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PERIODONTISTS' ABILITY TO SELF-ASSESS THEIR KNOWLEDGE OF PERIODONTICS

A Dissertation

Submitted to the Graduate Faculty of the
University of New Orleans
in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy
in
The Department of Educational Leadership, Counseling and Foundations

by

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For Hisho, Mami, Bobi, & Tayo

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ABSTRACT

This study examined periodontists' ability to self-assess their knowledge of periodontics. Self-assessment was measured as the difference between actual knowledge and perceived knowledge of two topics of clinical practice of periodontics: periodontal disease therapy and dental implant therapy. Other variables included were learning needs, motivation to learn, and background characteristics (number of years since graduation from a periodontics training program, classification as Diplomate or non-Diplomate, number of years since achieving Diplomate status, classification as private practitioner, academician, or private practitioner with a part-time academic position, and number of credit hours spent in continuing education per year). A questionnaire was e-mailed to 1,800 periodontists practicing in the USA. Two hundred and nineteen subjects participated in the periodontal disease therapy questionnaire and 200 in the dental implant therapy questionnaire. The results showed a significant difference between actual and perceived knowledge for both topics. Correlation coefficients showed no correlation between participants' actual knowledge and perceived knowledge of periodontal disease therapy and a low to moderate correlation between actual and perceived knowledge of dental implant therapy. Also, the results showed that need and motivation are not related to self-assessment ability, but actual knowledge may be related to moderate-high need and motivation; and, that among the background characteristics, Diplomate status is related to a better ability to self-assess, and fewer years since achieving Diplomate status is related to higher actual knowledge and perceived knowledge. In conclusion, periodontists' ability to self-assess their knowledge of periodontics is at best moderate. The concern that practitioners believe that they have higher knowledge in areas in which objectively measured knowledge is significantly lower continues to be valid.

CHAPTER 1

INTRODUCTION

Scholars and practitioners alike have discussed healthcare professionals' lack of commitment to maintaining current knowledge and suggest that healthcare professionals do not adequately promote the ethos of continuing education (Drummond, 1986). Some models address the evaluation and planning of continuing professional development by individuals and agencies that regulate the practice of healthcare professionals to evaluate and plan continuing professional development (Kerka, 1994; Knowles, Holton, & Swanson, 1998); however, incongruence between both study designs and results and the lack of long-term evaluations on the application of such models have not validated any single model.

The two major models are the mandatory assessment model and the self-assessment model. The former has long been the primary model in the healthcare fields (Kerka, 1994), but recent research on adult learning or andragogy indicates that adults prefer to self-assess their learning needs (Knowles, Holton, & Swanson, 1998). Andragogy is one of the central concepts in adult education and one of the major foundations for self-assessment. Andragogy suggests that adults prefer to have autonomy in their learning and become ready to learn when they experience a need to learn (Kerka, 1994; Knowles, Holton, & Swanson, 1998). In addition, andragogists believe that for one to achieve the highest level of motivation, one must self-assess specific learning needs (Knowles, Holton, & Swanson, 1998).

With andragogical principles as a conceptual framework, the question of this research is whether healthcare professionals are capable of self-assessing their knowledge in order to maintain and increase competency. This study examined periodontists' ability to self-assess their knowledge of periodontal topics that are necessary for the competent practice of the specialty.

In the United States of America (USA), the American Academy of Periodontology (AAP) is responsible for the advocacy, maintenance of standards, and promotion of excellence in the practice of periodontics, which is a subspecialty of dentistry (AAP, 2006a). In addition, the AAP organized the American Board of Periodontology (ABP) to encourage the continuing education of periodontics and to advance its practice. The ABP is responsible for creating, administering, and granting a nonmandatory Diplomate certification and recertification to periodontists who have made significant achievements beyond the mandatory educational requirements of the specialty (AAP, 2006b).

In the USA the only authority on licensure requirements for dentists is the individual state. For example, the Louisiana State Board of Dentistry requires a dentist to attend 40 credit hours of continuing education in a period of two years. To date, 47 of the 52 states and territories of the USA have continuing education mandates. Also, most states regulate the number of continuing education hours devoted to specific subjects to ensure a diverse continuing education (American Dental Association (ADA), 2006).

Therefore, periodontists may meet mandatory requirements for continuing education for licensure, but in the process use self-assessment to direct this education. Unfortunately, the research base on self-assessment offers mixed results on the ability of healthcare professionals to make effective self-assessments. In particular, research has not yet indicated if periodontists can effectively self-assess their knowledge of periodontics in order to meet their educational needs and be competent.

Therefore, this study examined periodontists' ability to self-assess their knowledge of two periodontal topics that are necessary for the competent practice of the specialty. This study also correlated periodontists' ability to self-assess, actual knowledge, perceived knowledge, learning needs, motivation to learn, and other background characteristics.

Statement of the Problem

The concept of self-assessment has been addressed mostly in opinion papers and qualitative studies in the medical and dental literature (Chambers & Glassman, 1997; Houlden & Collier, 1999; Orest, 1995). Such reports have concluded that self-assessment induces a willingness to improve and that dental professionals, because of their expertise level, can effectively determine their learning needs. However, quantitative research of self-assessment has shown diverse results. Most of these studies have provided only low to moderate support for the accuracy of healthcare professionals' self-assessment of their knowledge or performance (Regehr et al., 1996; Sáenz, 2002; Tracey et al., 1997). These studies have concluded that healthcare practitioners cannot accurately assess their own level of knowledge on a given topic and that professional development programs that rely on self-assessment of learning needs are likely to be flawed.

As a result, these conflicting findings and views leave a gap in the knowledge base of models for continuing education and provide no foundation for the value of self-assessment. These conflicting findings and gaps, however, do provide a basis for an in-depth examination of the construct of self-assessment and related issues including knowledge, learning needs, motivation to learn, and background characteristics for health professionals.

Purpose Statement

The primary purpose of this study is to assess periodontists' ability to self-assess their knowledge of periodontal topics. The secondary purpose is to assess the relationship between ability to self-assess, actual knowledge, perceived knowledge, learning needs, motivation to learn, and background characteristics. Background characteristics are a periodontist's number of years since graduation from a periodontics training program; classification as Diplomate or non-Diplomate, and, if classified as Diplomate, number of years since achieving Diplomate status; classification as private practitioner, academician, or private practitioner with a part-time

academic position; and number of credit hours required for licensure and actually spent in continuing education per year.

Significance

The results of this research will provide insight on the self-assessment of knowledge for periodontists, dental professionals in general, and agencies that regulate the practice of dentistry and its specialties. For dental professionals these results may lead to the development of guidelines that can improve their ability to self-assess, allowing them to recognize parameters and characteristics that relate to this ability. For agencies that regulate the practice of dentistry these results may help define parameters for continuing education and assure that the agencies place adequate weight on self-assessment since these agencies rely partially on self-assessment to award credit for the continuing competency of healthcare providers. The findings will be of particular value to the ABP because it developed a self-evaluation test as an elective component of recertification.

Overall, this study may be of value to educators who design professional development programs and to agencies involved in licensure and certification. In general, this study may advance the knowledge base of continuing education and self-assessment since the literature void is still ample. Ultimately, this study may have implications for theory, policy, practice, and future research.

Research Questions

The following research questions were developed based on previous research, the literature, and the researcher's observations on and interest in the topic.

1. What is the ability of periodontists to self-assess their knowledge of periodontics?
2. What are the relationships between periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, learning needs, and motivation to learn?

3. What are the relationships between periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, and background characteristics? Specifically:
 - 3.1. What is the relationship between number of years since graduation from a periodontics training program and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?
 - 3.2. What is the relationship between classification as Diplomate or non-Diplomate and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?
 - 3.3. What is the relationship between number of years achieving Diplomate status and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?
 - 3.4. What is the relationship between classification as private practitioner, academician, or private practitioner with a part-time academic position and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?
 - 3.5. What is the relationship between credit hours required and spent in continuing education per year and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?

Methodology

This is a two-part study. The first part consisted of the development of an instrument to measure knowledge. For this, the researcher delimited two topics for study: periodontal disease therapy and dental implant therapy. She formulated questions using these topics and literature published from July 2000 to June 2003 in the *Journal of Periodontology (JP)*, the official monthly publication of the AAP that all members receive. Then the validity and reliability of the questions were evaluated using a panel of experts and a pilot sample. The questions found to have poor

to moderate validities and reliabilities were eliminated. The final questionnaire was administered for the second part of the study.

The second part of the study consisted of the final analysis of the reliability of the instrument and the actual measurement of periodontists' ability to self-assess their knowledge of the two aforementioned topics of periodontics. In addition to the assessment of actual and perceived knowledge, the instrument assessed learning needs, motivation to learn, and background characteristics for the researcher to determine if these are related to self-assessment.

The instrument was e-mailed to periodontists in USA for self-administration. The data was then statistically analyzed. Pearson and Spearman correlations were used to assess relationships between actual knowledge, perceived knowledge, learning needs, and motivation to learn. Univariate analysis of variance (ANOVA) was used to assess the relationships between periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge to the background characteristics.

Conceptual Framework

Andragogy suggests that an adult prefers to have autonomy in learning and that for one to achieve the highest level of motivation, one must self-assess learning needs (Knowles, Holton, & Swanson, 1998). Andragogy also suggests that professionals are at an expertise level that permits them to diagnose their learning needs (Chambers & Glassman, 1997). These concepts are the conceptual framework of this study. If this research concludes that periodontists do indeed have the ability to self-assess their knowledge, then this study will provide empirical evidence supporting self-assessment as a valid model in continuing education.

Delimitations

This study examined the knowledge aspect of competency; it did not examine the other two aspects of competency: skill and professional attitudes. Within the knowledge aspect of competency, this study assessed the ability of periodontists to self-assess their knowledge of two topics of periodontology: periodontal disease therapy and dental implant therapy. These are topics within two of the seven subjects that the ABP has determined to be relevant to the science and art of periodontology. This study does not address other subjects or topics. Furthermore, these two topics are confined to only literature of periodontal disease therapy and dental implant therapy that was published in *JP* between July 2000 and June 2003.

Limitations

A limitation is that knowledge, even of specific topics, is too broad to evaluate. To overcome this limitation the subjects were given specific information of what knowledge would be evaluated. Also, the reliability and validity of the actual knowledge questionnaire are of concern, but this study took measures during part 1 of the study to control for this limitation.

The participants' self-administration of the questionnaire was also a limitation. The researcher can only assume that the participants responded in an honest system to the actual knowledge questionnaire without the aid of references as the instructions requested them to do.

Another limitation was that the questionnaire was web-based. This limited the pool of subjects to periodontists who list an e-mail address in the AAP directory and may have excluded more veteran periodontists who may be less computer savvy or may not even have an e-mail address. In addition, it is possible that some participants may have deleted the e-mail contacts before opening them due to fear of viruses or perceiving them as junk mail.

Definition of Terms

Ability to self-assess knowledge: the difference between actual and perceived knowledge, with a smaller difference indicating a better ability to self-assess.

American Academy of Periodontology (AAP): the American national academy for the dental specialty of periodontics. The AAP is an 8,000-member association of dental professionals specializing in the prevention, diagnosis, and treatment of diseases affecting the gums and supporting structures of the teeth and in the placement and maintenance of dental implants. The purpose of the academy is to advocate, educate, and set standards for advancing the periodontal and general health of the public and to promote excellence in the practice of periodontics (AAP, 2006a).

American Board of Periodontology (ABP): the only American national certifying board in the dental specialty of periodontics. The AAP organized the ABP in 1939 to elevate the standards and advance the science and art of periodontology by encouraging its study and advancing its practice. The board is responsible for creating and administering an examination process and granting and issuing Diplomate certificates. The ABP is one of the eight specialty boards that the ADA recognizes. The activities of the ABP conform to the requirements for recognition of dental specialties and national certifying boards for dental specialists of the American Dental Association Council on Dental Education (AAPb, 2006).

Competency: Elements of competence include knowledge, skills, and professional attitudes (Drummond, 1986). Competence implies that a practitioner exhibits the ability to integrate knowledge, skills, and attitudes into behaviors that are appropriate to a given situation and that conform to accepted standards of the profession (APTA, 1984 as cited in Deusinger, Sindelar, & Stritter, 1986).

Diplomate: a periodontist who is certified by the ABP following significant achievements beyond the mandatory educational requirements of the specialty. Educational requirements for board certification are certification as a dentist and certification as a periodontist after at least three years of postdoctoral study in an ADA approved program. In addition to the educational requirements, board certification requires comprehensive oral and written examinations in all phases of periodontal disease and its treatment, including dental implants (AAPb, 2006).

Knowledge: knowledge of a specific topic measured against well-accepted standards.

Learning needs: one's need to routinely update knowledge of a specific topic based on daily experience.

Motivation to learn: one's motivation to update knowledge of a specific topic.

Perceived knowledge: one's perceived level of knowledge of a specific topic.

Periodontics: the specialty of dentistry that encompasses the prevention, diagnosis, and treatment of the supporting and surrounding tissues of the teeth or their substitutes and the maintenance of the health, function, and esthetics of these structures and tissues (AAP, 2006a).

Self-assessment: one's ability to assess one's skills and knowledge, identify one's educational needs, evaluate one's progress, and determine the strengths and weaknesses of one's performance (definition modified from Knowles, Holton, & Swanson, 1998).

Summary

Adults prefer to have autonomy in their learning (Kerka, 1994; Knowles, Holton, & Swanson, 1998) and believe they are able to self-assess their educational needs (Chambers & Glassman, 1997). Though qualitative studies have concluded that self-assessment induces a willingness to improve (Chambers & Glassman, 1997; Houlden & Collier, 1999; Orest, 1995), quantitative studies provide mixed results on whether self-assessment of knowledge or performance predictably correlates with actual knowledge or performance (Henbest & Fehrsen, 1985; Regehr et al., 1996; Sáenz, 2002; Tracey et al., 1997). Nevertheless, healthcare agencies that regulate the practice of dentistry employ a combination of mandatory and self-assessment protocols for licensure or certification of their members even though the application of self-assessment in continuing education may not be a valid method to credit competency. These conflicting findings in the knowledge base of self-assessment and continuing education provide a basis for an evaluation of the construct of self-assessment and related factors including actual knowledge, perceived knowledge, learning needs, motivation to learn, and background characteristics for dental professionals.

The following chapter will review the literature on competency, continuing education, the mandatory-assessment model, and the self-assessment model. In a discussion on self-assessment, the author will review principles of adult education that guide the self-assessment model and qualitative and quantitative studies that support, question, or dismiss the validity of self-assessment. The author will address the relation between knowledge and actual competence, and knowledge and background characteristics and will explain the conceptual framework for this study.

Chapter 3, the methodology, will describe the methods involved in this study including the instrument and assessment of its validity and reliability, the participants and sampling procedures, the procedures and timeline for data collection, and the methods for data analysis, and will include a discussion of the delimitations, limitations, and assumptions. Chapter 4, the

results, will present the statistical findings. Finally, Chapter 5, the discussion, will compare and contrast the findings to the literature and will present implications for policy and future research recommendations.

CHAPTER 2

LITERATURE REVIEW

Assessment models have enabled individuals to examine, plan, and evaluate their continuing professional development. The two most common are the mandatory assessment model and the self-assessment model. The former has been the primary model in the healthcare field (Kerka, 1994). However, research on adult learning indicates that adults prefer to self-assess and self-direct their learning needs (Cross, 1981; Kerka, 1994; Knowles, 1980). These contradictory models sparked this study on the ability of dental professionals to self-assess their knowledge.

The purpose of this chapter is to provide a foundation for the literature on competency, continuing education, the mandatory-assessment model, and the self-assessment model. The chapter will review the principles of adult education that guide the self-assessment model, then will explore the research base including opinion and qualitative reports that recommend self-assessment in particular in the health professions, and quantitative studies that offer varying conclusions, which do not resolve the issue of whether healthcare practitioners can accurately assess their own level of knowledge on a given topic. The author will also consider the relation between knowledge and actual competence, and knowledge and background characteristics and, to end, will explain the conceptual framework for the proposed study.

Competence

Competence is a function of an individual's thought patterns, actions, and attitudes that collectively produce a professional knowledge base and job-specific behavior (Deusinger, Sindelar, & Stritter, 1986). Competence is more than the ability to perform isolated skills and the demonstration of desired professional behaviors. It is a practitioner's ability to integrate

knowledge, skills, and attitudes into behaviors that are appropriate to a given situation and that conform to accepted standards of the profession (American Physical Therapy Association (APTA), 1984 as cited in Deusinger, Sindelar, & Stritter, 1986). Another characteristic of a competent individual is accurate assessment of one's own competency (Chambers & Glassman, 1997).

Competence and Continuing Education in the Health Professions

To ensure that practitioners continue to demonstrate competence in practice, governing bodies have developed quality assurance mechanisms, such as continuing education programs and processes for certification and licensure (Abrahamson, 1984; Deusinger, Sindelar, & Stritter, 1986; McGuire, 1983). In the health professions the development of continuing education has followed an evolutionary pattern with medical education the furthest along the path (Abrahamson, 1984). Thus, this review of the literature of continuing education in the health professions begin with continuing education in the medical field and proceed to the development of continuing education in dentistry.

History of Mandatory Continuing Medical Education

Only in the last century have issues surrounding continuing medical education (CME) received serious attention. Around the turn of the 20th century Sir William Osler, in a major address in London, put forth the thesis that physicians, in order to retain their competence to practice, must be lifelong students. By 1930 the extraordinary scientific advances of the late nineteenth century and the early decades of the twentieth century, resulted in a wide gap between the good medical care provided by knowledgeable, well-trained, and up-to-date physicians and the routine practices of those whose learning ended when they received the degree of doctor of medicine. To address this gap, the medical academic profession offered practitioners specially designed postgraduate courses. Later, as a consequence of World War II,

a remarkable explosion of research and development in the biological sciences began and increasingly involved medicine. With this took place a rapid acceleration in the specialization of medicine, an increase in the numbers and types of residency programs for specialty and subspecialty training, and new imperatives to provide continuing education. Subsequently, troublesome issues arose, such as defining the roles that national, state, and local medical societies and professional associations should play and determining if competence should have any weight in the process of licensing physicians to practice. In the early 1950's the American Medical Association (AMA), after sponsoring a national study, recommended that CME be based in the university medical center and its affiliated hospitals rather than in the community. However, others voiced contrary opinions. A major recommendation, from the Post-Graduate Medical Institute of the Massachusetts Medical Society, which all states would eventually adopt, was that a division of a state medical society be charged with establishing local and regional programs and requirements (Uhl, 1992).

Two unexpected developments evolved from the movement towards CME. One is a voluntary program. Since 1968, physicians who meet a certain number of hours of study devoted to AMA-approved CME programs receive the AMA Physician's Recognition Award (PRA) (AMA, 2006a). The other has a legal thrust: the state of New Mexico passed legislation in the 1970s that mandated physicians to receive documented continuing education to remain licensed. To date, of the 68 medical boards in the USA, 54 have implemented a mandatory policy for licensure (AMA, 2006b). Also, a number of state medical associations and medical specialty societies require CME as a condition of continuing membership (Manning & Petit, 1987). Mandatory continuing education thus has become a major issue for the profession and a subject of controversy among educators in the field.

History of Mandatory Continuing Dental Education

Before 1969, continuing education of dentists was totally voluntary. Minnesota was the first state to impose mandatory continuing education for licensure (Kress, 1979). Until 1980, only 9 of the 52 states and territories of the USA required continuing education for dentists (Field, 1995). To date as a condition for licensure, 47 of the 52 state dental boards require continuing education credit hours for dentists over a one-to-five-year period (American Dental Association (ADA), 2006a).

For all dental professionals, including periodontists, the final authority on licensure requirements is the individual state (ADA, 2006a). In addition, to maintain active American Academy of Periodontology (AAP) membership, periodontists are required to attend one annual meeting of the AAP during each three-year period (AAP, 2006a). Furthermore, through elective examinations, periodontists may become Diplomates of the American Board of Periodontology (ABP). The ABP requires continuing education credit hours for continued certification, and has recently developed a self-evaluation test as an elective component for accreditation (AAPb, 2006).

Overall, despite requirements, problems with continuing education seem to persist.

Problems with Continuing Education

The literature has sporadically reported problems with continuing education including poor attendance, lack of relevance to one's practice, insufficient measurement of participants' acquisition of knowledge, and lack of evidence that continuing education improves practice (Harden et al., 1979; Kerka, 1998; McGuire, 1993). Performance in practice has been deduced from measures such as participation in continuing education and self-reports of scientific reading and other professional activities. For purposes of continued licensure and certification, these traditional indices have been expanded to include conventional tests and, in some instances, simulations of practice. Unfortunately, each of these types of instruments has serious deficiencies not only as a predictor of future performance, but even as an indicator of current

performance (McGuire, 1993). Moreover, the main problem is that competency assessment mechanisms have not shown that practitioners have the knowledge and skill necessary for practice in the constantly changing healthcare environment. No evidence exists of a correlation between attendance at continuing education programs and practice competence (Abrahamson, 1984; Deusinger, Sindelar, & Stritter, 1986; Koffman, 1980; McGuire, 1993). Thus, the profession lacks a systematic plan for routinely assessing the competence of its members and for directing continuing education (Deusinger, Sindelar, & Stritter, 1986). Despite the lack of evidence on outcomes, requirements are still in place and therefore support the demand for continuing education.

In great part the problem is that it is difficult to measure the degree of improvement in the practice of those who had taken continuing education courses. Such evaluation would be difficult and not only require on-site observation, but the measurement of certain intangible qualities, such as needs and motivation, which are crucial to the betterment of the practice of health providers (Uhl, 1992). Some recommendations move beyond mandatory continuing education as a measure of continuing competency and put forth the use of methods of measuring educational needs and professional performance and basing the content of continuing education on identified objectives followed by evaluation of results (Felch, 1992; Field, 1995).

Competence Assessment Models

All in all, the question stands: does continuing education for health professionals make a difference? As a guarantee of competence, scholars continue to suggest methods for the enforcement of competence that include mandatory assessment and self-assessment.

Mandatory Continuing Education

The term mandatory continuing education (MCE) refers to the imposition by states and professional associations of a requirement for members of certain vocations and professions to fulfill educational obligations in order to retain or renew their licenses to practice (Cross, 1981).

Mandatory continuing education (MCE) is the primary model for continuing education in the healthcare fields (Kerka, 1994). Opponents of this system have criticized it for several reasons. Among the chief arguments are that it is reductionist, it violates adult learning principles, it is punitive to those who participate voluntarily, evidence of it improving practice is lacking, programs are not consistently and uniformly available, and professionals should be accountable for effective performance, not just participation (Chappell 1996; Ecclestone 1997; Hyland 1994; Kerka 1994; Kerka 1998). The opposition to MCE also believes that money is a factor for its continued existence because continuing education providers make an income from offering programs to professionals who are legally compelled to attend (Cross, 1981; Felch, 1992). However, proponents support mandatory continuing education for a number of reasons; they believe that well-designed programs can influence effective practice, voluntary participation is unrealistic, MCE is available to everyone, mandates are necessary to protect the public, and MCE makes clear what is to be achieved and the standards for measuring achievement (Cross, 1981; Kerka, 1994; Kerka 1998). In theory, MCE overcomes the divide between theory and practice (Kerka, 1998).

Overall, the issues surrounding MCE are complex. They revolve around one basic question: is MCE effective; that is, do people who are required to attend continuing education necessarily become more competent? Only empirical research can answer this question. Without empirical research, Cross (1981) developed the following common-sense conclusions: (1) As a group, people who are required to learn are more likely to learn up-to-date information than people who are not required. (2) People who are motivated to learn are more likely to be

better informed than people who are merely serving time in class. (3) Voluntary learning is most effective, but compulsory learning is better than nothing.

Even if research could validate these conclusions, it would not answer the ultimate question of whether MCE protects consumers from incompetent practice. The professional must not only absorb the evolving knowledge and theoretical concepts of a field but also learn the skills for implementing that knowledge (Cross, 1981).

Self-Assessment

Proponents of the self-assessment model base their principles on the school of adult education. The following summarizes the main principles of adult education:

1. Learning is a lifelong continuum.
2. Adults of all ages can learn.
3. Experience is a resource for learning.
4. Adults look for practical learning.
5. Adults are self-directed in their learning.
6. Adults learn voluntarily due to:
 - a. Need
 - b. Personal satisfaction.
7. Learners are more apt to make changes due to learning if they have clear objectives (Knowles, 1980).

Overall, advocates of self-assessment for adult learning indicate that adults prefer to self-assess their learning needs and become ready to learn when they experience that need and motivation.

Educators define an educational need as a discrepancy between an existing set of circumstances and a more desirable set. In this context, circumstances can either be described in terms of knowledge, skills, and attitudes or as levels of competencies (Moore and Cordes,

1992). The more concretely individuals can identify their aspirations and assess their present level of competencies in relation to them, the more exactly they can define their educational needs, and the more intensively they will be motivated to learn. Moreover, interests are expressions of preferences among alternative activities, and the only valid source of information about the interests of adults is the individuals themselves. Additionally, the more congruent the needs of individuals are with the aspirations of their organizations and society (or the other way around—the more congruent the aspiration of organizations and society are with the educational needs of individuals), the more likely individuals will learn effectively (Knowles, 1980).

In sum, for one to achieve the highest level of motivation to learn, it is imperative that the individual self-assess specific learning needs. Self-assessment of learning needs refers to collecting information to identify gaps and then making judgments about the difference.

Research on Self-Assessment

Overall, the literature on self-assessment offers controversial results. Some studies have concluded that self-assessment induces a willingness to improve and correlates to actual knowledge or performance (Chambers & Glassman, 1997; Houlden & Collier, 1999; Orest, 1995, Henbest & Fehrsen, 1985), while other studies contradict this conclusion (Regehr et al., 1996; Sáenz, 2002; Tracey et al., 1997).

Chambers & Glassman (1997) believe that dental professionals who have achieved a stage of expertise may evaluate their education through self-assessment. They proposed that competency-based education assumes that learning to become a professional is a progression through stages and developed a model for educational and evaluation methods that is appropriate at various stages of the competency continuum (see Table 1). In their classification, the first three stages of competency are novice, beginner, and competent. Competent refers to

dental students who are to be certified as ready to begin independent practice. The last two stages, proficient and expert, refer to general dentists in practice.

Table 1

Chambers & Glassman’s Model for Educational Methods and Evaluation Methods

Stage of competency	Educational methods	Evaluation methods
Novice	Lecturing	Tests
Beginner	Seminars	Simulations
Competent	Real work	Authentic evaluations based on judgment by evaluator(s) (performance assessment) (i.e. test cases, case presentations, research projects, portfolios).
Proficient	Specialized training	Work-related markers
Expert	Self-managed	Self-assessment

Contrary to Chambers and Glassman’s (1997) belief that experts—dental professionals— have achieved a stage of expertise at which they may evaluate their education through self-assessment, this author (Sáenz, 2002) reported that younger professionals— equivalent to proficient in Chambers and Glassman’s classification—have a better ability to self-assess compared to more senior professionals —or experts in Chambers and Glassman’s classification. However, this author discussed that this finding may be attributed to younger professionals retaining more knowledge because they have recently completed their dental degree and to recent practice taking examinations.

Qualitative Studies on Self-Assessment

Over the years the concept of self-assessment has been recommended in opinion papers and qualitative studies in the medical literature (Chambers & Glassman, 1997; Houlden & Collier, 1999; Orest, 1995). Such reports have concluded that self-assessment induces a willingness to improve.

For instance, Orest (1995) described selected physical therapists' perceptions of self-assessment in their clinical practice. The subjects were four practicing physical therapists who were willing to discuss the topic of self-assessment. The themes related to self-assessment of competence, patient outcome, and professional development. Within these three themes of self-assessment, the subjects wanted to improve themselves as clinicians to be better able to serve their patients.

Other proponents of self-assessment add that it must be complemented by external support, such as guidelines and portfolios. For instance, Houlden & Collier (1999) believe that learning outcomes for continuing medical education should be derived from the learner's needs. They stated that concise, clear objectives assist learners in selecting appropriate learning activities, structuring learning experiences, and determining what has been learned. Trossman (1999) reported that some state boards are now requiring registered nurses to keep a career portfolio to maintain licensure. These portfolios include details of the current state of one's practice, background, skills, expertise, a working plan for professional growth, and a reflection on one's strengths and weaknesses. This model seems to aid in identifying what professionals need or want to learn to improve their practice. Jensen and Saylor (1994) also studied the usefulness of portfolios for professional development and reflection in the disciplines of physical therapy and nursing. Portfolios were prepared by students and used in combination with student self-evaluations and instructor assessments. Data suggested that the use of portfolios promoted student reflection on professional development.

Quantitative Studies on Self-Assessment

As the review of studies on self-assessment continues, one can notice that some of the differences in results may depend on the instructions and parameters given to the participants. For instance, Henbest and Fehrsen (1985) invited senior medical students to assess their performance compared to the assessment of two professors. For this, 19 students attended an orientation session that outlined the principles of teaching and learning that the department followed and were invited to take responsibility for and to participate fully in their own learning, including determining the criteria for evaluation. The results showed a significant correlation between students' and professors' assessment means ($r=0.74$). Following evaluations, the professors conducted individual feedback sessions for each student. Henbest and Fehrsen reported that one of the most striking things was the seriousness and enthusiasm with which students entered into assessing themselves and the reflection it caused. The assessments represented identification of their own strengths and weaknesses. Comments made by the students included statements such as "I worked much harder during this block because I was assessing myself" and "grading my own charts was a real eye opener." The positive results from this study may be related to the researchers giving the students the specific principles of teaching and learning of the department, and giving students control over their own evaluation may have motivated the students.

Other quantitative reports have found that self-assessment, as well as assessment by an expert, does not always correlate to a degree that one would consider to be predictable. For instance, Regehr et al. (1996) presented a theoretical framework and a measurement tool for understanding and exploring the nature of self-assessment. This alternative conceptualization of self-assessment is based on an individual's need to place stronger emphasis on improving certain specific skills by asking oneself: "What aspects of my performance need the most work?" Twenty-five psychiatry students were given a relative ranking instrument containing 10 skills following patient consultations. The students and two expert clinicians were asked to evaluate

the students' performance. Results showed that students' self-assessments as measured against the experts' were only moderately positive ($r=0.43$). Compared to Henbest & Fehrsen's study (1985), the difference in results may be related to students not receiving clear parameters for assessment.

Similarly, Tracey et al. (1997) conducted a study to determine whether medical general practitioners can make accurate self-assessment of their knowledge in specific areas. Sixty-seven general practitioners completed a self-assessment of their knowledge of a variety of topics using a nine point semantic differential scale. An objective assessment of their knowledge was then made through the administration of true-false tests on two of the topics: thyroid disorder and non-insulin dependent diabetes. The study was repeated with another group of 60 general practitioners, using sexually transmitted diseases as the topic. The results showed that correlations between self-assessment and test scores were poor for all three topics studied ($r=0.19$ for thyroid disorders, $r=0.21$ for non-insulin dependent diabetes, $r=0.19$ for sexually transmitted diseases). Tracey et al. concluded that general practitioners cannot accurately assess their own level of knowledge on a given topic, and professional development programs that rely on the doctors' self perception to assess their needs are likely to be seriously flawed.

This conclusion that self-assessment is an inadequate method to assess knowledge provoked controversy resulting in a few letters to the authors. For instance, Edwards et al. (1998) argued that Tracy et al. did not correctly assess knowledge and needs. Edwards et al. believe that identifying needs from personal experience is perhaps more valid than general rating scales of knowledge. They also believe that the vast range of clinical conditions only means doctors cannot know everything and that it is more important for general practitioners to access information when required rather than to have it readily accessible. Similarly, Crilly (1998) argued that continuing education needs to focus on helping doctors identify gaps in their knowledge while Taylor (1998) argued that testing could be valid only if questions are relevant to those tested.

Tracey et al. (1997) replied that they were not suggesting needs assessment is not important; rather they were making a case for it to be executed more rigorously. They also agreed that the range of clinical knowledge is too vast to maintain. However, the authors explained their concern was that some general practitioners in their study believed they had adequate knowledge in areas in which their objectively measured knowledge was poor.

More recently, the author (Sáenz, 2002) studied the ability of dental professionals to self-assess their knowledge. Questionnaires that included a self-assessment analysis of knowledge and a multiple-choice test that assessed clinical knowledge of multidisciplinary therapy were mailed in a dental school to full-time faculty, part-time faculty, and second- and third-year specialty residents. Thirty-four dentists responded. No significant correlation was found between actual and perceived knowledge using two parameters of measurement ($r=0.07$ and $r=0.22$). Nevertheless, it was found that recent dental graduates have more knowledge and better self-assessment ability than non-recent graduates. The author concluded that dental professionals do not seem to update their knowledge after formal training. However, Sáenz reported flaws in the study; the parameters given to assess knowledge were not specific enough and the questions used to assess knowledge were too diverse.

Therefore, a probable fault not only with the author's (Sáenz, 2002) study but with that of Tracey et al. (1997) as well is that, as Edwards et al. (1998) have expressed, the knowledge base, even for specific topics, is too vast; and, if practitioners are not given clear parameters for the knowledge that will be assessed, then that gap may be partially responsible for the poor correlations. Nonetheless, the issue still stands of whether professionals believe to have adequate knowledge in areas in which objectively measured knowledge is poor.

To sum up, results from quantitative research on the correlation between self-assessment and knowledge or performance vary from poor (Sáenz, 2002; Tracey et al., 1997), to moderate (Regehr et al., 1996), to good (Henbest & Fehrsen, 1985). Differences to consider

among studies are the degree of parameters given for assessment and whether the studies evaluated knowledge or performance. Table 2 summarizes the quantitative studies.

Table 2

Summary of Quantitative Studies on Self-assessment

	Subjects	Assessment	Correlation
Henbest & Fehrsen, 1985	19 senior medical students	Performance	r=0.74
Regehr et al., 1996	25 graduate medical students	Performance	r=0.43
Tracey et al., 1997	127 medical general practitioners	Knowledge	r=0.19 – r=0.21
Sáenz, 2002	34 general dentists and dental specialists	Knowledge	r=0.07 – r=0.22

Knowledge and Competence

Theoretically, a relationship is assumed between knowledge and competence in skills (Jansen et al., 1995). However, empirical studies have not consistently supported this relationship. Gonnella, Hojat, Erdman, & Veloski (1993) reported that several meta-analyses and correlational studies found little or no correlation between medical school grades and professional clinical competence of physicians.

At the graduate level, correlation between scores on performance-based tests and written tests assessing clinical competence appears to be variable. Some of the discrepancies may be due to differences in content of the tests compared. However, if the same blueprint is used for a clinical and a written examination, the correlation between them is high. For instance, Newble & Swanson (1988) reported a high correlation (0.88) between an objectively structured clinical examination (patient stations) and a short-answer test in the final-year examination,

using the same blueprint for both tests. Similarly, Van der Vleuten, Van Luyk, & Beckers (1988) found a high correlation between a written test and a performance-based test constructed according to the same blueprint and administered to senior medical students. Therefore, these studies showed that a written test score has potential predictive value for a performance-based test score in a population of graduating students. However, this could be quite different among practicing doctors practicing in a variety of conditions and having variable continuing medical education experience.

After graduation written examinations predominate because of advantages in terms of resources needed (Anderson & Kassebaum, 1993; Reznick et al. 1993). Due to their ease, written examinations are commonly given for continued licensure or certification. Although written tests may be highly reliable, they may lack validity and thus cause concern about their interpretation: a single-format test may be inadequate for measuring the multidimensional phenomenon of competence (Deusinger, Sindelar, & Stritter, 1986). Even so, the use of a written test and self-assessment is considered as a potential alternative method for performance-based testing (Jansen et al., 1995).

Knowledge and Background Characteristics

Age alone may not be a factor in maintaining competence (Bennett, 1992). However, studies with cross-sectional data or with data collected from different groups of people at the same time have shown some decline in test performance with age (Bennett, 1992; Sáenz, 2002). But longitudinal studies that follow the same people over time show less decline, and more active learners have more stability in learning over time. Health professionals are generally part of that group (Bennett, 1992).

Age, routine educational interaction, and competence are connected in certain situations. For example, physicians in solo practice without hospital privileges are at risk as they age, presumably because they lack day-to-day educational stimuli (Bennett, 1992).

Conceptual Framework

The conceptual framework for this study is based on the andragogical assumption that adults become ready to learn something when they experience a need and/or motivation to learn it in order to cope more satisfactorily with real-life tasks and problems (Knowles, 1980). Hence, through self-assessment professionals diagnose and meet their educational needs and ultimately maintain or increase their competence.

Being competent implies that a practitioner exhibits the ability to integrate knowledge, skills, and attitudes into behaviors that are appropriate to a given situation and that conform to accepted standards of the profession (APTA, 1984 as cited in Deusinger, Sindelar, & Stritter, 1986). This study will only assess the knowledge aspect of competency for periodontists, a subgroup of dental professionals. The assumption is that a higher ability to self-assess knowledge of a specific topic is related to higher actual knowledge, perceived knowledge, need to learn, and motivation to learn. Additionally, the assumption is that higher ability to self-assess, actual knowledge, and perceived knowledge, are related to the following background characteristics: fewer number of years since graduation from a periodontics training program, classification as Diplomate, fewer number of years since achieving Diplomate status, classification as private practitioner with a part-time academic position, and higher number of credit hours spent in continuing education per year (see Figure 1).

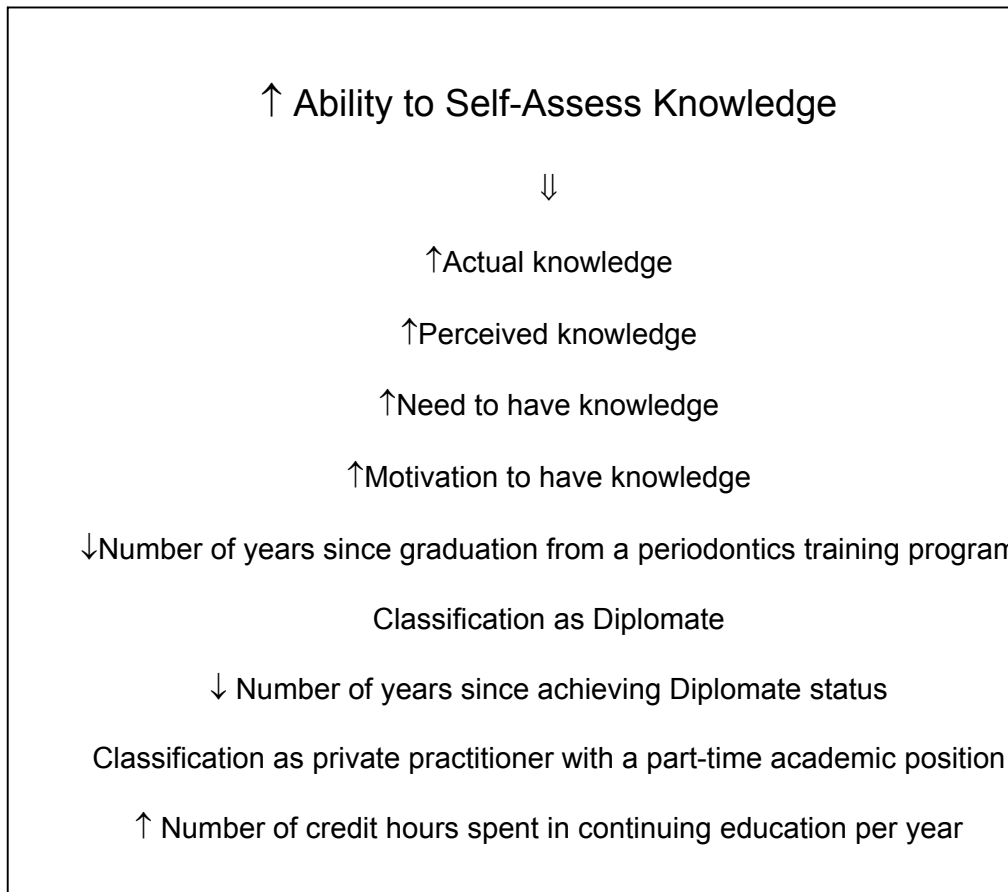


Figure 1. Conceptual framework.

↑ = higher; ↓ = fewer

Summary

Although mandatory education is the primary model used in healthcare fields for continuing education (Kerka, 1994), over the years the concept of self-assessment has been recommended in the health professions (Houlden & Collier, 1999). Researchers have reported that self-assessment induced a willingness to improve (Orest, 1995) and that expert health professionals are at a level at which they can self-assess their knowledge and educational needs (Chambers & Glassman, 1997). However, other researchers have reported that healthcare practitioners cannot accurately assess their own level of knowledge on a given topic and that professional development programs that rely on self-perception to assess competency

are likely to be flawed (Regehr et al., 1996; Sáenz, 2002; Tracey et al., 1997). Issues between models for continuing education remain unresolved due to the lack of evidence on outcomes. This study was designed to address this lack of evidence and the significant gap that exists in knowledge about continuing education for practicing healthcare professionals, particularly periodontists.

CHAPTER 3

METHODS

This study examined periodontists' ability to self-assess their knowledge of two topics of periodontics: periodontal disease therapy and dental implant therapy. In order to study this topic, the author developed an instrument in the form of a questionnaire (see Appendix A). Consequently, this is a two-part study. The first part consisted of the development of the questionnaire and assessment of its validity and reliability. The second part was the actual measurement of knowledge and self-assessment. In addition, this study assessed the relationship between ability to self-assess knowledge, actual knowledge, perceived knowledge, learning needs, motivation to learn, and background characteristics.

This chapter describes the methods that this study used, including the instrument and assessment of its validity and reliability, the participants and sampling procedures, the procedures and timeline for data collection, and the methods for data analysis. A discussion of the delimitations and limitations will follow.

Research Questions

1. What is the ability of periodontists to self-assess their knowledge of periodontics?
2. What are the relationships between periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, learning needs, and motivation to learn?
3. What are the relationships between periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, and background characteristics? Specifically:
 - 3.1. What is the relationship between number of years since graduation from a periodontics training program and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?

- 3.2. What is the relationship between classification as Diplomate or non-Diplomate and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?
- 3.3. What is the relationship between number of years achieving Diplomate status and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?
- 3.4. What is the relationship between classification as private practitioner, academician, or private practitioner with a part-time academic position and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?
- 3.5. What is the relationship between credit hours required and spent in continuing education per year and periodontists' ability to self-assess knowledge, actual knowledge, and perceived knowledge?

PART 1

The Instrument

The questionnaire that the author developed for this study has three sections. The first requested background information. The second measured self-assessment: perceived knowledge, learning needs, and motivation to learn. And the third assessed actual knowledge (see Appendix A).

The first step towards the development of the instrument was the selection of topics. For this, the selection was narrowed down to the two most frequently published topics in the *Journal of Periodontology (JP)* during a consecutive three-year period, July 2000 to June 2003. The topics were periodontal disease therapy and dental implant therapy. The procedures and results for topic selection will be explained in detail in Section 3 and in Chapter 4.

Section 1: Background Characteristics

This section of the questionnaire requested background information including number of years since graduation from a periodontics training program; classification as Diplomate or non-Diplomate, and, if classified as Diplomate, number of years since achieving Diplomate status; classification as private practitioner, academician, or private practitioner with a part-time academic position; and, number of credit hours spent in continuing education per year.

Section 2: Self-Assessment Questionnaire

This section focused on self-assessment of perceived knowledge, learning needs, and motivation to learn of each of the two topics of periodontology. Perceived knowledge is defined as the level of knowledge the participants believe to have of each of the two identified periodontal topics. Learning needs is defined as need to routinely update knowledge of each of the two topics based on daily experience. And motivation to learn is defined as the level of motivation the participant perceives to have to routinely update knowledge of each of the two topics.

A percentage and a Likert scale were used to measure perceived knowledge. Only Likert scales were used to measure need and motivation. The Likert scales consisted of a four-point criterion. The criteria for the self-assessment of perceived knowledge consisted of a score of 0 for no knowledge, 1 for minimal knowledge, 2 for moderate knowledge, and 3 for extensive knowledge. The criteria for learning needs consisted of 0 for no need, 1 for little need, 2 for moderate need, and 3 for high need. And the criterion for motivation to learn consisted of a score of 0 for no motivation, 1 for little motivation, 2 for moderate motivation, and 3 for high motivation.

Section 3: Actual Knowledge Questionnaire

The topics for assessment of actual knowledge were delimited from two of the seven subject areas that the American Academy of Periodontology (AAP) defines as relevant to the science and art of periodontology. The subject areas are basic sciences, oral medicine, oral pathology, periodontal histology and pathology, epidemiology and statistics, periodontal literature, and clinical practice (AAP, 2006a). The two subject areas selected for this study were periodontal literature and clinical practice. The two subject areas were selected based on accessibility and convenience since all members of the AAP receive *JP*, the official journal of the AAP, and it is estimated that close to 100% of the active members are clinical practitioners.

The subject area of clinical practice was further divided. The classification was based on the subject areas that the American Board of Periodontology (ABP) uses to examine candidates for Diplomate status during the oral examination. The subject areas include diagnosis (medical and dental history, intra- and extra-oral findings, occlusal and dental assessment), etiology, prognosis, treatment planning, therapy, and maintenance. All articles pertaining to clinical practice published in the *JP*, during the period from July 2000 to June 2003, were classified under one of the subject areas. In this categorization the most frequently published subject was therapy, and, within this subject, periodontal disease therapy and dental implant therapy were the most published topics. The author reviewed articles on these 2 topics and formulated multiple-choice questions from data reported in the articles.

Validity and Reliability of the Actual Knowledge Questionnaire

Three ex-ABP examiners served as panelists for this study and individually critiqued the face and content validity of each question. For this, the actual knowledge questionnaire was mailed to each panelist. A scale to assess validity and space for comments followed each question. The scale consisted of a three-point criterion: 1 = highly valid, 2 = moderately valid, and 3 = not valid (see Appendix A).

The results from the assessment of validity for each of the questions were averaged. The questions with validities greater than two were eliminated. The questions of actual knowledge were then administered to a pilot study group to assess internal reliability.

PART 2

Participants

The planned sample size was 400 participants. The author's (Sáenz', 2002) study that served as the design for this study reported a 44% response rate using a single contact, but response rates using several contacts vary from 50 – 80% (Dillman, 2000). Assuming a minimum of a 50% response rate, the author initially mailed the questionnaire to 800 periodontists practicing in the USA. Additional questionnaires were mailed relative to the response rate until the available pool of subjects was exhausted. Due to a low response rate a total of 1,800 questionnaires were e-mailed, but despite two attempts 272 were undeliverable. Of the 1,528 questionnaires delivered, 396 subjects accessed the link (25.94%). The actual response rate was 14.33% for the periodontal disease therapy questionnaire and 13.09% for the dental implant therapy questionnaire.

Sampling

A single-stage sampling procedure was employed. Participants were selected through systematic and stratified sampling procedures of AAP members who provide e-mail addresses in the AAP directory. Stratification was based on Diplomate status: non-Diplomate or Diplomate. A table of random numbers was used to locate the initial sampling points.

Procedures

Data Collection

A web-based survey company was used for the administration of the instrument, which allowed the creation of a professional-looking survey, generation of e-mail address books, use of management tools to track respondents, and the ability to download the raw data into a statistical program.

The instrument was administered by e-mail in five contacts as recommended by Dillman (2000):

1. Pre-notice e-mail: A brief pre-notice e-mail was sent to all selected participants a few days prior to the questionnaire. It noted that a questionnaire for a survey would arrive in a few days and explained its purpose and significance and that the person's response would be greatly appreciated (see Appendix B).
2. Web-Questionnaire: One week later, the web address to the web-based questionnaire was sent. This e-mail included a detailed cover letter reinforcing the significance of participants' response, provided directions for the completion of the questionnaire, indicated a one-week-period deadline for returning the forms, and requested that no references be used to aid in their responses. It also explained that confidentiality was guaranteed (see Appendix C).
3. Thank you e-mail: A follow-up e-mail was sent a few days to a week after the questionnaire. This e-mail expressed appreciation for responding and indicated that if

the completed questionnaire had not yet been completed it was hoped that it would be returned soon (see Appendix D).

4. Replacement web-questionnaire: A replacement web-based questionnaire was sent to non-respondents 2-4 weeks after the previous mailing (the survey web-based company used for this study allowed tracking of respondents and non-respondents). It indicated that the person's completed questionnaire had not yet been received and once again requested a response (see Appendix E).
5. Final contact: A final contact was made by e-mail to non-respondents a week after the fourth contact. The same message from the 4th contact was used.

As an incentive to participants, a copy of the knowledge questionnaire with the correct answers was offered. Prior to any contact with the participants, approval from the UNO Institutional Research Board was obtained (see Appendix F). Data collection was conducted between October 2004 and March 2005.

Non-responses

The author expected an approximate 50% response rate. Additional questionnaires were e-mailed to periodontists not selected in the first mailing until the pool of subjects was exhausted.

Missing values

The web-based questionnaire did not allow for missing values from the background and self-assessment part of the questionnaire, which included background information, perceived knowledge, learning needs, and motivation to learn. Any missing value from the actual knowledge part of the questionnaire was considered a wrong answer.

Data Analysis

Statistical Procedures

The statistical computer program SAS was used to analyze the data. The variables were summarized utilizing descriptive statistical procedures. Pearson and Spearman correlations were used to answer research questions 1 and 2: What is the ability of periodontists to self-assess their knowledge of periodontics?, and, what are the relationships between periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, learning needs and motivation to learn? The correlation coefficients determine the strength of the linear relationship between two variables (Hinkle, Wiersma & Jurs, 1998). Therefore, correlations allow the assessment of the relationship between all variables. Additionally, the use of correlations in studies by Regehr et al. (1996), Sáenz (2002), and Tracey et al. (1997) allowed the comparison of the results of those studies to this one.

Univariate analysis of variance (ANOVA) was used to analyze the relationships between the dependent variables (periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, learning needs, and motivation to learn) and each of the independent variables of background characteristics (number of years since graduation from a periodontics training program, classification as Diplomate or non-Diplomate, number of years since achieving Diplomate status, classification as private practitioner, academician, or private practitioner with a part-time academic position, and number of credit hours spent in continuing education per year). ANOVA tests assess the effects of the independent variables at once (Hinkle, Wiersma & Jurs, 1998; Stevens, 2002). If it is determined that a relationship exists between a dependent variable and an independent variable, post hoc multiple-comparison tests were conducted to determine which group(s) within the independent variable differ(s) significantly after a significant F ratio has been found in the ANOVA.

Summary

This is a two-part study that evaluated periodontists' ability to self-assess their knowledge of periodontics. Part 1 consisted of the development of a questionnaire. The topics selected for the assessment of actual knowledge were periodontal literature of periodontal disease therapy and dental implant therapy published in *JP* between July 2000 and June 2003. Preliminary assessment of validity and reliability were conducted using a panel of experts and a pilot study.

Part 2 consisted of the actual measurement of knowledge and self-assessment. In addition, this study assessed the relationship between ability to self-assess knowledge, actual knowledge, perceived knowledge, learning needs, motivation to learn, and background characteristics (number of years since graduation from a periodontics training program, classification as Diplomate or non-Diplomate, number of years since achieving Diplomate status, classification as private practitioner, academician, or private practitioner with a part-time academic position, and number of credit hours required for licensure and actually spent in continuing education per year).

The questionnaire was e-mailed to periodontists practicing in the USA. Subjects were selected through systematic and stratified sampling procedures using the directory of members of the AAP who provide e-mail addresses. Stratification was based on Diplomate status: non-Diplomate or Diplomate. The questionnaires were e-mailed using a web-based survey company.

The statistical computer program SAS was used to analyze the data. Pearson and Spearman correlations were used to assess relationships between actual knowledge, perceived knowledge, learning needs, and motivation to learn. Univariate analysis of variance (ANOVA) was used to assess the relationships between periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, and background characteristics.

CHAPTER 4

RESULTS

This study examined periodontists' ability to self-assess their knowledge of two topics of periodontics: periodontal disease therapy and dental implant therapy. The first part of the study consisted of the development of a questionnaire and assessment of its validity and reliability. The second part consisted of the measurement of actual knowledge, perceived knowledge, and self-assessment and the relationship between these variables and learning needs, motivation to learn, and background characteristics.

This chapter will report the results from the study including the validity and reliability of the instrument, descriptions of the participants' background, and results from the relationship between the variables studied.

PART 1

The Instrument

The questionnaire that was developed for this study has three sections. The first requested background information. The second measured perceived knowledge, learning needs, and motivation to learn; and the third assessed actual knowledge (see Appendix A).

The first step towards the development of the instrument was the selection of the topics of periodontics for the questionnaire. The selection began by the delimitation of two of the seven subject areas that the AAP defines as relevant to the science and art of periodontology. The subject areas are basic sciences, oral medicine, oral pathology, periodontal histology and pathology, epidemiology/statistics, periodontal literature, and clinical practice (AAP, 2006a). The two subject areas selected for this study were periodontal literature and clinical practice. The

subject area of clinical practice was further divided. The subdivision was based on the subject areas that the ABP uses to examine candidates for Diplomate status during the oral examination. The subject areas include diagnosis (medical and dental history, intra- and extra-oral findings, occlusal and dental assessment), etiology, prognosis, treatment planning, therapy, and maintenance. All articles pertaining to clinical practice published in the *Journal of Periodontology (JP)*, during the period from July 2000 to June 2003, were classified under one of the subject areas. This classification revealed that the most frequently published subject was therapy. Results are shown in Table 3. Because of the broadness of the subject area of therapy, the researcher further divided the subject of therapy into periodontal disease therapy, dental implant therapy, mucogingival therapy, and other types of therapy. The results show that the most frequently published topics within the subject of therapy were, first, periodontal disease therapy and, second, dental implant therapy (see Table 4).

Table 3

Number of Articles Published in JP between July 2000 and June 2003 Pertaining to Clinical Practice

Subject	Number of articles
Diagnosis	29
Etiology/Risk Factors	132
Prognosis	4
Treatment Planning	0
Therapy	272
Maintenance	1
Other clinical subjects	18

Table 4

Number of Articles Published in JP between July 2000 and June 2003 Pertaining to Therapy

Topic	Number of articles
Periodontal disease therapy	158
Dental implant therapy	56
Mucogingival surgery	41
Other therapy	17

The researcher reviewed the articles related to periodontal disease therapy and dental implant therapy and formulated multiple-choice questions from data reported in the articles. Fifty-eight questions were composed: 32 for the periodontal disease therapy topic and 26 for the dental implant therapy topic. Preliminary validity and reliability analyses followed.

Validity and Reliability of the Actual Knowledge Questionnaire

Three ex-ABP examiners individually critiqued the face and content validity of each question. For this, the actual knowledge questionnaire was mailed to each panelist. A scale to assess validity and space for comments followed each question. The scale consisted of a three point criterion: 1 = highly valid, 2 = moderately valid, and 3 = not valid (see Appendix A).

The results from the assessment of validity for each of the questions were averaged. The questions with validities greater than two were eliminated. A total of six questions were eliminated after that procedure.

The 52 remaining questions of actual knowledge were then administered to a pilot study group of 14 subjects to assess internal reliability. The pilot group consisted of 12 periodontal residents from two schools, 10 from Louisiana State University School of Dentistry and two from University of Texas Health Science Center School of Dentistry, and two faculty members, one

from each of the schools. The scores for each question were classified as 0 = wrong answer and 1 = correct answer. The 14 scores for each question were averaged. The questions that averaged 0 to 0.1 and 1 to 0.9 were eliminated to increase adequate distribution of scores. A total of 11 questions were eliminated: 5 for the periodontal disease therapy topic and 8 for the dental implant therapy topic. The final knowledge questionnaire consisted of 41 questions: 24 for the periodontal disease therapy topic and 17 for the dental implant therapy topic (see Appendix A).

Following administration of the instrument to the final sample, the scores for each question were once again classified as 0 = wrong answer and 1 = correct answer, and the scores for each question were averaged. The questions that averaged 0 to 0.1 and 1 to 0.9 were eliminated to increase adequate distribution of scores. Two questions were eliminated for the periodontal disease therapy topic. The statistical results for the knowledge questionnaire are based on 39 questions: 22 for the periodontal disease therapy topic and 17 for the dental implant therapy topic.

PART 2

Participants, Sampling, and Data Collection

The planned sample size was of 400 participants. The researcher assumed a 50% response rate and originally mailed the questionnaire to 800 periodontists practicing in the USA. A single-stage sampling procedure was employed. Subjects were selected through systematic and stratified sampling procedures of AAP members who provide e-mail addresses in the AAP directory. Stratification was based on Diplomate status: non-Diplomate or Diplomate. The questionnaire was administered by e-mail in five contacts: a pre-notice e-mail was sent to all selected participants four days prior to e-mailing the link to the questionnaire; the link to the web-based questionnaire was sent four days later; a thank you e-mail followed-up five days to a

week after the questionnaire, including the link to the questionnaire for those who had not responded; a replacement link to the questionnaire was sent to non-respondents 2 weeks after the previous mailing; and a final contact was made one week after the fourth contact.

Only 25.94% of the subjects accessed the link to the questionnaire, and approximately half of those subjects actually responded. Therefore, the instrument was mailed to a second group of subjects and then to a third. No more questionnaires were mailed afterwards because the available pool of subjects who are Diplomates and list an e-mail address in the AAP directory of members was exhausted.

The first group included 800 subjects; 667 questionnaires were delivered, but 133 questionnaires were undeliverable despite 2 attempts. The second group also included 800 subjects; 687 e-mails were delivered, but 113 e-mails were undeliverable despite two attempts. After the questionnaire was sent to the two groups, non-Diplomate participants accounted for fewer than 40% of the participants. In order to increase the proportion of Diplomate and non-Diplomate participants, additional questionnaires were mailed to non-Diplomates not selected in the first or second mailing. The third group included 200 non-Diplomates; 174 questionnaires were delivered, but despite two attempts 26 were undeliverable. A total of 1,800 questionnaires were e-mailed, 1,528 questionnaires were delivered, but only 396 subjects accessed the questionnaire—25.92% of the questionnaires delivered. Of the 396 subjects who accessed the questionnaire, 219 responded to the periodontal disease therapy questionnaire (55.30%) and 200 (50.51%) followed-up to complete the dental implant therapy questionnaire. The actual response rate was 14.33% for the periodontal disease therapy questionnaire and 13.09% for the dental implant therapy questionnaire (see Table 5).

Table 5

Number of Subjects, Questionnaires Delivered, and Access and Response Rate

	Number of subjects	questionnaires delivered	Access rate	Response rate
1 st group	800 subjects: 400 Diplomates 400 non-Diplomates	667	173 (25.94%)	
2 nd group	800 subjects: 400 Diplomates 400 non-Diplomates	687	191 (27.80%)	
3 rd group	200 subjects: all non-diplomates	174	32 (18.39%)	
Total	1,800 subjects: 800 Diplomates 1000 non-Diplomates	1,528	396 (25.92%)	13.09 - 14.33%

Participants and Background Characteristics

Two hundred and nineteen subjects responded to the periodontal disease therapy questionnaire, and of these 200 completed the dental implant therapy questionnaire. Results showed that 63% of the participants graduated from a periodontics training program 0-20 years ago. Approximately 56% are Diplomates of the ABP, and, among the Diplomates, 83% achieved the status 0-20 years ago. Approximately half of the participants are in private practice, with no part-time academic position. Over 67% of the participants are required to attend 11-20 hours of continuing education for licensure, but over 81% actually attend more than 21 hours every year. Also, over 80% of the participants perceive their knowledge of periodontal disease and dental

implant therapy to be adequate to extensive, over 79% perceive a moderate to high need to update their knowledge of the topics, and over 88 % have a moderate to high motivation to update their knowledge of the topics. Tables 6 to 13 and Figures 2 to 9 report specific details on the participants' background.

Table 6

Number of Years since Graduation from a Periodontics Training Program for Participants in Periodontal Disease Therapy (PDT) and Dental Implant Therapy (DIT)

Years since graduation	No. of participants in PDT	%	No. of participants in DIT	%
0-10	64	29.22	61	30.50
11-20	73	33.33	64	32.00
21-30	54	24.66	49	24.50
31+	28	12.79	26	13.00
Total	219	100	200	100

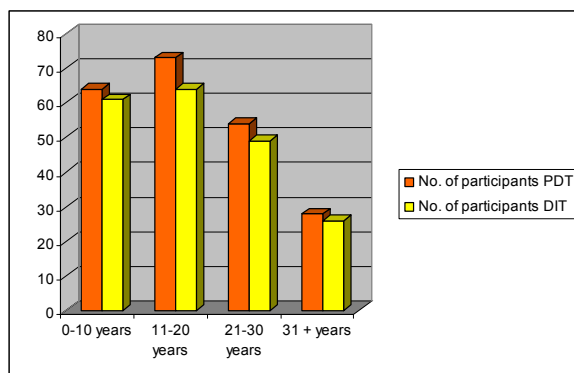


Figure 2. Number of years since graduation from a periodontics training program for participants in periodontal disease therapy (PDT) and dental implant therapy (DIT).

Table 7

Diplomate Status for Participants in Periodontal Disease Therapy and Dental Implant Therapy

Diplomate Status	No. of participants in PDT	%	No. of participants in DIT	%
Diplomate	122	55.71	111	55.50
Non-Diplomate	73	33.33	65	32.50
Diplomate eligible	24	10.96	24	12.00
Total	219	100	200	100

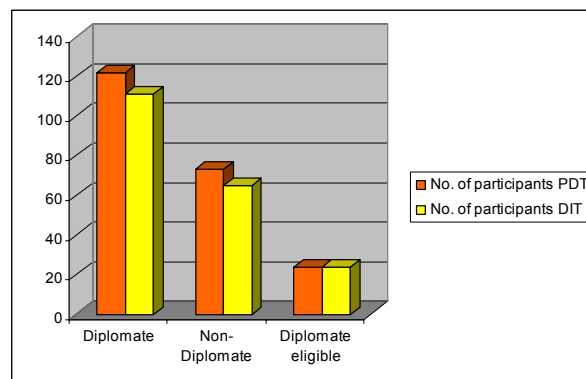


Figure 3. Diplomate status for participants in periodontal disease therapy and dental implant therapy.

Table 8

Number of Years since Achieving Diplomate Status for Participants in Periodontal Disease Therapy and Dental Implant Therapy

Years since Diplomate	No. of participants in PDT	%	No. of participants in DIT	%
0-10	62	51.97	62	53.45
11-20	39	30.71	33	28.45
21-30	19	15.75	19	16.38
31+	2	1.57	2	1.72
Total	122	100	116	100

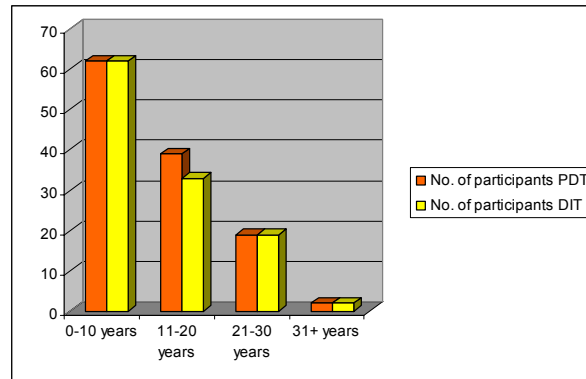


Figure 4. Number of years since achieving diplomate status for participants in periodontal disease therapy and dental implant therapy.

Table 9

Classification for Participants in Periodontal Disease Therapy and Dental Implant Therapy

Classification	No. of participants in PDT	%	No. of participants in DIT	%
PP	118	53.88	108	54.00
PP/PTA	56	25.57	53	26.50
Academician	34	15.53	29	14.50
Other	11	5.02	10	5.00
Total	219	100	200	100

PP = private practitioner; PP/PTA = part-time academician; Other = military

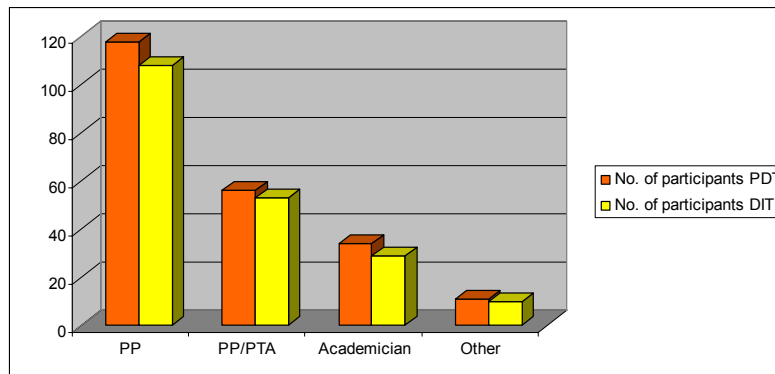


Figure 5. Classification for participants in periodontal disease therapy and dental implant therapy.

Table 10

Continuing Education Required and Attended for Participants in Periodontal Disease Therapy and Dental Implant Therapy

CE hours required	No. of participants in PDT	%	No. of participants in DIT	%	CE hours attended	No. of participants in PDT	%	No. of participants in DIT	%
0-10	16	7.31	14	7.00	0-10	4	1.83	3	1.50
11-20	148	67.58	138	69.00	11-20	35	15.98	35	17.50
21-30	48	21.92	42	21.00	21-30	71	32.42	65	32.50
31+	7	3.20	6	3.00	31+	109	49.77	97	48.50
Total	219	100	200	100	Total	219	100	200	100

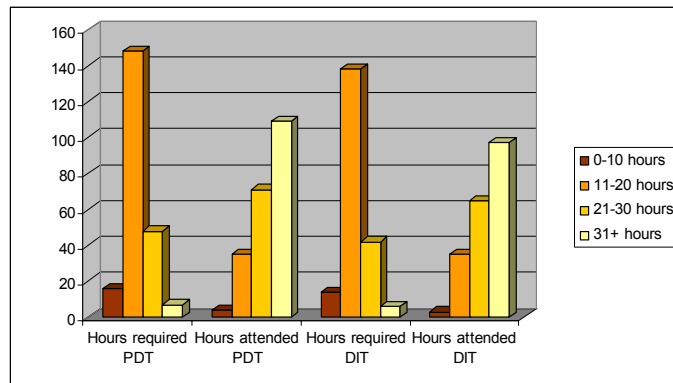


Figure 6. Continuing education required and attended for participants in periodontal disease therapy and dental implant therapy.

Table 11

Participants' Assessment of their Knowledge of Periodontal Disease Therapy and Dental Implant Therapy

Perceived knowledge	No. of participants in PDT	%	No. of participants in DIT	%
None-minimal	25	11.42	39	19.50
Adequate-extensive	194	88.58	161	80.50
Total	219	100	200	100

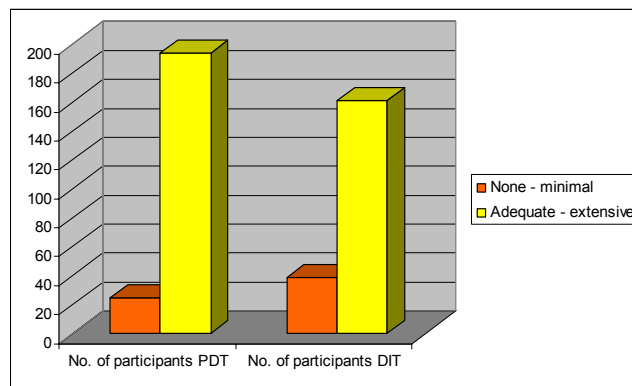


Figure 7. Participants' assessment of their knowledge of periodontal disease therapy and dental implant therapy.

Table 12

Participants' Need to Update their Knowledge of Periodontal Disease Therapy and Dental Implant Therapy

Need to update knowledge	No. of participants in PDT	%	No. of participants in DIT	%
None - minimal	44	20.99	26	13.00
Moderate - high	175	79.91	174	87.00
Total	219	100	200	100

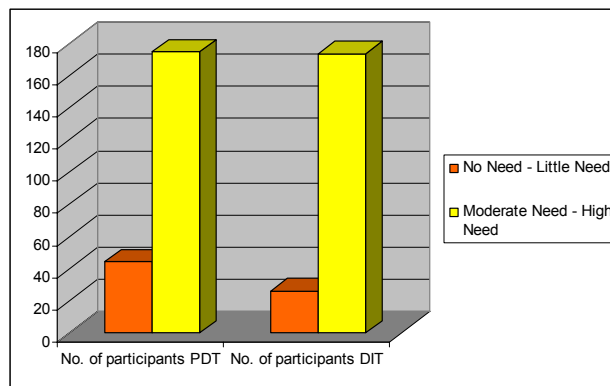


Figure 8. Participants' need to update their knowledge of periodontal disease therapy and dental implant therapy.

Table 13

Participants' Motivation to Update their Knowledge of Periodontal Disease Therapy and Dental Implant Therapy

Need to update knowledge	No. of participants in PDT	%	No. of participants in DIT	%
None - minimal	21	9.59	23	11.50
Moderate - high	198	90.41	177	88.5
Total	219	100	200	100

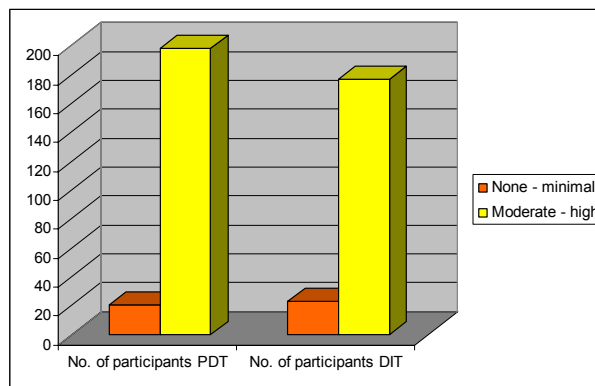


Figure 9. Participants' motivation to update their knowledge of periodontal disease therapy and dental implant therapy.

Periodontists' Ability to Self-Assess Their Knowledge of Periodontics

The mean actual knowledge score for the periodontal disease therapy was 51.40 (sd = 14.38), and the mean perceived knowledge score was 63.34 (sd = 20.13). The mean ability to self-assess (difference between actual and perceived scores) was -11.95 (sd = 23.87). Paired t-tests showed a significant difference between the actual and the perceived scores ($t = 7.41$, $p < .0001$).

Pearson and Spearman correlation coefficients were calculated for the relationship between participants' actual knowledge and perceived knowledge of periodontal therapy. No Pearson correlation was found using the perceived percentage of right answers ($r(219) = .08$, $p > .05$). Spearman correlation for the relationship between participant's actual knowledge and perceived knowledge using a scale also showed no correlation ($r(219) = .04$, $p > .05$).

The mean actual knowledge score for the dental implant therapy was 53.11 (sd = 13.67), and the mean perceived knowledge score was 60.97 (sd = 23.78). The mean ability to self-assess (difference between actual and perceived scores) was -8.71 (sd = 23.50). Paired t-tests showed a significant difference between the actual and the perceived scores ($t = 5.20$, $p < .0001$).

Pearson and Spearman correlation coefficients were calculated for the relationship between participants' actual knowledge and perceived knowledge of dental implant therapy. A low Pearson correlation was found using the perceived percentage of right answers ($r(200) = .26$, $p < .01$). Spearman correlation for the relationship between participant's actual knowledge and perceived knowledge using a scale showed a moderate correlation ($r(200) = .55$, $p < .01$) (see Tables 14 & 15 and Figures 10 & 11).

Also, the results showed that participants who perceived to have adequate to extensive knowledge of dental implant therapy have significantly higher actual knowledge (54.66 ± 12.72) than those who perceived to have none to minimal knowledge (46.18 ± 15.69) ($p < 0.001$). For

both topics, no significant differences were found between ability to self-asses knowledge using this scale. However, participants who perceived to have none to minimal knowledge significantly underestimated their knowledge compared to those who perceived to have adequate to extensive knowledge ($p < .0001$) (see Table 15 and Figure 11).

Table 14

Means for Actual Knowledge (AK), Perceived Knowledge (PK) and Self-Assessment Ability (SAA) for Periodontal Disease Therapy and Dental Implant Therapy

	AK	PK	SAA
PDT	51.40* \pm 14.38	63.34* \pm 20.13	-11.95 \pm 23.87
DIT	53.11* \pm 13.67	60.97* \pm 23.78	-8.71 \pm 23.50

* $p < .0001$.

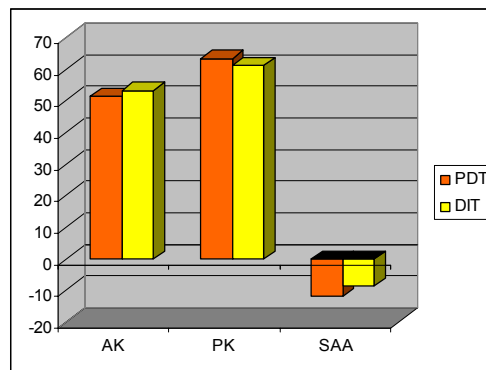


Figure 10. Means for actual knowledge (AK), perceived knowledge (PK) and self-assessment ability (SAA) for periodontal disease therapy and dental implant therapy.

Table 15

Means for Actual Knowledge and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy using the 1-4 Scale for Perceived Knowledge

Perceived knowledge	AK of PDT	SA of PDT	AK of DIT	SAA of DIT
None-minimal	50.00 ± 12.37	12.20** ± 22.87	46.18* ± 15.69	12.57** ± 24.65
Adequate-extensive	51.57 ± 14.67	-15.06** ± 22.21	54.66* ± 12.72	-13.47** ± 20.46

*p = .0007. **p < .0001.

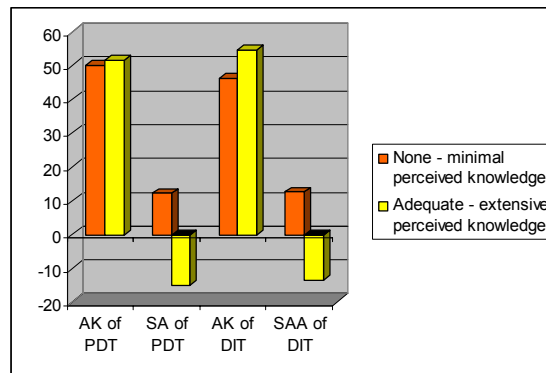


Figure 11. Means for actual knowledge and self-assessment ability for periodontal disease therapy and dental implant therapy using the 1-4 scale for perceived knowledge.

Relationships between Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, Perceived Knowledge, Learning Needs and Motivation to Learn

No significant relationships were found between need and motivation and knowledge or self-assessment ability of periodontal disease therapy. No significant relationships were found between need and motivation and knowledge of dental implant therapy although participants with a higher motivation to update their knowledge of dental implant therapy also have higher actual knowledge ($p = .07$). Significant relationships were found between moderate to high need and motivation and a higher perceived knowledge of dental implant therapy ($p < .0001$).

Participants who have no or little motivation to update their knowledge of dental implant therapy significantly underestimated their knowledge by an average of 12.31 points compared to participants who have a moderate to high motivation and overestimated their knowledge by 11.08 points ($p < .0001$). However, as absolute numbers there was no significant difference between ability to self-assess knowledge and motivation levels (see Tables 16 & 17 and Figures 12 & 13).

Also, the results showed a relationship between need and motivation: most participants who have a higher need to update their knowledge also have a higher motivation to update their knowledge (see Table 18).

Table 16

Means for Actual Knowledge, Perceived Knowledge, and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Need to Update Knowledge (Scale 1-4)

Need to update knowledge	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
None - minimal	51.85 ±	62.34 ±	-10.49 ±	48.91 ±	44.15** ±	-0.35* ±
	13.87	21.36	25.32	13.67	31.01	25.59*
Moderate - high	51.27 ±	63.59 ±	-12.32 ±	53.66 ±	63.48** ±	-9.81* ±
	14.58	19.86	23.55	13.61	21.51	23.06*

*p = .07. **p < .0001.

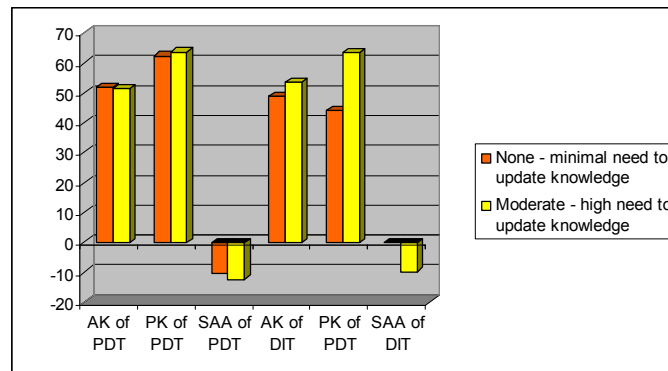


Figure 12. Means for actual knowledge, perceived knowledge, and self-assessment ability for periodontal disease therapy and dental implant therapy based on need to update knowledge (scale 1-4).

Table 17

Means for Actual Knowledge, Perceived Knowledge, and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Motivation to Update Knowledge (Scale 1-4)

Motivation to update knowledge	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
None - minimal	48.47 ± 11.70	51.19 ± 20.49	-2.72 ± 24.18	47.81* ± 16.26	31.52** ± 20.31	12.31** ± 19.46
Moderate - high	51.70 ± 14.66	64.63 ± 19.71	-12.93 ± 23.69	53.71* ± 13.26	64.71** ± 21.45	-11.08** ± 22.77

*p = .07. **p = <.0001.

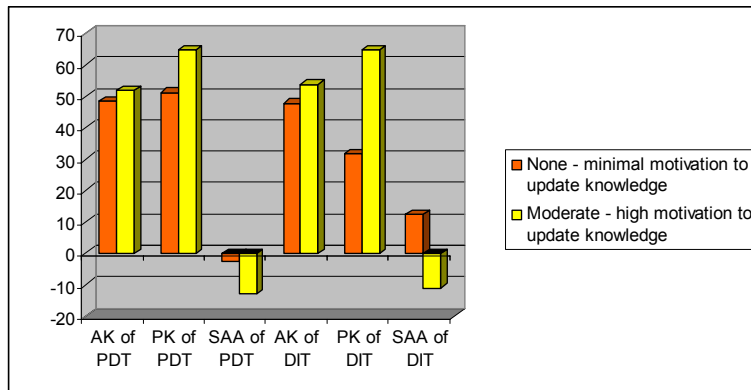


Figure 13. Means for actual knowledge, perceived knowledge, and self-assessment ability for periodontal disease therapy and dental implant therapy based on motivation to update knowledge (scale 1-4).

Table 18

Frequency between Need to Update and Motivation to Update Knowledge of Periodontal Disease Therapy and Dental Implant Therapy.

	None – minimal motivation		Moderate – high motivation	
	PDT	DIT	PDT	DIT
None – minimal need	6%	6.5%	14%	6.5%
Moderate – high need	4%	5%	76%	82%

Relationships between Periodontists’ Ability to Self-Assess Knowledge, Actual Knowledge, Perceived Knowledge, and Background Characteristics

This section will report the results for the relationship between self-assessment ability, actual knowledge, perceived knowledge, and background characteristics. The following are these characteristics: number of years since graduation from a periodontics training program; classification as Diplomate or non-Diplomate, and, if classified as Diplomate, number of years since achieving Diplomate status; classification as private practitioner, academician, or private practitioner with a part-time academic position; and, number of credit hours required and spent in continuing education per year.

Relationship between Number of Years since Graduation from a Periodontics Training Program and Periodontists' Ability to Self-Assess Knowledge, Actual knowledge, and Perceived Knowledge

For the topics periodontal disease and dental implant therapy no statistically significant relationships were found between number of years since graduation from a periodontics training program and the variables perceived knowledge, actual knowledge, and ability to self-assess. However, participants showed a decline of knowledge with time since graduation, mostly for dental implant therapy; particularly, the data showed that periodontists who graduated within 0-10 years have higher actual knowledge. On the other hand, the results showed that the participants with a better ability to self-assess their knowledge were those who graduated 21-30 years earlier. The results also showed a decline of perceived knowledge with time since graduation, except for perceived knowledge of periodontal disease therapy. The participants with 30+ years since graduation perceived to have the highest knowledge ($p = .06$) (see Table 19 and Figure 14).

Table 19

Means for Actual Knowledge, Perceived Knowledge and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Number of Years since Graduation from a Periodontics Training Program

Years since graduation	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
0-10	52.42 ± 12.86	65.16 ± 19.52	-12.74 ± 22.00	54.61 ± 21.44	67.38 ± 12.81	-12.77 ± 22.89
11-20	51.12 ± 15.74	64.56 ± 21.66	-13.44 ± 26.64	53.02 ± 26.60	58.67 ± 16.62	-7.38 ± 25.71
21-30	50.51 ± 13.61	57.13* ± 20.16	-6.63 ± 22.29	52.42 ± 20.15	56.84 ± 10.74	-4.41 ± 23.59
30+	51.46 ± 16.18	67.96* ± 14.95	-16.50 ± 22.73	51.00 ± 14.51	59.35 ± 26.22	-10.52 ± 17.85

*p = 0.06.

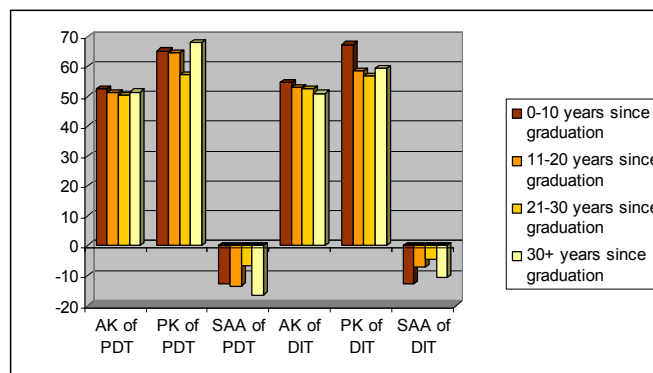


Figure 14. Means for actual knowledge, perceived knowledge and self-assessment ability for periodontal disease therapy and dental implant therapy based on number of years since graduation from a periodontics training program.

Relationship between Classification as Diplomate or Non-Diplomate and Periodontists'

Ability to Self-Assess Knowledge, Actual Knowledge, and Perceived Knowledge

For the topic periodontal disease therapy no statistically significant relationships were found between Diplomate status and the variables perceived knowledge, actual knowledge, and ability to self-assess.

Diplomates showed an almost statistically significant higher knowledge of dental implant therapy compared to non-Diplomates and Diplomate eligibles grouped together ($p = .07$). A significant relationship was found between perceived knowledge and ability to self-assess knowledge of dental implant therapy and Diplomate status. Periodontists who are Diplomate eligible perceived to have significantly higher knowledge than non-Diplomates ($p < .01$). However, Diplomate eligibles also showed a mean overestimation of 19.32% of their knowledge, which was significantly different from the overestimation of only 3.59% by the non-Diplomates ($p = .02$) (see Table 20 and Figure 15)

Table 20

Means for Actual Knowledge, Perceived Knowledge, and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Diplomat Status

Diplomate status	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
Diplomate	52.61 ± 14.35	64.84 ± 19.01	-12.24 ± 22.99	54.64* ± 13.59	62.91 ± 21.92	-9.37 ± 20.05
Non-Diplomate	48.88 ± 14.25	59.66 ± 22.67	-10.78 ± 26.42	51.17 ± 13.99	54.08*** ± 26.73	-3.59** ± 26.56
Diplomate eligible	52.83 ± 14.79	66.88 ± 16.21	-14.04 ± 20.66	51.30 ± 12.77	70.63*** ± 18.90	-19.32** ± 26.33

*p = .07. **p = 0.02. ***p = 0.006.

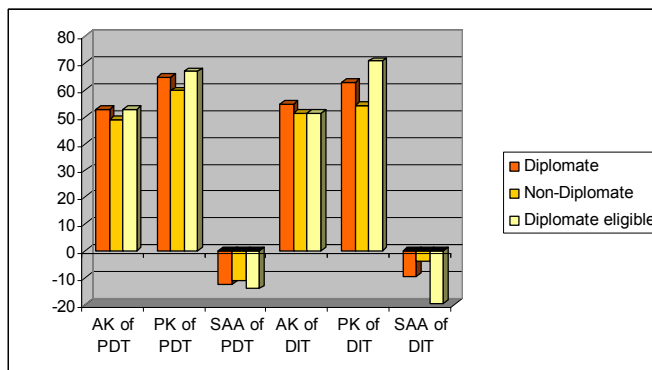


Figure 15. Means for actual knowledge, perceived knowledge, and self-assessment ability for periodontal disease therapy and dental implant therapy based on Diplomat status.

***Relationship between Number of Years since Achieving Diplomate Status and
Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, and Perceived
Knowledge***

For the topic periodontal disease therapy no statistically significant relationships were found between Diplomate status and the variables perceived knowledge, actual knowledge, and ability to self-assess.

A significant relationship was found between number of years since achieving Diplomate status and actual knowledge of dental implant therapy. Periodontists who are recent diplomates, 0-10 years, have significantly more knowledge of the topic (mean = 59.38) compared to diplomates who received the designation 31 or more years ago (mean = 37.50) ($p < .0001$). Accordingly, a decrease of actual knowledge is shown in the years following achievement of Diplomate status. Yet, participants who received diplomate status 30+ years earlier significantly perceived lower knowledge compared to recent diplomates ($p < .0001$). No statistically significant relationships were found between number of years since achieving Diplomate status and the variable ability to self-assess knowledge of dental implant therapy (see Table 21 and Figure 16).

Table 21

Means for Actual Knowledge, Perceived Knowledge, and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Number of Years since Achieving Diplomate Status

Years since Diplomate	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
0-10	54.13 ± 14.05	68.08 ± 16.95	-13.94 ± 20.67	58.37*± 13.34	69.27* ± 19.56	-10.91 ± 21.57
11-20	50.82 ± 15.14	60.46± 22.58	-9.65 ± 27.19	50.78 ± 11.52	58.89 ± 23.32	-8.11 ± 18.69
21-30	49.09 ± 14.42	64.00 ± 16.43	-14.91 ± 22.28	48.61 ± 12.61	58.61 ± 21.81	-10.00 ± 23.93
30+	52.27 ± 9.64	50.00 ± 28.28	2.27 ± 18.64	37.50* ± 17.68	30.00* ± 28.28	7.50 ± 10.61

*p<.0001.

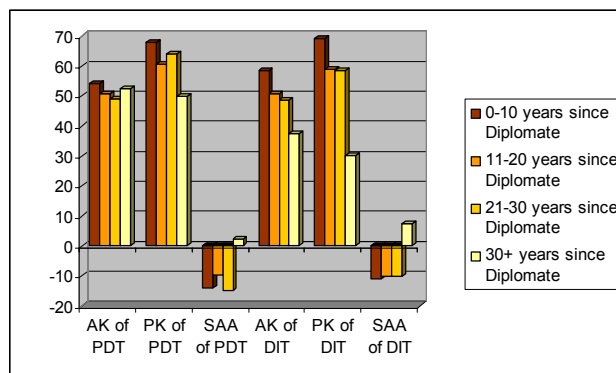


Figure 16. Means for actual knowledge, perceived knowledge, and self-assessment ability for periodontal disease therapy and dental implant therapy based on number of years since achieving Diplomate status.

Relationship between Classification as Private Practitioner, Academician, or Private Practitioner with a Part-Time Academic Position and Periodontists' Ability to Self-Assess Knowledge, Actual knowledge, and Perceived Knowledge

For the topic dental implant therapy no statistically significant relationships were found between classification as private practitioner, private practitioner with a part-time academic position, academician, or military and the variables ability to self-assess, actual knowledge, and perceived knowledge. For the topic periodontal disease therapy it was found that academicians perceive to have significantly higher knowledge of the topic compared to military participants ($p = .05$). No other significant relationships were found, but there is indication that academicians may have higher knowledge than the other classifications (see Table 22 and Figure 17).

Table 22

Means for Actual Knowledge, Perceived Knowledge, and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Classification

Classification	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
PP	50.96 ± 14.64	62.94 ± 20.28	-11.58 ± 24.60	52.40 ± 14.36	60.74 ± 24.58	-8.82 ± 23.74
PP/PTA	50.97 ± 13.31	64.29 ± 19.27	-13.31 ± 21.85	52.94 ± 11.55	62.83 ± 23.38	-12.26 ± 24.42
Academician	55.48 ± 15.42	68.85* ± 18.54	-13.37 ± 22.71	56.68 ± 15.40	63.21 ± 19.04	-6.53 ± 20.04
Other	45.46 ± 12.70	50.00* ± 23.02	-4.55 ± 30.60	51.25 ± 10.54	47.00 ± 28.01	4.25 ± 23.39

PP = private practitioner; PP/PTA = part-time academician; Other = military

*p = .05.

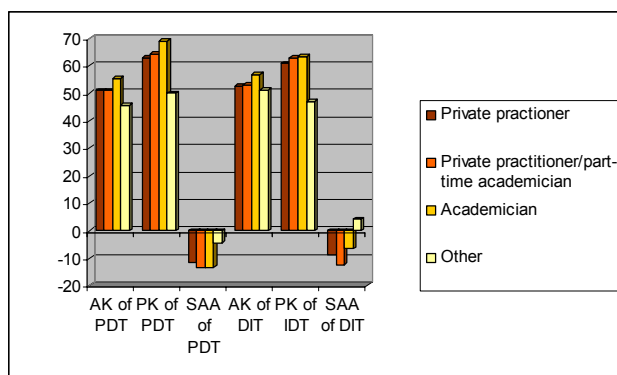


Figure 17. Means for actual knowledge, perceived knowledge, and self-assessment ability for periodontal disease therapy and dental implant therapy based on classification.

Relationship between Credit Hours Required and Spent in Continuing Education per Year and Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, and Perceived Knowledge

For the topics periodontal disease or dental implant therapy no statistically significant relationships were found between continuing education requirements or attendance and the variables perceived knowledge, actual knowledge, and ability to self-assess. However, participants with the best ability to self-assess their knowledge attend between 11 and 20 hours of CE per year. Also, although not statistically significant, there is indication that participants who attend more than 11 hours of CE have more knowledge than those who attend 0-10 hours per year (see Tables 23 & 24 and Figures 18 & 19).

Table 23

Means for Actual Knowledge, Perceived Knowledge, and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Continuing Education Requirements

CE hours required	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
0-10	53.69 ± 15.23	68.44 ± 16.81	-14.74 ± 24.67	51.44 ± 14.01	62.12 ± 25.02	-14.71 ± 28.84
11-20	51.17 ± 14.46	62.35 ± 19.47	-11.19 ± 23.38	53.88 ± 13.04	60.83 ± 21.57	-7.36 ± 22.28
21-30	51.99 ± 14.94	63.5 ± 23.47	-11.51 ± 25.71	51.37 ± 16.27	60.07 ± 29.32	-10.17 ± 24.19
30+	46.75 ± 6.81	71.43 ± 15.47	-24.68 ± 19.71	51.04 ± 7.31	67.50 ± 32.06	-16.46 ± 35.17

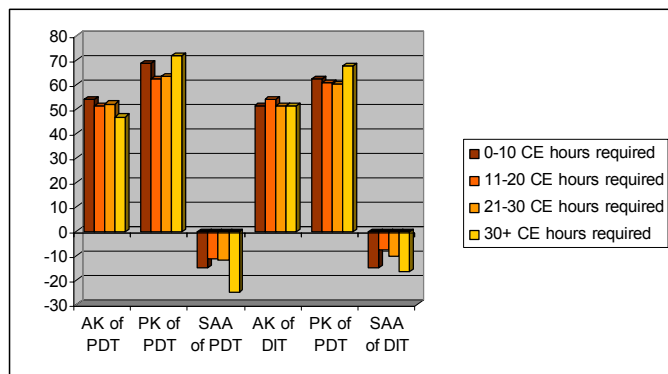


Figure 18. Means for actual knowledge, perceived knowledge, and self-assessment ability for periodontal disease therapy and dental implant therapy based on continuing education requirements.

Table 24

Means for Actual Knowledge, Perceived Knowledge, and Self-Assessment Ability for Periodontal Disease Therapy and Dental Implant Therapy based on Continuing Education Attendance

CE hours attended	AK of PDT	PK of PDT	SAA of PDT	AK of DIT	PK of DIT	SAA of DIT
0-10	47.73 ± 8.71	72.5 ± 2.89	-24.77 ± 11.38	47.92 ± 3.61	66.67 ± 15.28	-18.75 ± 18.16
11-20	54.41 ± 13.75	59.57 ± 21.94	-5.16 ± 21.80	53.39 ± 16.29	54.57 ± 22.83	-1.18 ± 23.91
21-30	49.17 ± 15.62	64.48 ± 18.47	-15.31 ± 25.08	51.95 ± 12.98	59.23 ± 23.40	-8.13 ± 24.12
30+	52.00 ± 13.86	63.47 ± 20.89	-11.47 ± 23.68	53.95 ± 13.34	64.26 ± 24.28	-11.56 ± 22.69

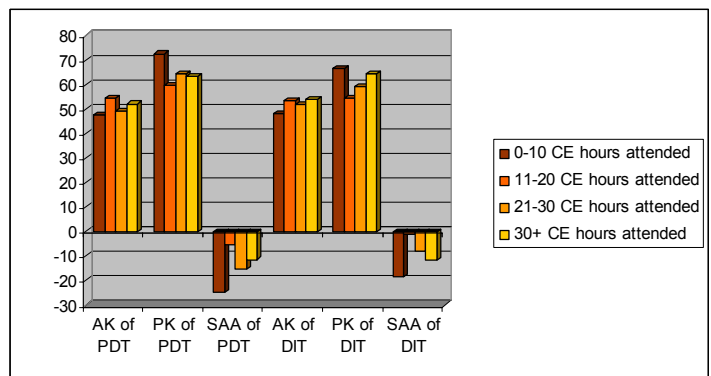


Figure 19. Means for actual knowledge, perceived knowledge, and self-assessment ability for periodontal disease therapy and dental implant therapy based on continuing education attendance.

Summary

This study examined periodontists' ability to self-assess their knowledge of two topics of periodontics, periodontal disease therapy and dental implant therapy. It also examined the relationships between actual knowledge, perceived knowledge, and self-assessment; learning needs; motivation to learn; and background characteristics.

Paired t-tests showed a significant difference between actual and perceived scores for both topics. Pearson and Spearman correlation coefficients showed no correlation between participants' actual knowledge and perceived knowledge of periodontal disease therapy and a low to moderate correlation between actual and perceived knowledge of dental implant therapy. Therefore, at best periodontists' ability to self-assess is only moderate. However, the results showed that participants who perceived to have adequate to extensive knowledge of dental implant therapy indeed have higher actual knowledge than those who perceive to have none to minimal knowledge.

For learning needs and motivation, the results showed that participants with a higher need and motivation to update their knowledge of dental implant therapy also perceived to have higher knowledge of the topic and have slightly higher actual knowledge. Participants who have no or little motivation to update their knowledge of dental implant therapy significantly underestimate their knowledge compared to participants who have a moderate to high motivation. Also, the results showed a relationship between need and motivation: most participants who have a higher need to update their knowledge of dental implant therapy also have a higher motivation to update their knowledge of the subject. No significant relationships were found between need and motivation and knowledge or self-assessment ability of periodontal disease therapy.

No statistically significant relationships were found between the number of years since graduation from a periodontics training program and the variables perceived knowledge, actual

knowledge, and ability to self-assess. However, participants showed a decline of knowledge of dental implant therapy with time since graduation. The results also showed that the participants with a better ability to self-assess their knowledge were those who graduated 21-30 years ago.

A significant relationship was found between ability to self-assess knowledge of dental implant therapy and Diplomate status. Periodontists who are Diplomate eligible showed higher overestimation of their knowledge compared to non-Diplomates. Diplomates showed a trend towards higher knowledge of dental implant therapy compared to non-Diplomates and Diplomate eligibles. Also, a significant relationship was found between number of years since achieving Diplomate status and actual knowledge of dental implant therapy. Periodontists who are recent diplomates have significantly more knowledge of the topic compared to diplomates who received the designation 31 or more years ago.

The results also showed that academicians perceive to have significantly higher knowledge compared to military participants. No other significant relationships were found among the variables, including the participants' actual knowledge, perceived knowledge, and self-assessment ability and classification as private practitioner, private practitioner with an academic part-time position, academician, or other or continuing education requirements or attendance. However, there is indication that participants who attend more than 11 hours of continuing education have more knowledge than those who attend 0-10 hours per year.

The next chapter will discuss the results of this study in relation to the literature. Also, implications for policy and recommendations for future research will be suggested.

CHAPTER 5

DISCUSSION

This study focused on periodontists' self-assessment ability. The concern that practitioners, particularly healthcare professionals, continue to demonstrate competence has stimulated the development of quality assurance mechanisms, such as continuing education programs and processes for certification and licensure. (Abrahamson, 1984; Deusinger, Sindelar, & Stritter, 1986; Grant et al., 1979; McGuire, 1983). The two major models that are most often considered are the mandatory assessment model and the self-assessment model. Though the former has been the primary model in the healthcare field (Kerka, 1994), research on adult learning indicates that adults prefer to self-assess and self-direct their learning needs (Cross, 1981; Kerka, 1994; Knowles, 1980). This contradiction led to this study's principle question: since adults prefer to self-assess their educational need, are professionals able to self-assess their knowledge?

In this study, self-assessment was measured as the difference between actual knowledge and perceived knowledge of two topics of clinical practice of periodontology: periodontal disease therapy and dental implant therapy. Perceived and actual knowledge were also correlated to two variables associated with self-assessment: learning needs and motivation to learn. Additionally, ability to self-assess, actual knowledge, and perceived knowledge were correlated to background characteristics. Background characteristics are number of years since graduation from a periodontics training program; classification as Diplomate, Diplomate eligible, or non-Diplomate, and, if classified as Diplomate, number of years since achieving Diplomate status; classification as private practitioner, academician, or private practitioner with a part-time academic position; and number of credit hours required for licensure and those actually spent in continuing education per year.

This chapter addresses the results of this study in relation to the literature in three sections: the relationship between actual knowledge, perceived knowledge, and ability to self-assess; the relationship between these variables and need and motivation; and the relationship between ability to self-assess, actual knowledge, perceived knowledge, and background characteristics. The chapter also revisits the conceptual framework, suggests implications for policy, and offers recommendations for future research.

Periodontists' Ability to Self-Assess Their Knowledge of Periodontics

The results showed a significant difference between actual and perceived scores for both periodontal disease therapy and dental implant therapy: overall, the participants significantly overestimated their knowledge. However, correlation coefficients that measured the relationship between participants' actual and perceived knowledge showed different results for the two topics: for periodontal disease therapy no correlations were found using the perceived percentage of right answers or the Likert scale; for dental implant therapy, a low correlation was found using the perceived percentage of right answers and a moderate correlation using the scale. Also using the scale, the results showed that participants who perceive to have adequate to extensive knowledge of dental implant therapy indeed have higher actual knowledge than those who perceive to have none to minimal knowledge.

As with this study, research on self-assessment shows controversial results. Opinion papers have concluded that self-assessment induces a willingness to improve (Chambers & Glassman, 1997; Houlden & Collier, 1999; Orest, 1995), a mixed method study reported that self-assessment correlates to actual performance (Henbest & Fehrsen, 1985), and a quantitative study reported that self-assessments only correlates moderately to performance (Regehr et al., 1996). However, quantitative studies have not supported this conclusion when self-assessment is correlated to actual knowledge (Sáenz, 2002; Tracey et al., 1997).

With the addition of this study to the literature, results from quantitative research continue to vary. Even in this study, when topics and parameters were substantially delimited, the correlation between perceived knowledge and actual knowledge was still non-existent to low using the percentage of right answers and moderate using the scale. A difference between the results from the periodontal disease therapy section and the dental implant therapy section may be attributed to the scope of the topic. Periodontal disease therapy is an older field, and the amount of literature surpasses the newer field of dental implant therapy, which has been taught in schools only since the early 1990's. In conclusion, when topics and parameters are delimited, professionals are at best moderately able to self-assess their knowledge.

Relationships between Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, Perceived Knowledge, Learning Needs, and Motivation to Learn

The literature states that an educational need is a discrepancy between an existing set of circumstances and a more desirable set. The more concretely individuals can identify their aspirations and assess their present level of competencies in relation to them, the more exactly they can define their educational needs, and the more intensively will they be motivated to learn (Knowles, 1980).

In great part a problem with continuing education is that need and motivation, two intangible qualities that are crucial for the betterment of the practice of health providers (Uhl, 1992, ed by Rosof & Felch, 1992), are difficult to measure. However, some educators believe that identifying needs from personal experience is perhaps more valid than general rating scales of knowledge, and that continuing education should help individuals identify gaps in their knowledge and meet their needs (Crilly, 1998; Edwards et al., 1998). Moreover, others have recommended the abandonment of mandatory continuing education as a measure of continuing competency and the adoption of methods of measuring educational needs and basing content of continuing education on identified deficiencies (Felch, 1992; Field, 1995).

Based on these concepts, this study measured need and motivation to update one's knowledge of the two topics studied. For both topics the results showed no significant relationship between actual knowledge and need and motivation. However, although not truly significant, the results showed an approaching statistically significant relationship between actual knowledge of dental implant therapy and need and motivation: the participants with a higher need and motivation to update their knowledge also have higher actual knowledge. The results also showed that participants with a higher need and motivation to update their knowledge of dental implant therapy also perceive to have higher knowledge of the topic. Regarding self-assessment, participants who have no or little motivation to update their knowledge of dental implant therapy significantly underestimate their knowledge compared to participants who have a moderate to high motivation and overestimate their knowledge. However, as absolute numbers, there is no significant difference between ability to self-assess knowledge and motivation levels. Additionally, the results showed a relationship between need and motivation: most participants who have a higher need to update their knowledge of either subject also display a higher motivation to update their knowledge of the subject.

In conclusion, this study found that periodontists who have higher learning needs and motivation to learn perceive to have higher knowledge, may have higher knowledge, but overestimate their knowledge. This study supports Cross' (1981) conclusion that people who are motivated to learn are more likely to be better informed.

Relationships between Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, Perceived Knowledge, and Background Characteristics

There is little literature on background characteristics, knowledge, and self-assessment. For age, number of years since graduation, and classification as private practitioner or academician the literature has two related reports. Therefore, most of the results from this study will be discussed but could not be compared and contrasted to other reports.

Relationship between Number of Years since Graduation from a Periodontics Training Program and Periodontists' Ability to Self-assess Knowledge, Actual Knowledge, and Perceived Knowledge

Research studies on the relationship between adult's ability to learn and age show that age alone is not a single factor in maintaining competence. However, studies that used cross-sectional data or those that collected information from different groups of people at the same time show some decline in test performance with age (Bennett, 1992; Sáenz, 2002). The author found that recent dental graduates have more knowledge and better self-assessment ability than non-recent graduates. Both Bennett and Sáenz concluded that dental professionals do not seem to update their knowledge after formal training. However, longitudinal studies that follow the same people over time have shown fewer decline and reported that more active learners have even more stability in learning over time. Health professionals are generally part of that group (Bennett, 1992).

This study showed no statistically significant relationships between number of years since graduation from a periodontics training program and the variables actual knowledge, perceived knowledge, and ability to self-assess for the topics periodontal disease therapy or dental implant therapy. However, participants showed a decline of knowledge, particularly of dental implant therapy, with time since graduation. In general, the data showed that periodontists who graduated 0-10 years earlier have higher actual knowledge. This finding is in agreement with a previous study by the author (2002). This finding may be due to younger professionals training in dental implant therapy during their periodontics training program compared to more veteran periodontists who did not receive this formal training.

On the other hand, results from this study showed that participants with a better ability to self-assess their knowledge were those who graduated 21-30 years earlier. This agrees with the competency-based education model of Chambers and Glassman (1997), which assumes

learning to become a professional is a progression through stages and learners are considered capable of self-assessment when they have achieved a stage of expertise. However, contrary to Chambers and Glassman's model and the findings of this study, the author (2002) reported that younger professionals—equivalent to proficient in Chambers and Glassman's classification—have a better ability to self-assess compared to more senior professionals—or experts in Chambers and Glassman's classification.

Relationship between Classification as Diplomate or Non-Diplomate and Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, and Perceived Knowledge

Diplomates showed a nearly statistically significant higher knowledge of dental implant therapy compared to non-Diplomates and Diplomate eligibles. Also, a significant relationship was found between perceived knowledge, ability to self-assess knowledge of dental implant therapy, and Diplomate status. Periodontists who are Diplomate eligible showed a significantly higher overestimation of their knowledge compared to non-Diplomates. For the topic periodontal disease therapy no statistically significant relationships were found between Diplomate status and the variables ability to self-assess, actual knowledge, and perceived knowledge.

Relationship between Number of Years since Achieving Diplomate Status and Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, and Perceived Knowledge

A decrease of actual knowledge of dental implant therapy was shown with time following achievement of Diplomate status. Periodontists who are recent Diplomates, 0-10 years, have significantly more knowledge of the topic compared to Diplomates who received the designation 31 or more years earlier. This finding may be related to more veteran periodontists not training in dental implant therapy during their formal periodontal training. The same relationship was found between perceived knowledge and number of years since achieving Diplomate status:

periodontists who are recent Diplomates, 0-10 years, believe they have more knowledge of the topic compared to Diplomates who received the designation 31 or more years ago. No statistically significant relationships were found between number of years since achieving Diplomate status and ability to self-assess knowledge of dental implant therapy. However, the findings suggest that all Diplomates have a similar ability to self-assess their knowledge of dental implant therapy.

Similar to the background characteristic number of years since graduation from a periodontics training program, the variable number of years since achieving Diplomate status indicates that periodontists show some decline in actual knowledge with increased years since active training or completion of the requirements for Diplomate status. These findings support implementation of periodic evaluations for licensure and maintenance of Diplomate status.

For the topics periodontal disease therapy no statistically significant relationships were found between Diplomate status and the variables perceived knowledge, actual knowledge, and ability to self-assess.

Relationship between Classification as Private Practitioner, Academician, or Private Practitioner with a Part-Time Academic Position and Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, and Perceived Knowledge

Presumably physicians in solo practice without hospital privileges are at risk of decreasing knowledge as they become older because they lack day-to-day educational stimuli (Bennett, 1992). Although no statistically significant, this study found that academicians have higher actual knowledge than the other classifications, which supports Bennett's (1992) finding that practitioners in an academic environment benefit from day-to-day educational stimuli. However, practitioners with a part-time academic position demonstrated knowledge that was almost equal to that of practitioners in private practice with no academic position. Therefore, part-time academic stimuli do not seem to relate to higher knowledge.

Relationship between Credit Hours Required and Spent in Continuing Education per Year and Periodontists' Ability to Self-Assess Knowledge, Actual Knowledge, and Perceived Knowledge

No statistically significant relationships were found between continuing education requirements or attendance and the variables ability to self-assess, actual knowledge, and perceived knowledge for the topics periodontal disease therapy or dental implant therapy. However, participants with the best ability to self-assess their knowledge attend between 11 and 20 hours of continuing education per year, and participants who attend more than 11 hours of continuing education per year appear to have higher knowledge than those who attend 0-10 hours per year. The results do not support Cross' (1981) conclusion that people who are required to learn are more likely to have up-to-date information than people who are not required.

In conclusion for the relationship between ability to self-assess, actual knowledge, and perceived knowledge, and background characteristics, this study found that Diplomate status is significantly related to ability to self-assess and perceived knowledge, and number of years since achieving Diplomate status is significantly related to actual knowledge and perceived knowledge. No significant relationships were found between all other background characteristics. However, this study indicates that periodontists' knowledge decline with time after graduation; Diplomates have higher knowledge compared to non-Diplomates and Diplomate eligibles; academicians have higher knowledge compared to the other classifications; and participants with the best ability to self-assess their knowledge and higher actual knowledge attend more than 11 hours of continuing education per year.

Revisiting the Conceptual Framework

The conceptual framework for this study was based on the assumption that adults through self-assessment diagnose and meet their educational needs and ultimately maintain or increase their competence. The assumption was that a higher ability to self-assess knowledge of a specific topic is related to higher actual knowledge, perceived knowledge, need to learn, and motivation to learn. Additionally, the assumption was that higher ability to self-assess, actual knowledge, and perceived knowledge, are related to the following background characteristics: fewer number of years since graduation from a periodontics training program, classification as Diplomate, fewer number of years since achieving Diplomate status, classification as private practitioner with a part-time academic position, and higher number of credit hours spent in continuing education per year.

Based on the findings it may be supported that a higher ability to self-assess is related to higher actual knowledge and higher number of credit hours spent in continuing education per year. But contrary to the conceptual framework, a higher ability to self-assess was not related to higher perceived knowledge, higher need to learn, higher motivation to learn, fewer number of years since graduation from a periodontics training program, classification as Diplomate, fewer number of years since achieving Diplomate status, or classification as private practitioner with a part-time academic position.

In relation to actual knowledge, the findings do support that higher actual knowledge is related to higher motivation to learn, classification as Diplomate, fewer years since achieving Diplomate status, and may be related to higher need to learn, fewer number of years since graduation from a periodontics training program, and higher number of credit hours spent in continuing education per year. However, the findings do not support that private practitioners with a part-time academic position have higher actual knowledge.

Implications for Policy

The findings of this research and their comparison to the literature offer insight that may affect future policy, especially for agencies that regulate the practice of health practitioners, particularly dental professionals. The following is an outline of findings and their possible implications for future policy:

- Periodontists cannot accurately self-assess their knowledge. Therefore, agencies that regulate the continuing education of periodontists and other health professionals cannot rely on self-assessment as the only method to credit continuing competency.
- Periodontists' need and motivation to learn are not related to ability to self-assess, but the two variables may be related to actual knowledge: periodontists who report higher levels of need and motivation to learn may have higher knowledge. Also, need and motivation are constructs that are significantly related. Therefore, one of the two, probably more relevant need to learn, could be considered in guidelines for continuing education to assist professionals direct their education.
- Periodontists may experience a decline of knowledge with number of years since graduation, and periodontists who are recent Diplomates have significantly more knowledge than more veteran Diplomates. This supports the implementation of requirements for periodic evaluation for licensure and for maintenance of Diplomat status.
- Periodontists who are Diplomates have higher knowledge than non-Diplomates. This supports the ABP purpose, which is to elevate the standards and advance the science and art of periodontology by encouraging its study. This finding may also relate to motivation; periodontists who elect to pursue Diplomat status may be more motivated individuals.

- Periodontists who are academicians may have higher knowledge than periodontists who work in private practice with or without a part-time academic position. This may support taking into account credit towards continuing education requirements for full-time academicians.
- No clear relationship exists between number of hours required and attended of continuing education and ability to self-assess or actual knowledge. However, there is indication that periodontists who attend between 11-20 hours per year may have a better ability to self-assess and that those who attend more than 11 hours per year may have higher actual knowledge compared to those who attend 0-10 hours per year. These indications may support the need for requirements of more than 10 hours of continuing education per year.

Overall, educators, and organizations and agencies regulating the practice of dentistry and other fields must provide concise, clear objectives to help practitioners to determine what they need to learn in order to maintain competency and to aid them in their self-assessment of their continuing educational needs.

Recommendations for Future Research

The concern that practitioners are incapable of self-assessing their knowledge continues to be valid: research has not shown that practitioners have the ability to self-assess their knowledge necessary for practice in our constantly changing healthcare environment. Based on the current knowledge in the field of continuing education and self-assessment for healthcare practitioners, the following are recommendations for future research:

- Repeat this study using more delimited topics and a larger sample to evaluate if further delimiting parameters would aid in the self-assessment of knowledge. If it is proven that practitioners can effectively self-assess their knowledge of specific topics, then the

agencies that regulate requirements for continuing education would need to provide very specific standards for competency.

- Further examine the relationship between need, motivation, knowledge, and self-assessment. A validated model that assists individuals in the measurement of their need for continuing education would be valuable for continuing education providers and agencies that design professional development programs.
- Further examine the relationship between actual knowledge, perceived knowledge, ability to self-assess, and background characteristics:
 - Further examine the relationship between actual knowledge, perceived knowledge, and ability to self-assess to number of years since graduation, Diplomate status, and number of years since achieving Diplomate status. Such information would provide valuable information for agencies that regulate licensure and certification.
 - Examine the relationship between competence and number of hours per week exposed to academic stimuli. This study did not measure this variable, and it is probable that practitioners who are exposed to more academic stimuli have a better ability to self-assess and higher actual knowledge.
 - Further examine the relationship between attendance at continuing education programs and competence so that agencies that regulate requirements for continuing education can objectively determine the most effective range of continuing education hours that one needs to maintain and increase competency.

Summary

This study focused on periodontists' self-assessment ability. Self-assessment was measured as the difference between actual knowledge and perceived knowledge of two topics of clinical practice of periodontology: periodontal disease therapy and dental implant therapy.

Other variables included were learning needs, motivation to learn, and background characteristics.

Two hundred and nineteen subjects participated in the periodontal disease therapy questionnaire and 200 in the dental implant therapy questionnaire. Paired t-tests showed a significant difference between the actual and the perceived scores for periodontal disease therapy and dental implant therapy. Pearson and Spearman correlation coefficients were calculated for the relationship between participants' actual knowledge and perceived knowledge of periodontal disease therapy and dental implant therapy. For periodontal disease therapy, no correlations were found. For dental implant therapy, a low to moderate correlation was found, but indeed participants who perceived to have adequate to extensive knowledge did have higher knowledge compared to those who perceived to have none to minimal knowledge.

In this study the difference between the results from the periodontal disease therapy and the dental implant therapy questionnaires may be attributed to the scope of the topics. Periodontal disease therapy is an older field, and the amount of literature surpasses that in the newer field of dental implant therapy, which has been taught in schools only since the 1990's. However, even when topics and parameters were delimited, periodontists were at best moderately able to self-assess their knowledge.

This study also measured need and motivation to update knowledge of the two topics. This study found no significant relationships between periodontists' ability to self-assess knowledge, actual knowledge, perceived knowledge, learning needs, and motivation to learn. However, the results on motivation, need, and knowledge of dental implant therapy support Cross' (1981) conclusion that people who are motivated to learn are more likely to be better informed. The results also showed that motivation and need are highly correlated.

Finally, in relation to background characteristics, this study found that Diplomate status is significantly related to ability to self-assess and perceived knowledge; and number of years since achieving Diplomate status is significantly related to actual knowledge and perceived

knowledge. No significant relationships were found between all other background characteristics. However, this study indicated that participants experience knowledge decline with time since graduation; Diplomates showed higher knowledge compared to non-Diplomates and Diplomate eligibles; academicians showed higher knowledge compared to the other classifications; and, participants with the best ability to self-assess their knowledge attend between 11 and 20 hours of continuing education per year and those who attend more than 11 hours per year have higher knowledge.

In conclusion, this study found that periodontists' ability to self-assess their knowledge of two topics of periodontics is at best moderate; that need and motivation are not related to self-assessment ability, but actual knowledge may be related to moderate-high need and motivation; and, that among the background characteristics, non-Diplomate status is related to a better ability to self-assess, and fewer years since achieving Diplomate status is related to higher actual knowledge and perceived knowledge.

This study reports that periodontists cannot accurately self-assess their knowledge of periodontics. The concern that practitioners believe that they have higher knowledge in areas in which objectively measured knowledge is significantly lower continues to be valid.

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APPENDICES

Appendix A

Questionnaire

1. Welcome

Thank you for agreeing to voluntarily participate in this survey, which should take under 20 minutes to complete.

Tips:

1. Please scroll down to answer all of the questions and to find the "Next" button that allows you to continue.
2. Respondents that return to an incomplete survey will be taken to the point that they left off.
3. In the rare event that not all of the text has appeared on your screen, press the "Refresh" button of your browser.

1. How many years ago did you graduate from periodontics?

- 0-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40 40+
-

2. Are you a diplomate of the American Board of Periodontology?

- Yes
 No
 None of the above, I am a diplomate eligible

3. How many years ago did you receive your diplomate status? (if applicable)

- 0-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40 40+
-

4. Which of the following classification applies to you?

- Private practitioner
 Private practitioner with a part-time academic position
 Academician
 Other (please specify) _____

5. On average, how many continuing education hours do you attend per year?

- 0-10 11-20 21-30 31+
-

6. How many credit hours does your state board requires that you attend for licensure per year? (Please divide number of required credit hours by cycle length, i.e. 40 credit hours every 2 years = 20 hours)

- 0-10 11-20 21-30 31+
-

7. What do you believe is your knowledge of recent literature (2000-2003)?

- Periodontal disease therapy none minimal adequate extensive
-

Dental implant therapy

8. Based on your daily experience, what is your need to routinely update your knowledge?

	no need	little need	moderate need	high need
Periodontal disease therapy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dental implant therapy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. What is your motivation to update your knowledge of recent literature?

	no motivation	little motivation	moderate motivation	high motivation
Periodontal disease therapy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dental implant therapy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. What percentage of questions do you expect to answer correctly of recent literature (2000-2003)?

Periodontal disease therapy _____
Dental implant therapy _____

Next >>

2. Periodontal Disease Therapy

This section contains 24 questions. Once again, thank you for participating in this study.

11. Walters et al. (2003) compared a xenograft with porous (ePTFE) (Goretex) membrane or non-porous (PTFE) (TefGen) teflon membrane in the treatment of vertical osseous defects. They reported significantly better defect fill with:

- ePTFE
- PTFE
- no significant difference between membranes

12. Machtei et al. (2003) studied guided tissue regeneration (GTR) in the treatment of class II furcation defects in smokers and reported that the effect of aggressive anti-infective therapy resulted in _____ regenerative outcomes compared to conventional anti-infective therapy.

- similar
- enhanced
- detrimental

13. Reddy et al. (2003) reported that local application of chlorhexidine chips one week prior to regenerative therapy resulted in _____ bone height compared to the use of sham chips.

- gain of
- loss of
- no difference in

14. Jansson et al. (2003) evaluated the clinical outcome in patients with recurrent periodontal disease following local application of 25% metronidazole gel compared to placebo and reported:

- greater reduction of probing depths with metronidazole
- greater reduction of bleeding on probing with metronidazole
- no difference between therapies

15. Sculean et al. (2003) studied the healing of intrabony defects treated non-surgically with and without application of enamel matrix derivative (Emdogain), and reported that decreases in probing depth and gains in clinical attachment levels were:

- greater in sites treated with enamel matrix derivative
- greater in sites treated without enamel matrix derivative
- similar for all sites regardless of treatment modality

16. Based on current studies, gingival curettage should be considered as a procedure that _____ scaling and root planing in the treatment of chronic periodontitis.

- has additional benefit beyond
- has no additional benefit beyond
- provides similar benefits to

17. Which laser has FDA clearance for use directly upon hard tissue:

- CO2
- Nd:YAG
- Diodide
- Er:YAG

18. Rosen & Reynolds (2002) in a retrospective case series comparing the use of combined enamel matrix derivative (EMD) (Emdogain) plus demineralized freeze-dried bone allograft (DFDBA) or freeze-dried bone allograft (FDBA) for the treatment of advanced osseous lesions reported greater improvements in clinical attachment levels with:

- EMD with DFDBA
- EMD with FDBA
- neither, both therapies showed similar improvements

19. According to Novak et al. (2002), what mean probing depth reduction in deep sites (> 7 mm) was found after treatment of severe generalized periodontitis following subgingival debridements and the administration of systemic subantimicrobial doxycycline?

- 1 mm
- 2 mm
- 3 mm
- 4 mm

20. In a 5-year follow-up of aggressive periodontitis patients, Buchman et al. (2002) reported that surgical periodontal therapy, supplemented with amoxicillin plus metronidazole, and 3-4 months maintenance, achieved stable attachment levels in about _____ % of the treated sites.

- 60-65
- 70-75
- 80-85
- 90-95

21. What root surface characteristics did Frentzen et al. (2002) observe following scaling with the Er:YAG laser versus scaling with hand or ultrasonic instruments?

- more residual calculus following hand instrumentation
- smoother root surfaces following laser instrumentation
- greater gouging of surfaces following ultrasonic instrumentation

- greater, irregular removal of tooth structure with laser instrumentation

22. Zucchelli et al. (2002) compared therapies in the treatment of deep vertical bony defects. Which of the following therapies resulted in greatest clinical attachment gains?

- flap/debridement and guided tissue regeneration (GTR) with titanium reinforced ePTFE (Goretex)
- flap/debridement and enamel matrix derivative (Emdogain)
- flap/debridement alone

23. Klein et al. (2001) reported that radiographically _____ infrabony defects respond more favorably to guided tissue regeneration (GTR).

- narrow and shallow
- narrow and deep
- wide and shallow
- wide and deep

24. Becker et al. (2001) presented 5-year results from a longitudinal study comparing scaling and root planing, osseous surgery, and modified Widman flap therapies. Which therapy showed greater probing depth reduction for 4 to 6 mm probing depths?

- scaling and root planing
- osseous surgery
- modified Widman
- all of the above showed similar probing depth reduction

25. Lekovic et al. (2001) studied the use of bovine bone mineral (BBM) (Bio-Oss) in combination with enamel matrix derivative (EMD) (Emdogain) or in combination with autologous fibrinogen/fibronectin in the treatment of intrabony defects. Which treatment showed greater clinical attachment gain and better bone fill?

- BBM with EMD
- BBM with autologous fibrinogen/fibronectin
- both therapies showed similar results

26. Lekovic et al. (2001) studied the combined use of enamel matrix derivative (Emdogain), bovine porous bone mineral (Bio-Oss), and a bioabsorbable membrane (Bioguide) in the treatment of intrabony defects compared to open flap debridement. All of the following were observed to be greater in the combination treated sites, EXCEPT:

- reduction in probing depth
- gain in attachment gain
- percentage of defect fill
- none of the above, all were greater

27. Novaes Jr. et al. (2001) studied the influence of root trunk concavities on the treatment of class II furcations with ePTFE membranes (Goretex), and reported that adaptation of the membrane collar to the concavity

- prevented migration of junctional epithelium
- slowed the migration of junctional epithelium
- did not prevent migration of junctional epithelium

28. Cortellini & Tonetti (2001) reported that the use of a microsurgical approach in guided tissue regeneration therapy of intrabony defects resulted in about a _____ maintenance of closure over the membranes during healing.

- 100%
- 90%
- 80%
- 70%

29. Yukna et al. (2001) compared expanded polytetrafluoroethylene barrier (ePTFE) (Goretex) and bioactive glass (PerioGlas) in the treatment of mandibular molar Class II furcations. They reported clinical results to be:

- better for ePTFE
- better for bioactive glass
- similar for both treatments

30. Sculean et al. (2001) studied the effect of postsurgical systemic administration of antibiotics on the healing of intrabony defects treated with enamel matrix derivative (Emdogain) at 1 year and reported:

- greater reduction in probing depths with the use of systemic antibiotics
- greater gain of clinical attachment levels with the use of systemic antibiotics
- greater reduction of bleeding on probing with the use of systemic antibiotics
- no clinical difference with the use of systemic antibiotics

31. The benefits of collagen membranes include all of the following, EXCEPT:

- promotion of wound healing through clot stabilization
- chemotactic ability to attract fibroblasts
- chemotactic ability to attract osteoblasts
- all of the above

32. Yukna et al. (2000) reported a mean defect fill of about _____ in the treatment of intrabony defects with a combination of a synthetic cell-binding peptide (PenGen P-15) and bovine hydroxyapatite bone matrix (ABM) (OsteoGraf/N-300), while ABM alone resulted in about 50% defect fill.

- 65%
- 75%
- 85%
- 95%

33. Ultrasonic scalers, sonic scalers, and hand instruments appear to attain similar results for removing plaque, calculus, and endotoxin, but _____ seem to produce less root surface damage (position paper, AAP).

- ultrasonic scalers
- sonic scalers
- hand instruments

34. Kinane & Radvar (1999) compared the effect of three local delivery antimicrobials as adjuncts to scaling and root planing in the treatment of persistent periodontal pockets and reported greatest probing depth reductions with:

- 25% tetracycline fiber (Actisite)
- 2% minocycline gel (Dentomycin)
- 25% metronidazole gel (Elyzol)

<< Prev Next >>

3. Dental Implant Therapy

This is the last section and contains 17 questions. It will only take approximately five more minutes to complete. Thank You.

35. Joly et al. (2003) studied soft and hard tissue changes around one-stage implants with a smooth suprabony portion (neck) of 2.8 or 1.8 mm (ITI). They reported that a shorter neck:

- is sufficient to support the soft tissues and does not promote recession
- results in less crestal bone resorption
- results in less osseous density loss
- all of the above
- none of the above

36. Trisi et al. (2003) evaluated the 2-month bone-implant contact for dual acid-etched and machined implant surfaces and reported greater bone-implant contact with:

- dual acid-etched surfaces
- machined implant surfaces
- no difference

37. Conner et al. (2003) compared guided tissue regeneration around 3 implant surfaces. Which implant surface showed the greatest bone-to-implant contact?

- titanium plasma-sprayed
- hydroxyapatite-coated
- acid etched
- none of the above

38. Yukna et al. (2003) reported that following ridge preservation/augmentation with hard tissue replacement graft (HTR) (Bioplant) in conjunction with immediate dental implants. About what percent of the sites showed an INCREASE or NO CHANGE in ridge width.

- 20%
- 40%
- 60%
- 80%

39. King et al. (2002) studied the effect of internal versus external abutment connections on early crestal bone loss, and concluded that at 3 months implants with external connections showed _____ crestal bone loss:

- greater
- less
- similar

40. Nociti et al. (2002) studied the effect of cigarette smoke inhalation on bone healing after implant placement, and reported that smoke inhalation:

- decreases the degree of bone-to-implant contact
- decreases the bone area within implant threads
- has no effect on bone healing

41. Karabuda et al. (2002) compared peri-implant soft tissue health of implants supporting overdentures with ball attachments or bar attachments, and reported that:

- bar attachments correlated to higher probing depths
- bar attachments correlated to a higher plaque index
- bar attachments correlated to a higher bleeding index
- there was no significant difference

42. Mayer et al. (2002) reported _____ success rates for single-tooth replacement implants compared to data from bridged implant studies.

- higher
- lower
- similar

43. Which factors did Nemcovsky & Artzi (2002) find to negatively influence the healing of buccal dehiscence defects around implants?

- delayed implant placement
- single implant placement
- spontaneous implant exposure
- all of the above

44. In a review of the literature on early implant bone loss, Oh et al. (2002) concluded that the establishment of the biological width might be associated with:

- thickness of soft tissues around implants
- location of the junction between rough and polished surfaces in non-submerged implants
- location of the microgap in submerged implants
- all of the above

45. Piattelli et al. (2001) studied fluids and microbial penetration in the internal part of cement-retained versus screw-retained implant-abutment connections. Which connection offered less permeability?

- cement retained
- screw retained
- both offered similar permeability

46. Mengel et al. (2001) reported a 5-year implant success rate in patients treated for generalized aggressive periodontitis of approximately:

- 100%
- 90%
- 80%
- 70%

47. Fugazzotto (2001) reported cumulative success rates for root-resected molars after >15 years in function and molar position implants after 13 years in function. He found success rates to be:

- greater for molar position implants
- greater for root-resected molars
- similar for both therapies

48. According to Romanos et al. (2001), the success of immediately loaded implants is dependent on:

- implant design
- a splinted prosthesis
- implant surface coating
- primary implant stability

49. Carpio et al. (2000) studied guided bone regeneration around implants with and without barrier fixation and reported that _____ of the membranes became prematurely exposed compared to no membrane exposure when barrier fixation was used.

- 7%
- 17%
- 27%
- 37%

50. According to Hermann et al. (2000), the early crestal bone changes around dental implants is determined by the:

- microgap
- thread profile
- surface character
- depth of placement

51. During implant placement, the lowest temperature for bone necrosis is _____ for 1 minute:

- 27 degree C
- 37 degree C
- 47 degree C
- 57 degree C

<< Prev Done >>

Appendix B

First Contact

Date

Dear Doctor,

My name is A. Margarita Sáenz, I am a periodontist, a diplomate of the American Board of Periodontology, and a doctoral candidate at the University of New Orleans (UNO). I am conducting my dissertation on the ability of periodontists to self-assess their knowledge of periodontics. The study is an important one that will provide insight for periodontists, dental professionals in general, and other agencies that regulate the practice of dentistry and its specialties about the self-diagnosis of knowledge.

This postcard is an introduction to the study. Within the next week, you will receive the web-address to the study's questionnaire. Please be assured, that your answers are confidential and will be handled in an appropriate manner.

Thank you for your time and consideration. It is only with the generous help of people like you that my research would be successful.

Sincerely,

A. Margarita Sáenz, D.D.S., M.Ed., M.S., PhDc
Doctoral Candidate, UNO
asaenz@uno.edu
(504) 831-0800

P.S. I will forward a copy of the questionnaire with the answers as a way of saying thanks.

Appendix C

Second Contact

Date

Dear Doctor,

I am writing to ask your help in a study about the ability of periodontists to self-assess their knowledge of periodontics. This study is part of the effort to [learn](#) about the self-diagnosis of knowledge and its use for continuing education. By understanding the ability of periodontists to self-assess, the American Academy of Periodontology, and other academies and state boards may gain knowledge to better support members continued competency and revise their parameters for competency. Overall, this study may be of value to continuing educators who design professional development programs and to agencies involved in licensure, re-licensure, certification, and recertification.

Your answers are completely confidential and will be released only as summaries. This survey is also voluntary. If you have any questions or concerns about this study, please do not hesitate to contact me, or my faculty supervisors, Dr. Jim Killacky (ckillack@uno.edu or 504-280-6449) or Dr. Ray Yukna (ryukna@lsuhsc.edu or 504- 619-8659).

As a token of appreciation I will forward the questionnaire with the answers.

Thank you very much for offering your time and helping with this important study.

Sincerely,

A. Margarita Sáenz, D.D.S., M.Ed., M.S., PhDc
Doctoral Candidate, UNO
asaenz@uno.edu
(504) 831-0800

The web-address to the questionnaire is:
<http://www.surveymonkey.com/s.asp?u=11109612781>"

Appendix D

Third Contact

Date

Dear Doctor,

A few days ago you should have received a request from me to complete a questionnaire. It was sent to this e-mail address as part of my effort to study the ability of periodontists to self-assess knowledge and contribute to the field of continuing education.

If you have already completed it, please accept my sincere thanks. If you have not yet completed the web-questionnaire, please I kindly ask to do so as soon as possible. The address to the web-questionnaire is: <http://www.surveymonkey.com/s.asp?u=11109612781>"

Gaining knowledge about methods for continuing education is important to aid our own American Academy of Periodontology and all other programs and agencies charged with development of professionals on how to provide support to continued competency.

Sincerely,

A. Margarita Sáenz, D.D.S., M.Ed., M.S., Ph.D.
Doctoral Candidate, UNO
asaenz@uno.edu
(504) 831-0800

Appendix E

Fourth and Fifth Contacts

Date

Dear Doctor,

About three weeks ago I sent a web-questionnaire to you for a study about the ability of periodontists to self-assess. To the best of my knowledge, it has not yet been returned.

The preliminary results indicate that the final results will be very useful to the American Academy of Periodontology and other state and national agencies charged with the continuing education of professionals.

I am writing again because of the value that your response has for helping obtain accurate results. It is only by receiving data from nearly everyone in the sample that I can be sure that the results are truly representative.

Your answers are confidential. Once the questionnaires are returned, the list of names will be destroyed so that individual names can never be connected to the results in any way. Protecting the confidentiality of participants is very important to us, as well as to the University.

We hope that you fill out the web-questionnaire soon, but if for any reason you prefer not to answer it, please let me know by replying to this message, so that I would not contact you any further.

Sincerely,

A. Margarita Sáenz, D.D.S., M.Ed., M.S., PhDc
Doctoral candidate, UNO
asaenz@uno.edu
(504) 831-0800

The web-address to the questionnaire is:
<http://www.surveymonkey.com/s.asp?u=11109612781>

Appendix F

Approval from the UNO Institutional Research Board

University Committee for the Protection
of Human Subjects in Research
University of New Orleans

Form Number: 01NOV04

(please refer to this number in all future correspondence concerning this protocol)

Principal Investigator A. Margarita Saenz Title: Graduate Student

Faculty Supervisor: Jim Killacky *(if PI is a student)*

Department: Educational Leadership, CQ College: Education and Human Development

Project Title: Periodontists' Ability to Self-Assess their Knowledge of Periodontology

Date Reviewed:

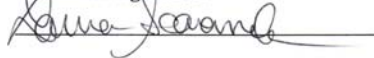
Dates of Proposed Project Period From 10/01/04 to 04/01/05

**approval is for one year from approval date only and may be renewed yearly.*

Note: Consent forms and related materials are to be kept by the PI for a period of three years following the completion of the study.

Approval Status	Date
<input type="checkbox"/> Full Committee Approval	
<input checked="" type="checkbox"/> Expedited Approval	<u>11-5-04</u>
<input type="checkbox"/> Continuation	
<input type="checkbox"/> Rejected	
<input type="checkbox"/> The protocol will be approved following receipt of satisfactory response(s) to the following question(s) within 15 days:	

Committee Signatures:

	Laura Scaramella, Ph.D. (Chair)
_____	Pamela Jenkins, Ph.D.
_____	Anthony Kontos, Ph.D.
_____	Richard B. Speaker, Ph.D.
_____	Gary Talarchek, Ph.D.
_____	Kari Walsh
_____	L. Allen Witt, Ph.D.

VITA

Dr. Ana Margarita Sáenz was born in 1969 in Guatemala, Guatemala, where she also grew up, and graduated from Universidad Francisco Marroquín with a Baccalaureus Scientiae in 1990. She graduated from Universidad Francisco Marroquín Facultad de Odontología, with the degree of Doctor in Dental Surgery in 1994. She completed a one-year advance education in periodontics at New York University School of Dentistry in 1996 and received a postgraduate certificate in periodontics in 1999 following a three-year residency at Louisiana State University School of Dentistry. Dr. Sáenz also obtained the degrees of Master of Education from University of New Orleans in 1999 and Master of Science from Louisiana State University in 2000. Currently, she lives in New Orleans and practices periodontics in private practice.