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Measurement of Perceived Service Quality of Selected Dental Specialists

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MEASUREMENT OF PERCEIVED SERVICE QUALITY
OF SELECTED DENTAL SPECIALISTS

by

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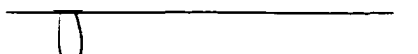
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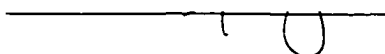
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ABSTRACT

MEASUREMENT OF PERCEIVED SERVICE QUALITY OF SELECTED DENTAL SPECIALISTS

David P. Paul, III
Old Dominion University, 1998
Director: Dr. John B. Ford

Although consumers find it difficult to evaluate the quality of healthcare services in general and dental services in particular, they do make such evaluations. The most widely accepted measurement scale for service quality is SERVQUAL (Parasuraman, Zeithaml and Berry 1988). A more parsimonious alternative to SERVQUAL, SERVPERF, has also been developed (Cronin and Taylor 1992). Previous research comparing these two scales in the setting of adult patients of general dentists concluded that SERVPERF accounts for significantly more of the variance in perceived service quality than does SERVQUAL (McAlexander, Kaldenberg and Koenig 1994). This dissertation extends this line of research to the perceived service quality of dental specialists who treat predominately adult patients: prosthodontists, periodontists and endodontists.

Patients' expectations and importance scores were obtained prior to treatment, and their perception scores and demographics were measured after treatment, thus eliminating a possible confounding effect present in previous research.

The data were analyzed using factor analysis, correlation analysis, and ANOVA. As hypothesized, the five factor structure of SERVQUAL was not found, and there was no statistically significant difference in overall perceived service quality score for the three specialties, allowing them to be grouped together for further analysis. Unexpectedly, SERVPERF was not a better measure of overall service quality than was SERVQUAL.

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More specifically, I thank the members of my Dissertation Committee: Dr. John Ford, Dr. Earl Honeycutt, and Dr. Edward Markowski. Each of these individuals has served as teacher and mentor, without whom this work would never have been conceived, let alone completed. Dr. Markowski's methodological skills were most appreciated - he devoted much time and effort to discuss with me how the analyses associated with this work could be better crafted and explained. Dr. Honeycutt has provided tremendous editorial and conceptual assistance with this work and a number of others - his clarity of expression is something which I will always envy. Dr. Ford has provided essential guidance and encouragement in the crafting of this work, from both a conceptual and methodological standpoint. His insistence that I better focus my efforts has made this dissertation considerably more succinct. Each of these individuals has had a tremendous impact on my education and development as a marketing scholar. I owe them a huge debt of gratitude.

The customary final paragraph thanks "the wife" for her understanding and patience during the Ph.D. process in general and the dissertation in particular. These educational

processes are certainly arduous, for both the doctoral candidate and his family. In my particular case, this is even more true, as this is my second doctoral degree, and the second time my wife, Jan, has been the spouse of a graduate student. Truly, I could not have completed this degree without the support of my wife and family who, whether they truly understood the doctoral educational process fully or not, always supported me, even though it meant a substantial change in lifestyle over the last five years.

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Measurement of Perceived Service Quality of Selected Dental Specialists

Chapter I: Statement of the Problem

Introduction

Because of increasing competition and more demanding customers, quality has become a watchword for virtually all businesses, domestic and foreign. This generalization holds true for large/global firms - as exemplified by Ford Motor Company's "Quality is Job 1" slogan - and small/local ones - as exemplified by Lynnhaven Marine's "20 Years of Quality Service" slogan (Anonymous 1996). Richard Leventhal, the Editor of the Journal of Consumer Marketing recently stated that "The battle cry of the 90s is 'service and quality'" (Parker, 1997 page D1). Quality is difficult for service firms to measure, especially service providers in the health care field. However, measurement is a prerequisite for anything which is to be improved - health care, and dentistry in particular, is no exception.

This research examines the concept of perceived quality as it applies to dentistry in general and dental specialists' services in particular. The predominant perceived service quality measurement tool for years has been SERVQUAL (Parasuraman, Zeithaml and Berry 1988). However, criticisms of SERVQUAL (Babakus and Mangold 1989; Brown, Churchill and Peter 1993; Carman 1990; Cronin and Taylor 1992; Spreng and Singh 1993; Teas 1993a, b; others) have led to the development of a more parsimonious perceived service quality

measurement tool - SERVPERF - which is a subset of the SERVQUAL measurement scale (Cronin and Taylor 1992). Controversy exists as to which of these two measurement scales more accurately measures the construct of perceived service quality. The background of perceived service quality as a construct and the development of the SERVQUAL and SERVPERF scales will be reviewed in more detail in Chapter II.

Previous research (McAlexander, Kaldenberg and Koenig 1994) applied both of these two measurement instruments - SERVQUAL and SERVPERF - to a sample of adult dental patients of general dentists practicing in Oregon. They concluded that SERVPERF more accurately measures the perceived service quality of general dentists. This research also compares the measurement of adult dental patients' perceptions of service quality using SERVQUAL and SERVPERF. However, this dissertation extends the line of perceived service quality research in two ways. First, the two major components of the SERVQUAL scale - perceptions and expectations - are measured separately, eliminating the confounding of these concepts which has been criticized in previous perceived service quality research. Second, the population sampled will be adult patients of selected dental specialists. Thus, this research will potentially allow generalizations to be made regarding which of the two perceived service quality scales more accurately measures perceived service quality for all adult dental patients.

Perceived Service Quality

Health care quality has been posited to consist of two parts: quality as perceived by the consumer and quality in fact (Omachonu 1990). Although it can be argued that the "real"

quality of a product or service is not necessarily reflected in the customer's perceptions (Marr 1986), health care consumers will draw their own conclusions about quality (Friedman 1986). In health care, as in other products and services, it is "perceived quality" that is important, not "objective quality." For consumers, perception is reality (Ries and Trout 1993; Rust, Zahorik and Keiningham 1994; Woodruff and Gardial 1996), and it is this perceived quality, as opposed to actual or absolute quality, that is important for health care professionals to manage (Goolsby and Singh 1989).

Consumers generally find the evaluation of health care services difficult. Rarely does the consumer know which features of the health care service to base their evaluative judgements or how best to evaluate those features the consumer does choose to evaluate (John 1989). This is especially true when the consumer evaluates the more technical features of health care, such as the qualification(s) of health care personnel or the improvement in patients' conditions after consumption of the health care service (John and Miller 1988). The typical consumer can readily assess only the nontechnical aspects of health care, such as the attentiveness and responsiveness of the health care provider, how comfortable the delivery of care is, or how long one had to wait before being treated (Ellwood 1988; Wyszewianski 1988b). These generalizations regarding health care are especially true with respect to dentistry, where treatment results may not be immediately obvious to the patient (Brody 1982).

Measurement Necessary

Health care providers are only today beginning to realize what product manufacturers

learned in the 1980s - that quality does not improve unless it is measured (Reichheld and Strasser 1990). Previous studies (Parasuraman, Zeithaml and Berry 1988; Cronin and Taylor 1992) involved the development of scales - SERVQUAL and SERVPERF - which have been shown to be useful in measuring the perceived quality of services. These tools have been applied to the measurement of perceived service quality in general dentistry, with the conclusion that SERVPERF is the better measurement tool for perceived service quality by adult patients in this venue (McAlexander, Kaldenberg and Koenig 1994). Although most dentists practice general dentistry, they often refer their more complex cases to dental specialists, who have received two to five years of additional specialized education and training beyond that of the general dentist.

Thus, the purpose of this research is to extend the research of McAlexander, Kaldenberg and Koenig (1994) to include selected dental specialists. As McAlexander, Kaldenberg and Koenig (1994) surveyed only adult patients, dental specialists who limit their practices to adults were selected for this extension of their work. Three dental specialties will be examined: prosthodontics (who perform complex restorative dentistry), endodontics (who perform root canal treatment) and periodontics (who perform gum treatment). Prosthodontists practice the same basic type of restorative dentistry as do general practitioners, although at a much higher level of complexity. Since SERVQUAL and SERVPERF have already been compared for general dental services, extending this research to prosthodontists seems a reasonable first step. Additionally, endodontists and periodontists will be studied. These two specialties represent the extremes of dental specialist-patient relationship length: the patient's relationship with the endodontist is infrequent to episodic.

while the patient's relationship with the periodontist is frequently long-term. Thus, if the same measurement tool can be shown to best apply to perceived service quality for all three of these dental specialties, then it would be reasonable to conclude that the application of this tool to most adult dental patient-dental specialist relationships would be valid.

History

Growth in Health Care Services and Costs

After World War II, private health care insurance increased tremendously (Wyszewianski 1988a). It is well known that insurance generally makes the demand curve less elastic (Phelps 1992) and this has certainly been shown to be true in health care (Crane and Lynch 1988; Lumpkin and Tudor 1990; Mirmirani and Ott 1990; Scheffler and Watts 1986). By the 1980s, the health care consumer was making purchasing decisions little regard to costs, because out-of-pocket expenses were small (Drake 1994). Dentistry was no exception to this trend. Based on a 1971 cross-sectional survey of 7775 adults, Manning and Phelps (1979) found the demand for dental services was price inelastic. This price inelasticity appears to have affected the development of quality assurance systems in dentistry. As expressed by Marcus (1985):

“Much of the impetus for the development of quality assurance stems from the involvement of prepaid dental care. The relationship between an individual patient and his or her dentist has some inherent controls when the patient is bearing the total cost of his dental care. When a significant portion of the cost of care is not the responsibility of the patient, the decision-making is likely to have fewer restraints.”

In addition, the Federal Government introduced measures, especially the enactment of

Medicare and Medicaid in 1965, to promote the access and availability of health care (Relman 1988). An unanticipated result of the enactment of the Medicare and Medicaid programs was that total expenditures for health care increased rapidly (Bowen 1987), causing grave financial pressures on both individuals and the government. Individuals responded to these pressures by buying more/better health insurance and/or demanding more health insurance from their employers. The government responded by initiating a series of changes in the system by which health care professionals and organizations were compensated. The most recent of these governmental cost controls is managed care, where health care providers are paid a set fee to provide all or a part of the health care needed by some group. Some 70% of the privately insured U.S. population is now enrolled in some form of medical managed care (Kongstvedt 1997).

Dentistry is following medicine in embracing managed care. Managed dental care plans are experiencing double digit annual gains in patient enrollment (Kehoe 1997), and currently, there are 19.5 million dental managed care enrollees (Tekavec 1997). The National Association of Dental Plans reported that, depending on the type of managed dental care plan, enrollment increased between 15% and 30% in 1995 (Wienthop 1997). The dental managed care organizations believe that if they can demonstrate that patients are satisfied with the care they are receiving in these plans, convincing additional individuals and firms to sign up will become relatively easy (Kehoe 1997). To date, patients report that they are reasonably satisfied with both the dentists providing managed dental care and the plans themselves, as noted by the 1996 data in Table 1 (Wienthop 1997):

Table 1Satisfaction with Dental Managed Care

<u>Company</u>	<u>Percent satisfied</u>	
	<u>DDS</u>	<u>Plan</u>
Cigna	82	80
Delta	97	N/A
MetLife	96	89
Prudential	91	87

Structural Changes in Dentistry

Technical advances in the practice of dentistry such as fast-setting amalgam, high-speed handpieces and four- and six-handed dentistry have allowed dentists to increase their productivity and treat more patients in less time (Anonymous 1983; Mangold et al. 1986). At the same time, the demand for traditional restorative dentistry has decreased due to the fluoridation of drinking water (Mangold et al. 1986; Mogelonsky 1996), improved dietary and oral hygiene practices (Grove, Pickett and Finn 1994), and a decrease in the size of the average American family (Wang, Janda and Rao 1996). Also, the growth in the number of practicing dentists has exceeded the growth in the public's demand for their services (Bentley and Woodall 1984; Bush and Nitse 1992; Doherty 1981; Littleton 1980). Thus, the market for dentists' services has become much more competitive (Chakraborty, Gaeth and Cunningham 1993). Preventive dentistry has led to fewer cavities in children, but it also allows older Americans to keep many of their teeth for a lifetime. This trend, combined with

the current emphasis on cosmetic dentistry, provides dentists with a steady, although aging, supply of patients (Mogelonsky 1996).

Increasing Importance of Quality

Quality issues are increasingly becoming important in the public's mind because of fears that efforts to cut health care costs will also result in loss of quality (Anonymous 1987; Wyszewianski 1988a). Aggressive forms of cost containment have resulted in consumers experiencing a general decline in the quality of health care (Mishra 1994).

A survey of 679 new residents of Shelby County, Tennessee, found that the greatest patient need appeared to be for information relating to quality of care of local dentists (Mangold et al. 1986). In spite of this, there is little evidence of significant implementation of quality assurance programs by the nation's largest dental organization, the American Dental Association (Capilouto 1989). However, based on the above discussion, there can be little doubt that concerns regarding health care quality are becoming more prevalent. As concerns mount, the accurate measurement of health care quality becomes more important to all involved: patients, providers, and both public and private third-parties.

This widespread concern regarding health care quality has created a demand for health care quality measures that are easily understood and readily obtained. To date, there is no claim that such measures exist. However, some believe that admitting this to the various concerned groups - the U.S. Congress, the press and many segments of the general public (Wyszianski 1988a) - would reinforce their worst fears. One approach has been to emphasize that, because health care is so complex and unpredictable, it cannot be defined.

much less measured (Wyszianski 1988a). Another approach has been to publish simple, understandable measures of health care quality, such as hospital mortality rates, while overlooking the possible inadequacies such measures might have.

Dental Service Quality Measurement

Previous Work in the Field (General Practitioners)

Health care practitioners would contend that service quality is the provision of appropriate and technically sound care that produces the desired effect (McAlexander, Kaldenberg and Koenig 1994). However, Swartz and Brown (1989) have demonstrated that patients' perceptions frequently differ from those of doctors, and that doctors frequently misperceive their patients' perceptions. This difference or "gap" in perception could have consequences for patient satisfaction and even financial success for professional practices.

Since research suggests that customers are reluctant to complain when dissatisfied with professional services (Andreasen 1985; Best and Andreasen 1977), the existence of this discrepancy between patients' and providers' perceptions may not be noticed by the provider until it is too late for the practitioner to attempt a service remedy. The result could be that the health care professional would bear the burden of having dissatisfied patients, including negative word-of-mouth and patient turnover (McAlexander, Kaldenberg and Koenig 1994).

Marketing researchers have devoted a great deal of time and effort conceptualizing and measuring perceived service quality, a construct which has been described as elusive and abstract (DeFries 1985). Marketers understand that patients' perceptions of service quality may differ from those of health care providers, and that patients' perceptions may be based

on a “more holistic” assessment of the health care experience. Reflecting this understanding, Parasuraman, Zeithaml and Berry (1985) viewed service quality from the perspective of the consumer. They developed a conceptual model that describes service quality in terms of reliability, responsiveness, competence, courtesy, access, communication, credibility, security, understanding and tangibles.

Parasuraman, Zeithaml and Berry (1988) measured service quality in terms of a “gap” between the consumers’ service expectations and their perceptions of the service providers’ performance. Their instrument (SERVQUAL) is described as a generic method for measuring service quality, and is frequently used for that purpose in the marketing literature. However, none of the services used in the development of SERVQUAL were within the health care domain. Parasuraman, Zeithaml and Berry’s (1985) service quality model and the SERVQUAL scale based on it (Parasuraman, Zeithaml and Berry 1988) are discussed more fully in Chapter II.

Although SERVQUAL is widely used, it is not without its detractors. Carman (1990) expressed concern regarding the measurement of service quality over multiple service functions, the treatment of the expectations measurement, and the omission of importance of each of the dimensions in measuring service quality. Babakus and Boller (1992) also raised concerns about SERVQUAL’s applicability across a wide variety of services, its dimensionality, the appropriateness of measuring service quality as a “gap” score, and the specific measurement properties associated with SERVQUAL.

Cronin and Taylor (1992) argued that both the conceptualization and operationalization of SERVQUAL were inadequate. They pointed out the confusion in the

literature over the relationship between service quality and consumer satisfaction, concluding that although service quality had been described as similar to an attitude, the operationalization used in SERVQUAL was more consistent with the conceptualization and operationalization of the consumer satisfaction/dissatisfaction paradigm. Cronin and Taylor (1992) specifically explored the relationship between service quality, satisfaction and purchase intention, comparing SERVQUAL weighted by importance with a performance measure (SERVPERF) both weighted and not weighted by importance. They found that service quality was an antecedent of customer satisfaction and that satisfaction had a stronger influence on purchase intentions than did service quality. More importantly, they found that the unweighted measure of service performance (SERVPERF) explained more of the variance and was a more parsimonious measure of service quality than the other measures tested. The development and empirical testing of the SERVPERF scale are discussed in more detail in Chapter II.

To the dentist, this debate surrounding SERVQUAL and SERVPERF raises an important question: Given the specific criticisms of SERVQUAL, which instrument (SERVQUAL or SERVPERF) more accurately measures perceived dental service quality? Because SERVQUAL was developed outside the dental industry, and has been applied to health care only sparingly, additional research appears necessary to determine which of these tools more accurately measures perceived dental quality.

Dentistry is different from the services used in the development of SERVQUAL (product repair, retail banking, dry cleaning and fast food) in several important ways. Consumers of dental services are generally more involved in the outcome and process of the

service delivery. The relationship between the service recipient and service provider tends to be rather intimate in nature, and may extend over a long period of time, perhaps decades. These and other differences suggest that dental service quality and also its measurement may be different than for other, non-clinical services.

McAlexander, Kaldenberg and Koenig (1994) tested SERVQUAL versus SERVPERF for general dental services. Their results showed that the measurement of dental service quality as performance only (SERVPERF) was superior to the conceptualization which included an expectations component (SERVQUAL), a result they attribute to patients' uniformly high expectations across all the SERVQUAL dimensions. Thus, although their conclusion is based on a somewhat limited sample of only two general dental practices from which 346 usable questionnaires were obtained, McAlexander, Kaldenberg and Koenig (1994) conclude that SERVPERF appears more suitable for the measurement of perceived service quality of general dentists by adults.

Dental Specialists versus General Dentists

Does the result of McAlexander, Kaldenberg and Koenig (1994) regarding the dental service quality as perceived by adults extend to services of dentists other than general practitioners, specifically dental specialists who treat adults? Motes, Huhmann and Hill (1995) have demonstrated that consumers' behavior differs according to whether they seek care from a general dentist or a specialist, at least with respect to search processes employed.

Plan of this Dissertation

A sample of 900 patients of selected Tidewater prosthodontists, endodontists and periodontists were administered a modified version of the SERVQUAL and SERVPERF scales (McAlexander, Kaldenberg and Koenig 1994). The responses were analyzed using correlation analysis, factor analysis and discriminant analysis to determine which of the two scales better measures patients' perceptions of dental specialists' service quality.

Chapter II presents a comprehensive review of the literature pertaining to this research. Chapter III provides a discussion of the sampling frame, specific research hypotheses, and methodology that were used in the analysis.

Chapter II - Literature Review

The Nature of Services

Services are different from goods. As Rathmell (1966) and Berry (1980) put it, a good is a thing (a noun) while a service is an act or a deed (a verb). Goods and services can be thought of as existing on a tangibility-based continuum. At one end is the very tangible (for example, salt) while at the other end is the very intangible (for example, a haircut). While there are differences between goods and services, it must be noted that virtually all goods contain service elements, although the reverse is not true. Service must be included with the salt, for if the customer concludes that it is defective in some way, it may be returned for refund or exchange (a service). If a haircut displeases a consumer, a refund is possible, but an exchange is not.

Another framework for isolating differences between goods and services lies in the classification of properties of goods proposed by Nelson (1974) and Darby and Karni (1973). Nelson distinguished between two categories of properties of consumer goods: search properties, attributes which a consumer can determine prior to product purchase, and experience properties, attributes which a consumer can discern only after purchase or during consumption. Darby and Karni (1973) added a third category to Nelson's classification system: credence properties, or characteristics which the consumer may find impossible to evaluate even after purchase and consumption. Generally speaking, offerings high in search properties are easiest for consumers to evaluate, those high in experience properties harder for consumers to evaluate, and those high in credence properties hardest for consumers to

evaluate (Parasuraman, Zeithaml and Berry 1985). Services are generally quite high in credence properties, relatively high in experience properties, and low in search properties (Zeithaml and Bitner 1996).

It is necessary to differentiate between notions of goods quality and service quality. Although differences of opinion exist on the definition of quality itself (Garvin 1988; Steenkamp 1989; Zeithaml 1988), and multidimensional definitions of goods quality have been proposed (Garvin 1984, 1987), goods quality is typically described in terms of conformance to manufacturing or technical specifications (Cravens et al. 1988; Crosby 1989; Evans and Lindsay 1996). Service quality, however, is more or less an interpersonal dynamic. Customers evaluate the entire service experience (Johnson, Tsiros and Lancioni 1995). Thus, even if consumers have specific service experience standards, the service provider can affect these standards as the service experience unfolds. This ability to influence the consumer's evaluative process and tailor service performance is one differentiating factor of the service experience as opposed to goods performance. Service quality thus contains dynamic properties not found in goods performance (Oliver 1993a).

Services are generally described in terms of four properties, described initially by Wyckham, Fitzroy and Mandry (1975): inseparability, intangibility, perishability and heterogeneity. These characteristics continue to serve as the basic descriptors of services.

Inseparability refers to the idea that the producer of a service and the recipient of that service must be simultaneously present for the service act to take place. The simultaneous production and consumption which characterize most services thus force the buyer into intimate contact with the service production process (Carman and Langeard 1980). It nearly

always makes the producer and the seller of a service the same entity, which necessitates direct distribution of the service (Upah 1980) and causes production and marketing of the service to be highly interactive (Gronroos 1978).

Intangibility refers to the idea that because services are actions, not things, they cannot be seen, tasted, felt or touched like products. This fundamental difference between products and services is cited universally by service authors (Rathmell 1966; Shostack 1977; Berry 1980; Lovelock 1981), and is thus often considered to be the critical differentiator between goods and services. Tangibility and intangibility are not absolutes (Shostack 1977), but exist on a continuum. All products, whether goods, services or a combination, possess elements of tangibility and intangibility (Levitt 1981). Because of the basically intangible nature of services, measuring service quality presents a major challenge (Cravens, Dielman and Harrington 1985).

Perishability refers to the concept that services cannot be produced in advance or stored for future use (Thomas 1978). When the service is completed, the thing of value which the customer possesses is an outcome - a change in status (for example, a haircut) - not an output (pieces of hair to take home).

Heterogeneity refers to the high variability which often occurs in the production of services - a property especially prevalent in highly labor-intensive industries (Berry 1980). This variability can occur between different providers of the same service or for a particular service provider at different times.

The differentiating factors between products and services have been discussed, as well as characteristics of services in general. This background material will make further

discussion of dentistry as a service more meaningful.

Dentistry as a Service

Dentistry contains elements of both a product and a service, although the service elements overwhelmingly predominate. Although some patients seek dental care in order to receive particular appliances - dentures, for example - the product itself is useless without the professional services involved in its fabrication. Dental patients who request dental appliances such as dentures are requesting in actuality solutions to their particular dental problems, such as an inability to masticate their food properly. Without the dentist's professional service involved in the design and fabrication of dental appliances, such appliances simply cannot satisfactorily perform as patients require - the do-it-yourself denture does not exist. For other patients seeking dental care, the product elements are even less important. Patients seek relief from dental pain through endodontics, long-term dental health through regular check-ups and treatment, and more attractive appearances through cosmetic dentistry and orthodontics. The exact method of solving the patient's problem is rarely of as much concern to the patient as is the eventual solution of that problem. Thus, dentistry is a service.

Quality of care is quite important to dental patients. Quality of care has been shown to be preeminent among factors considered to be important by patients in selecting a dentist (Hawes 1986). In a study of 4532 dental patients in southern New England, 99% of respondents rated quality of care as very important in the selection of a dentist (Barnes and Mowatt 1986). Rao and Rosenberg (1986), in a mail survey of 1000 citizens of a

southwestern SMSA found that dental service quality was among the most important factors patients listed in their choice of a dentist.

The criteria used by a dental patient in the choice of a new dentist have been shown to be different than those used in evaluating a current dentist (Garfunkel 1980). The decision process involved in the selection of a dentist involves an evaluation of practice characteristics not yet experienced by the patient, while the decision to remain a patient of a dentist involves an evaluation of attributes that have been personally experienced (Manski 1989). In this setting, too, quality of care remains important to dental patients. Garfunkel (1980) found that dental service quality (defined as an evaluation of professional competency) was one of the most important factors used by patients in evaluating their present dentist. Kriesberg and Treiman (1962) surveyed 1862 adults by personal interview regarding the way their present dentist practiced, finding that the quality of dental treatment performed and the dentist's personality and way of relating to patients were most important to patients. Based on a national survey, Gerbert, Bleeker and Staub (1994) noted that dental patients rated interpersonal caring and professionalism (defined as patient evaluation of dentist competence and skills - essentially a quality evaluation) as the most important things they liked about their present dentist.

Dentistry has been presented as a health care service, and the importance of quality of care for dentistry has been introduced. For dental consumers, quality of care is a particularly salient aspect of their dental decision-making.

The Concept of Service Quality

Since the 1970s, service quality has been acknowledged as a key factor in acquiring and sustaining competitive advantage (Hampton 1993; Sherden 1988). Quality service has been demonstrated to contribute to increased market share, greater return on investment, and lower production costs (Phillips, Chang and Buzzell 1983; Garvin 1983). Improved quality has been shown in the long run to decrease total costs (Crosby 1989; Deming 1986). Service quality is important because a customer's evaluation of service quality and the resulting level of satisfaction is believed to help determine the likelihood of repurchase and ultimately to affect business success (Iacobucci, Grayson and Ostrom. 1994). Achieving superior perceived quality gives a business three attractive possible options: (1) charge a higher price for the superior offering and let the premium fall directly to the bottom line; (2) charge a higher price for the superior offering and reinvest the premium in research and development and new products to ensure continued superior perceived quality; and (3) offer the customers better value by charging the same price as competitors while offering a superior product, resulting in increased market share (Gale and Buzzell 1989). Evidence is mounting that high quality enhances profitability, productivity and competitive position (Buzzell and Gale 1987; Deming 1982; Gale and Klavens 1985; Ishikawa 1982; Rust and Zahorik 1993).

Exploratory research conducted by Parasuraman, Zeithaml and Berry (1985) supports the idea that service quality is an overall evaluation similar to an attitude. These researchers conducted a total of twelve focus group sessions with current or recent consumers of four different services: retail banking services, credit card services, securities brokerage services, and product repair and maintenance services. The discussion centered around such issues as the meaning of quality in the context of the service in question, the characteristics the

service and the service-provider should possess in order to project a high-quality image, and the criteria that customers used in evaluating service quality. Comparison of the findings from these focus groups revealed that, regardless of the service, customers used basically the same general criteria in arriving at an evaluative judgement regarding service quality (Parasuraman, Zeithaml and Berry 1988).

The writings of Gronroos (1983) and the extensive focus groups conducted by Parasuraman, Zeithaml and Berry (1985) support the idea that service quality, as perceived by consumers, stems from a comparison of what they feel the service provider should offer (i.e., from their expectations) and their perceptions of the performance of the actual service delivery process. Perceived quality is therefore viewed as the degree and direction of the discrepancy between customers' perceptions and expectations (Parasuraman, Zeithaml and Berry 1988). Consumer behavior literature indicates that perceived quality is one of the key variables influencing consumers' intentions to purchase products or services (Bolton and Drew 1991b; Zeithaml 1988).

The dental literature focuses almost exclusively on the evaluation of quality from the point of view of the dentist - the technical aspects of service quality (Olsen and Ellek 1995; Schonfeld 1971). This approach suggests that dental service quality is primarily a function of the training and skills of the service provider, the accuracy of the service performance, and the nature of the clinical process and outcomes. Additionally, this approach implicitly emphasizes the difficulty the dental patient has in evaluating the technical aspects of dentistry, and his subsequent reliance upon functional aspects of dental service quality (Delene and Lee 1994).

The services marketing literature has a significantly different orientation regarding the evaluation of quality, focusing more on the opinions of the service recipient. This literature considers service quality to be a function of both what the service customer receives and how they receive it (Bopp 1990; Gronroos 1988; Parasuraman, Zeithaml and Berry 1988).

In dentistry, surveys of patients and dentists to determine the criteria useful in the determination of a “good” dental practice produced significantly different results - the three highest ranked criteria were explanation of procedures, sterilization/hygiene and dentists’ skills (all proposed by patients), while the three lowest ranking criteria were up-to-date equipment, pleasant office decor and surroundings, and good practice image (all criteria proposed by dentists). Overall, the criteria proposed by dentists as a group scored significantly lower than those proposed by patients as a group (Sheiham, Maizels and Cushing 1992). Abrams, Ayers and Petterson (1986) also found differences between patients and dentists in evaluating dental care quality, with dentists concentrating on technical aspects of quality and patients on process attributes.

Variations in dental treatment recommendations have been shown to exist (Bailit, Blazer and Clive 1983; Grembowski, Milgrom and Fiset 1990, 1991). Based upon a study of three years of insurance data of 227 general dentists, Bailit and Clive (1981) document wide variations in dental treatment recommendations across small areas, large regions, and dentists. They suggest those underlying differences in patient need may be a factor in this variation in dental treatment recommendations, but attribute much of the variation to regional dental practices. Certainly, informal reports among dentists indicate that dentistry is

practiced differently in disparate parts of the U.S. (Morris et al. 1988). To control for variation in patients' needs, Grembowski, Milgrom and Fiset (1990) calculated the service rates of 200 general dentists practicing in Washington state based on a homogenous sample of well-educated, upper-middle-class patients. Wide variations in the treatment rates of the dentists were observed, leading the authors of this study to conclude that variations in practice beliefs were the source of the variation in the treatment rates.

In an attempt to further remove the effects of different patients' underlying dental treatment needs, studies have examined different dentists' treatment recommendations based on a sample of one or a very small number of patients. Hazelkorn (1985) examined variations in treatment recommendations for a single patient, finding that they varied considerably among the examining dentists. Shugars and Bader (1992) reported on ranges of treatment recommendations made for two patients, with one patient being examined by 15 dentists and the other by 16 dentists. The first patient's treatment recommendations ranged from 4 to 11 procedures (total costs ranged from \$180 to \$1340), while the second patient's treatment recommendations ranged from 2 to 11 procedures (total costs ranged from \$420 to \$2400).

While the above studies were scientifically conducted and reported in various professional journals, the results in all probability were not widely read and/or understood, at least outside the dental profession - dental journals such as the Journal of the American Dental Association do not make for "popular" reading. Of more interest to the general public is a recent article in Readers' Digest (Ecenbarger 1997). The author reported the story of a single individual who was examined by 50 dentists in various parts of the U.S. Although the

patient's regular dentist and three other dentists who were consulted before the study was undertaken all agreed that she needed one or possibly two crowns, treatment recommendations among the 50 dentists selected for the study ranged from two crowns at a cost of \$460 (by a student at the Creighton University Dental School) to 21 crowns and 6 veneers at a cost of \$29,850 (by a dentist in New York). Even more telling was the variation in comments by the examining dentists, which ranged from "Your dental work is lousy" to "Whoever's been working on your mouth really knows his stuff (Ecenbarger 1997, page 53)." Dentists as a group have been shown to be highly trusted: in a randomized national sample, 84.6% of adults surveyed stated they had either a moderate amount or a great deal of trust in dentists in general (DiMatteo et al. 1995). Although a recent Gallop poll showed that dentists ranked in the top five for trust (Blatchford 1997), the widespread dissemination of the Reader's Digest report cannot help but to bring this trust into question, resulting in patients questioning not only treatment recommendations, but also the quality of treatment rendered. Certainly as businesses and individuals learn more about these wide variations in treatment recommendations and costs, they cannot help but question whether differences in results exist as well. Thus, quality cannot help but become a critical variable (Frieden and Kisner 1992).

Service Quality Measurement Issues

Marketing models of service quality begin with the work of Gronroos (1978), who advanced the concept that perceived service quality depends on expected and perceived service. Although Gronroos (1982) initially conceived service quality to be three-

dimensional, consisting of technical quality (what the service recipient actually receives), functional quality (how the service experience was perceived by the recipient), and corporate image, Gronroos (1983; 1984) later proposed that service quality consisted of only two dimensions - technical quality and functional quality, both affected by the image of the service firm. What customers receive in their service encounters - the end result of the service production process and the service-recipient/service producer interaction - frequently, although not always, is reasonably easy for the service recipient to evaluate, because it is a technical solution to a particular problem. This technical quality is clearly important to service recipients, but is only a part of quality service. Because there are often a number of interactions between the service provider and the service recipient, the technical quality will not account for the total quality of the service experienced by the service recipient. Total service quality will also be influenced by the manner in which the technical quality was delivered to them. In other words, customers are influenced by how they receive the service and how they experience the service delivery process. The latter is the functional quality of the process, which clearly cannot be evaluated as objectively as the technical dimension of quality. Frequently, this functional dimension of quality is perceived and evaluated quite subjectively (Gronroos 1988).

A number of researchers (Babakus and Mangold 1992; Crane 1993; Ferguson and Cooper 1988; Ginsburg and Hammons 1988; Morgan and Piercy 1992) agree with Gronroos (1983, 1984) that service quality in health care consisted of technical and functional dimensions. However, Brook, Williams and Avery (1976) and Wyszewianski (1988a) further separate the functional dimension into interpersonal components and amenities of

care. The interpersonal component refers to how responsive and attentive the health care professional is in interacting with the patient, while the amenities of care refer to how appealing and comfortable the facilities are where care is provided.

Technical quality of care is thought to be the most important component of dentistry to consumers (Mummalaneni and Gopalarkrishna 1995), who assume that it will generally be satisfactory (Friedman 1986). However, technical quality alone falls short of being a complete description of patients' description of quality. Kuehl and Ford (1977) and Mangold et al. (1986) found that structural factors such as education and years in practice had only limited impact on consumers' attitudes and behavioral intentions in the selection and evaluation of professionals, including clinicians. Moreover, Kovner and Smits (1978) found that most patients did not have the knowledge to evaluate the technical aspects of health care in an effective manner. Consequently, consumers base their health care evaluations on other factors, such as the functional and interpersonal elements of health care. Health care professionals have generally regarded these "other factors" as being less important than technical quality, and have generally ignored them (Donabedian 1981). However, the current trend in health care quality assessment is to give greater weight to the views of patients (Thomason and Watters 1995).

Like other clinicians, when most dentists think of quality of care, their typical concern is technical quality (Marcus 1985). Even when developing methods for evaluation of the quality of programs of dental care, technical quality is typically the only kind of quality evaluated (Bailit et al. 1974; De Jong and Dunning 1970; Ryge and Snyder 1973; Lewis and Monroe 1974). How then have dentists approached the description of technical

quality in dentistry?

Barish and Collins (1974) suggest that evaluation of the technical quality of dentistry is particularly difficult because dentistry combines elements of both a science and an art. They point out that, even given the most scientific approach to dental diagnosis, a variety of ethical treatments may be proposed by different dentists. This wide variation in what dentists consider to be acceptable makes development of explicit quality standards, even technical ones, virtually impossible. Take, for example, dental radiology, a relatively limited area of dental practice. Although a number of studies have described technical factors important in dental radiographs (Bailit et al. 1979; Barr 1966; Beideman, Johnson and Alcox 1976; Crabtree 1977; Wuerhmann 1974), the overall level of compliance with these guidelines by either private practitioners (Kantor, Hunt and Morris 1990) or dental schools (Farman and Shawkat 1981) is poor.

Although numerous studies by dentists have concluded that the technical quality of dentistry practiced in the U.S. is high (Bailit et al. 1979; Bailit 1980; DeVincenzi and Ryge 1979; Grembowski et al. 1988), few systematic analytic reports have been made about the quality of dental care in private practice (Stern, Morrissey and Maudlin 1979). Explicit standards for dental quality, even technical ones, do not exist in a manner that can be described as being universally accepted and applied. Dental quality, even to dentists themselves, seems to be of the "I know it when I see it" variety, not something that can be compared to an objective standard.

Dentists seemingly cannot agree, even among themselves, exactly what constitutes technical quality in dentistry. Is it any wonder that dental patients have great difficulty with

this same task, and are thus forced to judge the quality of their dentistry using their own criteria?

SERVQUAL

With encouragement and support of the Marketing Science Institute in Cambridge, Massachusetts, Leonard Berry, Valarie Zeithaml, and A. “Parsu” Parasuraman in 1983 began a systematic study of service quality. The first phase of this research was exploratory, and involved a series of focus group interviews with consumers and in-depth interviews with service industry managers to develop a conceptual model of service quality. A total of 12 focus groups were conducted, three from each of the following services: retail banking, credit card, securities brokerage, and product repair and maintenance. Focus group participants were screened to insure that they had recent (within the previous three months) experience with the service in question.

The focus groups’ discussions revealed several underlying themes across services and groups. Foremost of these themes was that consumers had certain expectations of what a service business should offer against which they compared their experiences of what did actually transpire; i.e., service quality as perceived by consumers was based on a comparison of expected service with perceived service.

The focus groups also revealed that, regardless of service discussed, participants used similar criteria in describing service quality. These criteria were grouped into ten categories or dimensions, not all mutually exclusive. For a brief explanation of each dimension, see Table 2:

Table 2: Dimensions of Service Quality

Dimension	Explanation
Reliability	dependability and consistency of service provision, including the service firm keeping its promises and performing the service correctly the first time.
Responsiveness	willingness and readiness of the service employees to provide the service, including performing the service in a timely manner
Competence	possession of the appropriate skills and required knowledge to perform the service
Access	approachability and ease of contact
Courtesy	politeness, respect, consideration and friendliness on the part of the service contact personnel
Communication	keeping customers informed in language they can understand; listening to the customers
Credibility	trustworthiness, believability and honesty; having the customer's best interest at heart
Security	freedom from danger, risk or doubt
Understanding/ knowing the Customer	making the effort to understand the needs of the customer
Tangibles	physical evidence of the service such as the appearance of the physical facility and the personnel

To obtain the managerial viewpoint of the service provider-service recipient

interaction, a series of 14 personal interviews was conducted with three or four executives from each of the four industries studied. As in the consumer focus groups, patterns emerged. These patterns suggested the existence of four discrepancies or “gaps” between the viewpoints of service executives and service recipients regarding what constituted service quality.

These gaps and a brief explanation of each are:

- Gap 1 (Consumer expectation - management perception gap): while management thought that it had a good understanding of customer expectations regarding service quality, they often either overlooked something that consumers regarded as important, or management’s valuation of consumers’ expectations regarding service quality differed from consumers’ valuations.

- Gap 2 (Management perception - service quality specification gap): even in instances when management was aware of considerations that customers considered critical to service quality, factors such as resource constraints, market conditions or management indifference prevented them from meeting those customers’ expectations.

- Gap 3 (Service quality specification - service delivery gap): even when formal standards were in place for performing services well, occasionally the actual performance of the service fell short of the standard due to variability in service employee performance.

- Gap 4 (Service delivery - external communications gap): because customers’ expectations were based, in part, on the service company’s external communications with customers, such communications could not only affect consumer expectations about the service (by raising customers’ expectations to a level that the service firm could not meet),

but also their perceptions (by failing to inform customers adequately of efforts taken to serve customers well).

A key finding of the focus groups was that service quality could be characterized by the discrepancy or gap between customer perceptions and expectations. The executive interviews showed that this service quality gap (Gap 5) on the customer's side is a function of Gaps 1 through 4 on the service firm's side. For more detail on the qualitative research basis behind the development of SERVQUAL, see Berry, Zeithaml and Parasuraman (1985), and Parasuraman, Zeithaml and Berry (1985).

The process used to develop the SERVQUAL service quality measurement scale itself followed the guidelines recommended by Churchill (1979). The conceptual definition of service quality (i.e., as the gap between consumer perceptions and expectations represented by Gap 5) and the ten dimensions of service quality assessment elaborated earlier (Berry, Zeithaml and Parasuraman 1985; Parasuraman, Zeithaml and Berry 1985) served as a basis for this development.

An initial pool of 97 items was generated to include all aspects of the ten service quality dimensions. Each item was recast into two statements - one to measure consumer expectations about service firms in general and the other to measure consumer perceptions regarding a particular service provider firm under assessment. Approximately half the statements were positively worded and the remainder were negatively worded. Assessment of agreement with each statement was by means of a seven-point Likert scale, with anchors of "Strongly Agree" and "Strongly Disagree." Intermediate points on the scale were not labeled. The expectations statements were grouped together and formed the initial section

of the questionnaire; the remaining perceptions statements formed the latter half of the questionnaire.

A sample of 200 adults, 40 each for appliance repair and maintenance, retail banking, long-distance telephone, securities brokerage and credit cards services, were recruited by a market research firm. The sample included approximated equal numbers of males and females who had utilized the service in question during the previous three months.

For the expectations part of the questionnaire, respondents were asked to decide the level of service that firms should offer. For the perceptions section, respondents were instructed to name a service firm with which they were familiar, and then grade their perceptions regarding the service actually provided by that firm.

The data from all five service industries were pooled and converted into gap scores (i.e., perception score less expectation score). These scores were then subjected to a series of item-to-total correlation analyses within each of the 10 dimensions, followed by a series of factor analyses.

To further evaluate the reduced question set, additional data were collected regarding the service quality of four nationally known service firms: a bank, a credit card company, a long-distance telephone company, and a firm dealing in appliance repair and maintenance. For each service provider firm, a shopping-mall sample of 200 customers was recruited. Again, to qualify for inclusion in this sample, individuals had to be familiar with the particular service firm and have used its services within the previous three months.

Gap scores were again obtained for each service, and were subjected to another series of item-to-total correlational and coefficient alpha analyses, followed by factor analyses to

examine dimensionality. Additional items were eliminated due to poor item-to-total correlation, bringing the final item total down to 22 pairs of statements. The number of factors was also reduced to five. Three of the original ten dimensions - tangibles, reliability and responsiveness - remained intact through the iterative scale development process, while the other seven dimensions were condensed into two: avoidance (which encompassed the original dimensions of competence, courtesy, credibility and security) and empathy (which encompassed the original dimensions of access, communication and understanding the service customer).

The resulting five SERVQUAL dimensions and an explanation of each are found in Table 3:

Table 3: SERVQUAL Dimensions:

Dimension	Explanation
Reliability	ability to perform the promised service quickly and accurately
Responsiveness	willingness to help customers and provide prompt service
Assurance	knowledge and courtesy of employees and their ability to convey trust and confidence
Empathy	caring, individualized attention the firm provides its customers
Tangibles	physical facilities, equipment and appearance of personnel

Estimates of the importance of these five dimensions were derived indirectly in the form of regression weights (Parasuraman, Zeithaml and Berry 1988, Table 61).

Mathematically, the SERVQUAL model can be stated as:

$$\text{SERVQUAL score} = \sum_i \sum_j [I_i (P_j - E_j)].$$

where I_i = importance weight on dimension i

P_j = respondent's score on perception question j

E_j = respondent's score on expectation question j

The SERVQUAL score can be computed as a single, overall measure of service quality - as in the above formula - or as individual scores for each of the SERVQUAL dimensions - by computing a score for each of the i dimensions.

Although the SERVQUAL scale, having been developed across several types of service industries, is considered to be suitable for assessment and measurement of service quality across a wide range of service firms or divisions within a single firm, Parasuraman, Zeithaml and Berry (1988, page 28) conclude that "appropriate adaptation of the instrument may be desirable when only a single service is investigated." For more details on the method and analysis employed in the initial scale development of SERVQUAL, see Parasuraman, Zeithaml and Berry (1988).

SERVQUAL was further refined by Parasuraman, Berry and Zeithaml (1991), this time in a study of retail banking, insurance, and telephone repair. The refinements involved changes in the SERVQUAL instructions and some of the SERVQUAL statements, but not to the 7-point rating scale or the 5-dimensional structure.

It had been previously noted that the distribution of the expectation scores was highly skewed toward the upper end of the scale - the overall mean expectation score was 6.22 on a 7-point scale (Parasuraman, Berry and Zeithaml 1991). Because the authors

suspected that the “should” wording in the expectations statements was causing respondents to furnish unreasonably high ratings, they revised these statements to reflect what customers “will” expect from service firms delivering “excellent” service. The instructions were also revised to reflect the changes in wording of the expectations statements (Parasuraman, Berry and Zeithaml 1990).

The negatively-worded statements in the original SERVQUAL were thought to be problematic for several reasons: they were awkward; they seemed to be confusing respondents (substantially higher standard deviations were noted for response scores of the negatively worded statements than for those worded in a positive manner); their presence lowered the reliabilities (coefficient alpha values) of the dimensions in which they were included. Consequently, all the negatively worded statements were reworded into a positive format.

Two of the original SERVQUAL scale items - one each for assurance and tangibles - were replaced with two new items. The new tangibles item referred to the appearance of communication materials, and the new assurance item to employees’ knowledge. These changes had been suggested by service firm managers, and were done in an effort to reduce redundancy and to more fully capture the five SERVQUAL dimensions.

The method of determining the importance weights of the five SERVQUAL dimensions was also altered. Previously, these weights had been obtained indirectly, in the form of regression weights. However, direct measures of the consumer weighing of the five dimensions were thought to be useful, especially for combining individual attribute ratings together to obtain a measure of overall service quality. Therefore, direct weighing of the five

SERVQUAL dimensions was obtained by having subjects allocate a total of 100 points across the dimensions according to how important subjects considered each to be.

The psychometric properties of the revised SERVQUAL scale were then reassessed. Strong reliability was observed - the coefficient alpha values for all dimensions exceeded 0.7, the value recommended by Nunnally (1978) as an acceptable minimum. The five dimensions also possessed predictive and convergent validity, evidenced by their ability to explain the variance in customers' perceptions of the firms' overall service quality, measured on a 10-point scale with anchors of "extremely poor" and "extremely good."

The evidence for reliability and validity of the revised SERVQUAL scale was stronger than had been obtained for the original SERVQUAL scale (Parasuraman, Zeithaml and Berry 1988). Thus, although the refinements seemed to have resulted in somewhat greater overlap of the five SERVQUAL dimensions, especially responsiveness and assurance, they did appear to have improved the cohesiveness of the items in each of the dimensions and the ability of the expectations-disconfirmation conceptualization to measure overall service quality.

Zeithaml, Berry and Parasuraman (1993) subsequently developed a conceptual model of expectations. They concluded that customers have two different levels of expectations that serve as comparison standards in assessing service quality: desired service - a combination of the level of service customers believe can be provided and the level of service customers believe should be provided; and adequate service - the minimum level of service that customers will accept. Separating these two levels is a "zone of tolerance" that represents service levels that customers find satisfactory.

Because the expectation component of SERVQUAL measures normative expectations, it taps the construct of desired service, but not the construct of adequate service. Therefore, SERVQUAL was further refined (Parasuraman, Zeithaml and Berry 1994b) to capture not only the gap between perceived and desired service - labeled the measure of service superiority (MSS) - but also the gap between perceived service and adequate service - labeled the measure of service adequacy (MSA).

To assess a difference score operationalization versus a direct operationalization, two measurement formats were tested:

- three column format: this involved obtaining separate ratings of desired, adequate and perceived service using three identical, side-by-side scales. Differences in ratings were used to calculate MSS and MSA. The operationalization of this measure is thus similar to SERVQUAL, but does not require repeating the battery of items.

- two column format: unlike SERVQUAL, this involved obtaining direct ratings of MSS and MSA with two identical, side-by-side scales.

Surveys containing the two questionnaire forms were mailed to samples of customers of a computer manufacturer, a retail chain, an auto insurance company, and a life insurance company. Sample sizes ranged from 800 to 1757 across companies; response rates ranged from 14-28% for the two-column format and from 17-28% for the three-column format.

The perceptions-only ratings (third column of the three-column format) were found to have the most predictive power. Regression of customer overall ratings (on a 9-point scale with “extremely good” and “extremely poor” as anchors) on the perceptions scores resulted in R^2 values ranging from 0.72 to 0.86 across the four firms. When difference score ratings

of MSS (i.e., perceptions minus expectations scores) were used as the independent variable in the same regression model, the R^2 values ranged from 0.51 to 0.60 across firms. When direct ratings of MSS were used (from the two-column format questionnaire), the R^2 values ranged from 0.45 to 0.74 across companies. The authors concluded that, if the purpose of the analysis was to maximize the variance explained in overall service ratings, measurement of perceptions alone appeared to be best.

The authors went on to note that managerial considerations, rather than explanatory completeness, might be the reason for undertaking service quality examination, especially by practitioners. If the purpose of conducting an examination of a firm's service quality was to determine service quality deficits and to demonstrate how best to allocate efforts to make appropriate improvements, then perceptions *and* expectations should be measures.

The importance of assessing perceptions relative to expectations rather than alone was evident from the pattern of results obtained from the customers of all four firms. For example, consider the mean ratings (9-point scale) obtained from customers of the computer company for the tangibles and reliability dimensions:

	<u>desired service</u>	<u>adequate service</u>	<u>perceptions</u>
tangibles	7.5	6.0	7.5
reliability	8.5	7.2	7.5

If perceptions alone are considered, the computer firm's performance of these two dimensions are identical, and the firm should place equal emphasis on each in terms of service improvements. However, when expectations are considered, it becomes obvious that

improvements associated with the tangibles dimension are unnecessary, because the firm is already at the level of desired service. Improvements associated with the reliability dimension should be of much more concern for the computer firm's management, as the firm currently is only marginally exceeding its customers' level of adequate service, and has substantial room for improvement before customers will judge its reliability of what is desired. Thus, the authors conclude that measuring expectations is necessary for managerial purposes - that to neglect expectations might cause firms to misrank the importance of the various performance criteria (Parasuraman, Zeithaml and Berry 1994a).

Many Uses of SERVQUAL

SERVQUAL was developed to be a useful service quality measurement and assessment tool for a wide variety of service industries. As such, it has been used for service quality assessment in settings as diverse as tire retailing (Carman 1990), accounting firms (Bojanic 1991; Freeman and Dart 1993), passenger airlines (Elliott and Tripp 1992; Young, Cunningham and Lee 1994), banking (Chaston 1995; McDougall and Levesque 1994), and law (Will and Stewart 1996). Many other uses of SERVQUAL - not cited here - exist.

Although health care was not one of the services used in its development, Babakus and Mangold (1989) concluded that SERVQUAL is potentially useful in that arena. Accordingly, SERVQUAL has become one of the most widely recognized single service quality measurement tools in health care (Bienstock, Mentzer and Kahn 1996). General health care applications are numerous - SERVQUAL has been used to examine service quality in hospitals (Mangold and Babakus 1991; Reidenbach and Sandifer-Smallwood

1990; Taylor and Cronin 1994; Woodside, Frey and Daly 1989), medical clinics (Headley and Miller 1993; O'Connor, Shewchuk and Carney 1994; Soliman 1992), free-standing medical imaging facilities (Peyrot, Cooper and Schnapf 1993), emergency rooms (Mowen, Licata and McPhail 1993), nursing services (Bebko and Garg 1995; Fusilier and Simpson 1995), health care provider choice (Bowers, Swan and Koehler 1994), hospital-physician relationships (Licata, Mowen and Chakraborty 1995) and in-vitro fertilization outcomes (Lytle and Mokwa 1992). Several studies have used SERVQUAL in studies of physicians (Brown and Swartz 1989; Soliman 1990; Walbridge and Delene 1993) and dentists (Carman 1990; Clow, Fischer and O'Brian 1995; McAlexander, Kaldenberg and Koenig 1994).

Criticisms of SERVQUAL

Despite the widespread use of SERVQUAL in health care and many other service industries, a number of researchers have pointed out problems with the scale and its use. These problems center around the areas of SERVQUAL's expectations conceptualization and measurement, its dimensionality, wording of some of the items, use of difference scores, and the measurement and significance of importance weights. These various reservations concerning SERVQUAL will now be examined.

A number of researchers have questioned the use of expectations in SERVQUAL (Babakus and Boller 1992; Babakus and Mangold 1992; Boulding et al. 1993; Carman 1990; Dabholkar 1993; Oliver 1993a; Teas 1993a, 1993b). Although studies have identified consumer expectations as an important part of the measurement of service quality (Bitner, Booms and Tetreault 1990; John 1989), the rationale for the importance of consumer

expectations is that service customers have expectations in appraising value and that these expectations are well-defined and based on criteria which are important to consumers with respect to a quality service experience (Sinkula and Lawtor 1988). The assumption that consumers' expectations are always "well-defined," especially for a wide range of different services, may be unfounded (Carman 1990).

Even if consumers' expectations are "well-defined," on what are they based? Expectations have been variously described in the consumer satisfaction literature as ideals, standards and experience-based norms (Olshavsky and Spreng 1989; Woodruff, Cadotte and Jenkins 1983; Woodruff et al. 1991); others have distinguished among ideal, desired and minimally tolerable expectation levels (Miller 1977; Swan, Trawick and Carroll 1980). Oliver (1981) felt that consumers will have some sort of modal expectation level that may or may not coincide with the ideal or any other particular level. Sirgy (1984) suggested that using more than one comparison standard may be useful for measuring customer satisfaction, an idea empirically supported by Tse and Wilton (1988). Cadotte, Woodruff and Jenkins (1987) proposed that customers may form standards which are weighted sets of several different standards. Because SERVQUAL is constructed with reference to an "ideal" company which delivers "excellent" service," it can be considered to be based on ideal expectations (Miller 1977). However, Boulding et al. (1993) determined that SERVQUAL is a function of two types of expectations - what should occur and what will occur. With all these different possible kinds of expectations, considered both individually and in combination, it is difficult to determine exactly what kind(s) of expectations SERVQUAL respondents use.

Parasuraman, Zeithaml and Berry (1988) emphasize that their use of expectations differs from that the consumer satisfaction literature (Oliver 1981; Oliver and DeSarbo 1988; Tse and Wilton 1988), in that expectations do not represent predictions or forecasts about what service providers “would” offer (Tse and Wilton 1988; Churchill and Suprenant 1982; Oliver and Bearden 1985), but rather what they “should” offer. However, Teas (1993b) questions Parasuraman, Zeithaml and Berry’s (1988) operationalization of the expectations component of service quality - Teas describes their use of “should” as vague - and feels that many respondents interpret the expectations measures to involve forecasted or perceived service levels. If this situation occurs, then expectation measures are the same as defined in the satisfaction literature (Cronin and Taylor 1992), and the perceptions minus expectations framework will be unable to discriminate between service quality and customer satisfaction.

Some confusion apparently exists between ideals and desired expectations. Because ideals can be viewed as perfect states, and are therefore unattainable, desires or norms might be a better standard. In fact, as Oliver (1993b) suggests, ideal standards may be unattainable for many consumers due to costs or availability. Because the actual referent used by each consumer for their expectations is unknown, Teas (1993b) suggests that a considerable amount of the variance in service quality expectations data is therefore attributable to different interpretations of the question being asked instead of due to different respondent attitudes and perceptions.

A final problem with SERVQUAL’s expectations measurement rests on the fact that Parasuraman, Zeithaml and Berry asked the same respondents to complete both the expectations and the perceptions sections of the survey at the same sitting (Carman 1990).

Oliver (1981) had previously argued forcefully that expectations and perceptions should be measured separately, because simultaneous measurement introduces a subtle interaction between actual outcomes and prior experiences. Hubbert, Sehorn and Brown (1995) suggest two reasons that measuring expectations and perceptions at the same time leads to confounding: (1) the expectations data are based on recall, with all the inherent limitations this implies, and (2) expectations assessed after consumption will be swayed by the perceived level of performance. The latter point had previously been made by Fisk et al. (1990).

Several researchers have noted that the dimensionality of SERVQUAL differs across service industries; i.e., the dimensions identified by Parasuraman, Zeithaml and Berry (1988) do not necessarily generalize across usage contexts. Reports by Babakus and Boller (1992), Babakus, Pedrick and Inhofe (1993), Carman (1990), Clow, Mason and Ashton (1991), Headley and Miller (1993), McDonall and Levesque (1994), Reidenbach and Sandifer-Smallwood (1990) and Spreng and Singh (1993) either fail to replicate the original dimensions or require deletion of old and construction of new items to adapt to the specific context under study. Dabholkar, Thorpe and Rentz (1996) reviewed ten studies using SERVQUAL, and concluded that, in general, the factor structure proposed by Parasuraman, Zeithaml and Berry (1988) was not supported. Because some determinants of perceived service quality are generic, while others are industry- or situation-specific (Cravens, Dielman and Harrington 1985), the type of service under consideration is probably the basis for the instability of the dimensionality of SERVQUAL (Babakus and Mangold 1989).

Roughly half of the statements in SERVQUAL were deliberately positively worded

and the other half negatively worded. Parasuraman, Zeithaml and Berry (1988) constructed SERVQUAL in this manner in accordance with recommendations for scale development made by Churchill (1979). However, Babakus and Boller (1992) questioned the use of both positively and negatively worded statements in SERVQUAL, on the grounds that such wording variation caused confusion in the mind of the respondent such that accurate response to the questionnaire became difficult, and that negatively worded statements might have negative connotations for respondents.

Concerns have been expressed about use of difference scores, either in general (Peter, Churchill and Brown 1993; Oliver 1993b) or specifically as applied to SERVQUAL (Babakus and Boller 1992; Brown, Churchill and Peter 1993; Carman 1990; Spreng and Singh 1993). Oliver (1993b) and Peter, Churchill and Brown (1993) both point out that the summing or otherwise combining difference scores is inherently unsound (Overall and Woodward 1975), and that this has been recognized in the psychometric literature for some time (Cronbach and Furby 1970; Lord 1958, 1963; Wall and Payne 1973). Peter, Churchill and Brown's (1993) extensive discussion of the problems associated with difference scores as construct measures centers around the following problem areas:

- reliability: difference scores are generally less reliable than are their components (Cronbach and Furby 1970; Johns 1981; Lord 1958, 1963; Prakash and Lounsbury 1983).

- discriminant validity: discriminant validity refers to the degree to which measures of theoretically distinct constructs do not correlate highly; without evidence of discriminant validity, a measure cannot demonstrate construct validity (Peter 1981). Difference scores often have low reliability, attenuating correlations between the measure and other construct

measures. The resulting correlations between a difference score measure and other measures may create the illusion of meeting discriminant validity standards simply because of low reliability. Linear combinations of difference scores have a greater problem in this area (Johns 1981; Wall and Payne 1973).

- spurious correlations: any correlation between difference scores and one of their components or other variables is likely to be spurious (Wall and Payne 1973).

- variance restriction: when one of the variables used in calculating the difference score is consistently higher than the other, a systematic restriction in the variance of the difference score results, leading to problems in many types of statistical analyses.

Because of these problems with the use of difference scores, Peter, Churchill and Brown (1993) express serious reservations about the use of such scores, such as is done in SERVQUAL to create a measure of perceived service quality. They point out (Brown, Churchill and Peter 1993) that these problems manifest themselves in SERVQUAL's use of a difference score to measure service quality in several ways: (1) although SERVQUAL has relatively high reliability, this reliability is less than a non-difference measure of service quality; (2) SERVQUAL does exhibit variance restriction; (3) SERVQUAL fails to demonstrate discriminant validity from its components; (4) the distribution of SERVQUAL scores is non-normal; and (5) SERVQUAL's perception component by itself performs as well as the perceptions-minus-expectations formulation on a number of criteria.

A final problem associated with the use of difference scores to measure service quality has been noted by Spreng and Singh (1993). These authors point out that SERVQUAL researchers generally calculate their scale reliabilities inappropriately - the

reliability calculation that should be used is the one designed specifically for difference scores (Lord 1963). Spreng and Singh (1993) calculated SERVQUAL reliability using both the conventional method and the method designed specifically for difference scores, and found consistently (but only slightly) smaller reliabilities when the more appropriate calculation technique was used. In the latest formulation of SERVQUAL, Parasuraman, Zeithaml and Berry (1994b, Table 3) calculate coefficient alpha using the formula for the reliability of a difference score.

Because the inclusion of the importance weights is inherently important in calculating an overall service quality score, Carman (1990) suggested that a better method of developing such importance weights be developed. Parasuraman, Zeithaml and Berry (1988) measured perceptions and expectations, and from these inferred importance weights. Carman suggested a direct measure of customers' importance weights might yield more valid results.

Parasuraman, Zeithaml and Berry (1991, 1993, 1994a) address many of the concerns raised above. SERVQUAL's expectations measure was improved with the 1991 reformulation (Parasuraman, Berry and Zeithaml 1991). Although the dimensionality seems to vary with the industry examined, this had been foreseen by the scale developers (Parasuraman, Zeithaml and Berry 1988). Parasuraman, Berry and Zeithaml (1993) agree the universality of the five dimensional structure of service quality remains in doubt and should be further investigated. The criticisms of the use of difference scores in SERVQUAL were based on several premises: possible resulting low reliabilities, possible lack of discriminant validity, and possible variance restriction. Parasuraman, Berry and Zeithaml (1993) point out that, as SERVQUAL's reliability is high (0.87 to 0.92 in Parasuraman,

Zeithaml and Berry 1988 and 0.94 in Brown, Churchill and Peter 1993), low reliability of SERVQUAL does not appear to be a problem. It should be noted that evidence for SERVQUAL's reliability is mixed - Brown and Swartz (1989) reported reliability coefficients ranging from 0.93 to 0.64 for performance measures and from 0.55 to 0.48 for expectation measures. With respect to discriminant validity, because Brown, Churchill and Peter (1993, page 130) define discriminant validity as "the degree to which measures of *theoretically unrelated constructs* do not correlate highly with one another (emphasis added)," and Parasuraman, Zeithaml and Berry (1985) specified that service quality is a *function of the discrepancy between customers' expectations and perceptions*, inferring poor discriminant validity on the part of SERVQUAL is inconsistent with the definition of discriminant validity and hence is inappropriate. Parasuraman, Berry and Zeithaml (1993) agree that the potential variance restriction problem raised by Brown, Churchill and Peter (1993) is valid - that the high mean value and low standard deviation for SERVQUAL's expectations component does restrict the variance of the difference scores at higher levels of service quality. However, Parasuraman, Berry and Zeithaml (1993) question the relevance and seriousness of the potential problem, basing their argument on how the difference scores are to be used - the variance restriction of difference scores would be a problem *if* the SERVQUAL scores were to be used in multivariate analysis, but if simply used for managerial purposes - identification and management of service quality gaps - the use of difference scores poses no difficulty. With respect to Teas' (1993b) concerns regarding interpretation of the expectations standard - how much of the obtained variance is due to the variations on respondent attitudes and how much to differences in question interpretation -

Parasuraman, Zeithaml and Berry (1994a) argue that Teas' position is based on evaluation of the service dimension under consideration as a vector attribute - essentially a feasible ideal point - which is only appropriate under two of the five possible interpretations of service quality attributes. Parasuraman, Zeithaml and Berry (1994a) conclude that additional research is needed to determine how consumers actually do evaluate each service quality dimension.

Finally, no matter how determined, importance weights seem to be of little practical significance. Babakus and Inhofe (1993) found that inclusion of importance weights actually caused the explanatory power of the model to drop. Others (Rao, Kelkar and Md-Sidin 1993; McAlexander, Kaldenberg and Koenig 1994) have found that inclusion of importance weights causes a statistically significant but very small increase in the explanatory power of SERVQUAL. It appears that importance weights add little, if anything, to SERVQUAL.

The disconfirmation paradigm for service quality (SERVQUAL) is firmly based on gap analysis - the use of difference scores - and is "moving rapidly toward institutionalized status" (Buttle 1995, page 25). The objective of SERVQUAL is to provide managers and researchers in the service field with a tool which can be used to evaluate the various gaps existing at different levels within their organization(s) and in their service provider-service recipient interactions. Given the obvious value of gap analysis, it certainly is a process that should be performed for or by practitioners in order to determine areas that might need improvement (Dabholkar 1993). However, it is quite possible to conduct gap analysis without making it a part of the explicit definition of service quality. For example, Zeithaml (1988) discussed perceived quality without reference to expectations and, based on a later

empirical study (Boulding, Karla, Staelin and Zeithaml 1993) concluded that service quality is directly influenced only by customer perceptions. Increasingly, services marketing researchers (Bolton and Drew 1992; Gronroos 1993; McAlexander, Kaldenburg and Koenig 1994) suggest that service quality measurements are better tied directly to service recipient perceptions rather than be based of the gap between service recipient expectations and perceptions.

SERVPERF

Carman (1990) suggested that expectations may not be particularly important in the establishments of consumers' development of service quality impressions. Bitner (1990) hypothesized that service quality is essentially an attitude (Oliver 1980) rather than a disconfirmation between consumer expectations and perceptions. Bolton and Drew's (1991a) empirical results confirmed this hypothesis by showing that service quality is strongly affected by performance and the effect of discrimination between consumer expectations and perceptions is transitory and weak. Cronin and Taylor (1992) investigated the usefulness of measuring service quality simply in terms of customer perceptions of service provider performance. Although the veracity of conceptualizing the SERVQUAL scale as the five distinct components described by Parasuraman, Zeithaml and Berry (1988) has been questioned (Carman 1990), Cronin and Taylor accepted the five dimensional structure of service quality and the 22 individual performance scale items that made up the SERVQUAL scale (Parasuraman, Zeithaml and Berry 1985). Cronin and Taylor (1992) therefore initially used the same 22 performance items defined by Parasuraman, Zeithaml

and Berry (1988) in their analysis of appropriate measurement tools of service quality.

Personal interviews with 660 randomly selected consumers, all of whom answered all questions posed, were conducted by trained interviewers in a two-week period in 1988. The sampling frame was an entire city, and interviewers were assigned specific areas within the city to prevent overlap. Subjects were questioned concerning their perceptions and expectations regarding four industries: banking, pest control, dry cleaning and fast food. These industries were chosen based on a convenience sample which suggested that these service industries were most familiar to the city's population. The two firms which had the largest sales volume in each industry agreed to participate in the study. Because of the number and length of the questionnaires, each subject was asked to evaluate only one firm. Respondents were required to have used the services of a firm in the industry about which they responded within the previous 30 days. This screening ensured that each subject was familiar with the services of the firm which he or she was asked to evaluate.

Cronin and Taylor compared SERVQUAL, importance-weighted SERVQUAL, a performance-only measure of service quality (which they called SERVPERF) and an importance-weighted version of SERVPERF. Subjects also completed a direct measure of service quality (based on a 7-point semantic differential scale) and a 22-item questionnaire to determine their importance weighing of the SERVQUAL dimensions. The 22 items comprising the SERVPERF scale consisted of the 22 "perceptions" items of SERVQUAL. Thus, SERVPERF is simply a subset - the performance component - of SERVQUAL.

Mathematically, the SERVPERF model can be described as:

$$\text{SERVPERF score} = \sum_i \sum_j I_i P_j$$

where I_i = importance weight on dimension i

P_j = respondent's score on perception question j

Because confirmatory factor analysis failed to support the five factor structure of SERVQUAL (Parasuraman, Zeithaml and Berry 1988) for any of the four industries examined, exploratory factor analysis was performed for both SERVQUAL and its performance-only component. Because all statements but one were shown to load on a single factor, the outlier statement was deleted, and both scales were treated as unidimensional. The reliability of the slightly shortened scales was recalculated, and coefficient alpha was determined to exceed 0.80 for both scales and all samples and industries.

The ability of each of the four scales examined - SERVQUAL, importance-weighted SERVQUAL, SERVPERF and importance-weighted SERVPERF - to explain variance in overall service quality was assessed by regression analysis. The individual scale items of each of the four scales were regressed against a global measure of overall service quality for each industry.

Importance weights were found to contribute little to either SERVQUAL or SERVPERF - in all industries, unweighted SERVPERF explained more of the variation in the global measure of service quality than did importance weighted-SERVPERF; in three of the four industries (the exception was dry cleaning), unweighted SERVQUAL explained more variation than did importance-weighted SERVQUAL. Although unweighted

SERVQUAL had an acceptable model fit in two of the industries, SERVPERF had an excellent model fit in all four industries. Thus, SERVPERF explained more of the variation in service quality than did SERVQUAL. Cronin and Taylor (1994) caution that, because SERVPERF is based on the five SERVQUAL dimensions, it may well demonstrate the same factor instability across different service industries.

Uses of SERVPERF

A comparison of the relative abilities of SERVQUAL and SERVPERF to explain variation in service quality in the airline industry concluded that SERVPERF was superior to SERVQUAL in this regard (Elliott 1995). However, the airline industry includes elements of both product (meals) and service (the trip itself).

Cronin and Taylor's (1992) development and testing of SERVPERF demonstrated that it explained more of the variation in service quality than did SERVQUAL; however none of the industries used in the development and confirmation of the SERVPERF scale included any aspect of health care. Therefore, we are faced with the question: Which model, SERVPERF or SERVQUAL, performs better in the measurement of health care quality?

Several researchers have examined SERVQUAL versus SERVPERF in terms of both models' ability to measure service quality in the hospital industry (Gotlieb, Grewal and Brown. 1994; Taylor and Cronin 1994). Both studies concluded that SERVPERF explained more of the variation in hospital service quality than did SERVQUAL. This line of research has also been extended to dentistry. McAlexander, Kaldenberg and Koenig (1994) compared the ability of SERVQUAL and SERVPERF to explain the variance in adult patients' overall

evaluation of service quality for the services of general dentists. Although their sample size was small - 966 patients of two general dental practices were surveyed with a response rate of 36% - they concluded that SERVPERF explained more of the variation in service quality than did SERVQUAL. They attributed SERVPERF's better performance to the fact that the patients had uniformly high expectations across all the SERVQUAL dimensions, probably due to the high esteem that society generally holds for health care professionals (Swartz and Brown 1991).

Although other tools have been developed to measure perceived service quality, none has achieved the widespread use of SERVQUAL and SERVPERF. SERVQUAL has been the most widely used scale for measurement of perceived service quality, both in dentistry and other fields. However, it has not been clearly established that SERVQUAL a better perceived service quality measurement scale in dentistry than is SERVPERF. In fact, existing available evidence (McAlexander, Kaldenberg and Koenig 1994) would indicate that SERVPERF is a superior measurement tool for perceived service quality of general dentists. Extending this line of research - whether SERVPERF or SERVQUAL better measures perceived service quality - to the services of dental specialists would help clarify the issue of which service quality measurement tool better measures the construct of perceived service quality.

Conclusion

The field of service quality research has been shown to be a fruitful one, full of divergent and interesting research possibilities. With respect to dentistry, the major concern

at this point revolves around the problem of how best to measure perceived dental service quality. Several specific research hypotheses which address this topic and the methodology which was used to test these hypotheses are presented in Chapter III.

Chapter III: Methodology and Hypotheses

Introduction

Service quality as perceived by the patient is a complex construct which has been shown in Chapter II to be extremely important for dentists. However, the most appropriate scale for the measurement of this construct has yet to be established. The two major scales for measuring perceived service quality are SERVQUAL and SERVPERF. McAlexander, Kaldenberg and Koenig (1994) compared a modified version of SERVQUAL to a comparable version of SERVPERF for services of general dentists, concluding that SERVPERF accounted for more of the observed variance than did SERVQUAL. This research extended the work of McAlexander, Kaldenberg and Koenig (1994) to the services of selected dental specialists.

Sample Frame

Dental specialties selected for this research were prosthodontics, endodontics and periodontics. Prosthodontists were selected because their treatment domain - restorative dentistry - resembles that of the general dentist more closely than does the domain of any other dental specialty. Endodontists and periodontists were included because they represent a wide range of dentist-patient relationships - endodontists see patients on an episodic basis, while periodontists treat patients on a long-term basis. Each of these selected specialties also deals exclusively with adults.

Three prosthodontists, three endodontists and three periodontists agreed to participate

in the study. Questionnaires were distributed to at least 300 patients of dental specialists. This sample size was determined according to a statistical power approach, which is appropriate when the statistical significance of a product moment correlation is desired (Cohen 1988). The significance level of a statistical test, alpha, is the rate of rejecting a null hypothesis which is true - a Type I error. Alpha is typically a small value. Power refers to the probability of rejecting a null hypothesis which is false - a type II error. The magnitude of the selected sample size is thus a function of significance level, power, and the minimum value of the correlations to be detected.

A significance level of $\alpha = 0.05$ was chosen. This level is traditional and widely accepted in the marketing literature. Because relationships in the behavioral sciences are frequently of the magnitude of 0.20 (Cohen 1988), this level of detectable correlational magnitude was chosen for this analysis. The conventional power level for exploratory research is 80 (Cohen 1988, page 100). However, because service quality research has been developed to the extent that it can no longer be classified as exploratory, for this research a more rigorous power level of 95 was chosen. Choosing this level for power also sets the Type I and Type II error risks equal to the chosen level of $\alpha = 0.05$, as suggested by Cohen (1988, page 53). Based on the chosen magnitude of these parameters, a sample size of 266 was determined to be appropriate. This sample size was rounded up to 300 in order to compensate for the possibility that some of the returned surveys may not be usable (see Table 4).

Table 4:
 SAMPLE SIZE TABLE
 alpha = 0.05

Correlation	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
Power									
0.25	97	24	12	8	6	4	4	3	3
0.50	272	69	30	17	11	8	6	5	4
0.60	361	91	40	22	14	10	7	5	4
0.70	470	117	52	28	18	12	8	6	4
0.75	537	134	59	32	20	13	9	7	5
0.80	617	153	68	37	22	15	10	7	5
0.85	717	178	78	43	26	17	12	8	6
0.90	854	211	92	50	31	20	13	9	6
0.95	1078	266	116	63	39	25	16	11	7
0.99	1570	387	168	91	55	35	23	15	10

Jacob Cohen (1988), Statistical Power Analysis for the Behavioral Sciences, Second Edition, Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers, page 101.

Survey Design

A revision of the questionnaire employed by McAlexander, Kaldenberg and Koenig (1994) to measure service quality of general dentists was pretested using a sample of 25 patients of a periodontist who was not planned for inclusion in the study. The initial revision of the questionnaire consisted simply of wording changes to reflect the change in target population from patients of general dentists to patients of selected dental specialists. Results obtained in this pretest of the revised questionnaire led to further revision of this questionnaire (see Chapter IV for details). The initial questionnaire is attached as Appendix I, Survey 1: Survey of McAlexander, Kaldenberg and Koenig (1994).

Research Hypotheses and Methods

McAlexander, Kaldenberg and Koenig (1994) used the five SERVQUAL dimensions - tangibles, reliability, responsiveness, assurance, and empathy - as a starting point for their initial research into the appropriateness of SERVQUAL and SERVPERF for perceived service quality of general dentistry as determined by adults, in that their questionnaire was a modification of the SERVQUAL items. However, although SERVQUAL was designed to be a generic service quality measurement scale (Parasuraman, Zeithaml and Berry 1988), its five dimensions have not been found to hold up across different industries (Babakus and Boller 1992; Carman 1990; Finn and Lamb 1991; Headley and Miller 1993; Reidenbach and Sandifer-Smallwood 1990). Other researchers' failure to replicate the five dimensional structure obtained by Parasuraman, Zeithaml and Berry (1988) may have occurred because different industries were examined, or because different methods for handling missing data

and/or outliers were employed by different researchers (Tabachnick and Fidell 1989). In fact, McAlexander, Kaldenberg and Koenig (1994) characterized the factor structures of SERVQUAL and SERVPERF as unidimensional. Because McAlexander, Kaldenberg and Koenig's (1994) research utilized patients of general dentists and this research utilizes patients of selected dental specialists, the factor structure obtained in this research was not anticipated to differ substantially from the unidimensional one obtained by McAlexander, Kaldenberg and Koenig. Thus, the initial research hypothesis relates to the dimensionality of SERVQUAL:

H₁: the five dimensional factor structure of SERVQUAL will not be obtained for this data.

Factor analysis was determined to be the appropriate analytical tool to test this hypothesis. Analysis of the correlation matrix of the items was first performed to determine that there was sufficient inter-correlation among the items to warrant the use of factor analysis.

McAlexander, Kaldenberg and Koenig (1994) compared SERVQUAL and SERVPERF for adult patients of general dentists. This research extended their work to a different domain - dental specialists who treat adult patients. There were three groups of specialists - prosthodontists, endodontists and periodontists - and a total of ten participating dental specialists. Thus, it will be necessary to examine the patient responses of all possible groups to determine if there is sufficient evidence of differences among these groups. Thus,

H₂ relates to anticipated differences which will be determined to exist within the groups of dental specialists:

H₂: There will be no difference in mean scores obtained for different dental specialists on SERVQUAL or SERVPERF.

The appropriate analytic tool in this situation is ANOVA. If H₂ had not been supported, further analysis would have been performed to identify the nature of differences identified among the groups. Since H₂ was supported, the data on these three dental specialist groups was combined into one group - dental specialists - for further analysis. Thus, since H₂ was supported, general conclusions were possible concerning adult patients' perceptions of service quality for all three dental specialists selected for this study.

With H₂ supported, the variance in perceived service quality obtained using SERVQUAL was compared to the variance obtained using SERVPERF. The appropriate analytic tool for this analysis was correlation analysis. Two correlations were important - the correlation between the SERVQUAL score and the measure of overall service quality, and the correlation between SERVPERF and the measure of overall service quality. Because McAlexander, Kaldenberg and Koenig (1994) found that SERVPERF explained more of the variance in overall perceived dental service quality for adult patients than did SERVQUAL, it was anticipated that a similar result will be obtained for adult patients of the selected dental specialists. Thus, the third hypothesis was:

H₃: SERVPERF scores explain more of the variance in overall perceived service quality than will SERVQUAL scores for all dental specialists.

Data Collection

One hundred questionnaires were hand delivered to the receptionist of each of the dental specialists who have agreed to participate in this research. Written instructions regarding the desired completion method for the questionnaires were given to each of the receptionists (see Appendix I: Instructions to Receptionist), and these instructions were reviewed in detail.

Patients were asked to complete the expectations section of the questionnaire (page 1) *before* receiving dental treatment, and the importance, perceptions and demographic sections *after* receiving dental treatment. It was anticipated that this procedure lessened confounding of the expectations and perceptions responses thought to exist when both of these sections are completed at the same sitting (Fisk et al. 1990; Hubbert, Sehorn and Brown 1995; Oliver 1981). The importance weighing method of McAlexander, Kaldenberg and Koenig (1994) was selected over the various other possible weighing methods (Parasuraman, Zeithaml and Berry 1988, 1991), again so the results obtained in this study would be as comparable as possible with those previously obtained for general dentists.

Chapter IV: Results of the Study

Survey Pretesting and Refinement

McAlexander, Kaldenberg and Koenig (1994) adapted the SERVQUAL scale originally developed by Parasuraman, Zeithaml and Berry (1985, 1988) to the measurement of dental service quality for the services of general dentists. This adaptation of the SERVQUAL scale served as the initial basis for the development of a survey for the measurement of perceived service quality for dental specialists.

The McAlexander, Kaldenberg and Koenig (1994) scale (see Appendix I, Survey 1) was revised to the services of dental specialists by simply substituting the name of the appropriate dental specialty where “general dentist” had been used. This adapted scale (see Appendix I, Survey 2: First Adaptation of Survey) was pre-tested using the patients of a periodontist in Norfolk, Virginia, who had agreed to allow his patients to be surveyed. These surveys were distributed to periodontal patients from April 23, 1997 to May 27, 1997. Each two-page survey was accompanied by a cover letter (see Appendix I, Patient Cover Letter) explaining the purpose of the study - academic research - and stressing that individual patient responses could not be identified. Each patient was asked to complete the Expectations and Importance sections - the front and back of the first page of the survey - before that day’s treatment, and the Perceptions and Demographics sections - the front and back of the last page - after that day’s treatment. Each patient was instructed to return the completed surveys to the receptionist in a sealed envelope. Envelopes containing completed surveys were collected weekly.

Six surveys were not distributed; i.e., 19 usable surveys were collected. Usable surveys were defined as those in which the dependent variable item had been completed, and no more than 5 of the 45 independent variable items had been omitted. Since 19 of 19 returned surveys met this condition, the completion rate for this version of the survey was 100%.

Several areas of concern were apparent with this first revision of the survey. First, only 19 surveys were distributed in slightly over a month, and all surveys were completed in full and returned. This result implies that, instead of randomly requesting patient participation, the receptionist was selecting patients according to some criteria known only to her. This procedure almost certainly resulted in a biased sample, with the extent of the bias unknown. However, the purposes of obtaining completed surveys at this stage were: (1) to examine the responses to ascertain if the items were understandable to dental specialists' patients and (2) to examine the range of responses to determine if sufficient variance existed to permit further analysis. Second, the Office Manager misunderstood the research design, and distributed the surveys at three different offices. Thus, responses to the statement regarding "physical facilities" were confounded by the multiple sites being considered by patients. Third, the response categories for demographic question 2 (treatment time), demographic question 4 (amount spent on dental services in the last 24 months) and demographic question 5 (annual household income) were not all-inclusive. These problems with the wording of the survey itself were not, however, the most important problems regarding this version of the survey. More significant was the fact that little or no variance was found in the patients' responses to a number of the independent variable items, and no

variance at all was detected in the dependent variable item. Descriptive statistics associated with independent and dependent variable items from this first revision of McAlexander, Kaldenberg and Koenig's (1994) survey are shown in Table 5:

Table 5: Descriptive Variable Data Associated with First Pretest of Survey (1 = strongly disagree; 7 = strongly agree)

Variable	Mean	Standard Deviation	Valid N
Expectation regarding:			
Facilities be attractive (E1)	6.68	.75	19
Doctor be dependable (E2)	7.00	.00	19
Employees willing to help (E3)	6.95	.22	19
Transactions should be safe (E4)	7.00	.00	19
Individual attention given patient (E5)	7.00	.00	19
Appointments should be convenient (E6)	6.42	.77	19
Doctor should be competent (E7)	6.95	.22	19
Doctor communicates well (E8)	6.95	.22	19
Treatments as painless as possible (E9)	6.95	.22	19
Patients treated with respect (E10)	6.95	.22	19
Charges not too high (E11)	6.74	.57	19
Doctor trustable (E12)	6.95	.22	19
Services of highest quality (E13)	7.00	.00	19
Staff acts professionally (E14)	7.00	.00	19
Protection from infectious disease (E15)	7.00	.00	19
Importance of:			
Attractiveness of facilities (I1)	6.26	.93	19
Dependability of doctor (I2)	7.00	.00	19
Willingness of employees to help (I3)	6.89	.32	19
Safety of transactions (I4)	6.89	.32	19
Individual attention given patient (I5)	6.84	.37	19
Convenient appointment times (I6)	6.68	.58	19
Competence of doctor (I7)	6.95	.22	19
Doctor communicates well (I8)	6.95	.22	19
Treatments as painless as possible (I9)	6.89	.32	19
Patients treated with respect (I10)	7.00	.00	19
Charges not too high (I11)	6.37	.89	19
Doctor trustable (I12)	7.00	.00	19
Services of highest quality (I13)	7.00	.00	19
Staff acts professionally (I14)	6.89	.32	19
Protection from infectious disease (I15)	7.00	.00	19

Table 5 (continued)

Variable	Mean	Standard Deviation	Valid N
Perceptions regarding:			
Attractiveness of facilities (P1)	6.84	.50	19
Dependability of doctor (P2)*	1.68	1.89	19
Willingness of employees to help (P3)	7.00	.00	19
Safety of transactions (P4)	7.00	.00	19
Individual attention given patient (P5)	7.00	.00	19
Convenient appointment times (P6)	6.68	.67	19
Competence of doctor (P7)	7.00	.00	19
Doctor communicates well (P8)	7.00	.00	19
Treatments as painless as possible (P9)	6.95	.22	19
Patients treated with respect (P10)	7.00	.00	19
Charges not too high (P11)*	3.94	2.75	18
Doctor trustable (P12)	7.00	.00	19
Services of highest quality (P13)	7.00	.00	19
Staff acts professionally (P14)	7.00	.00	19
Protection from infectious disease (P15)	7.00	.00	19
Overall measure of service quality	7.00	.00	18

* denotes negatively-worded

Two of the perception items (P2 and P11) had been negatively worded by McAlexander, Kaldenberg and Koenig (1994). Variance in responses to these two items were found to be much larger than for other items. The patients surveyed in the first pretest were predominantly insured females who had been treated by the specialist for less than 6 months. A majority were married. Racial distribution of respondents was approximately two-thirds Caucasian and one-third African American. A wide range of annual family incomes was reported.

One possible reason for the low variance in response to many of the items in this survey was the fact that patients of only one specialist had been surveyed. Additionally, the total lack of variance in the responses to the dependent variable item was attributed to be due to the limited range of possible responses, which were a 1-to-7 range, the same range as used

for the independent variable items. Thus, the dependent variable response range was modified from the original 1-to-7 range of possible responses to a 0-to-100 possible response range. Further, this new response range was end-anchored by “0 represents the worst possible [specialty name]” and “100 the perfect [specialty name]”. The demographic response categories were also recorded to make them all-inclusive. An example of the resultant survey is shown in Appendix 1, as Survey 3: Final Version of Survey).

Three entirely new dental specialists were approached who agreed to participate in pretesting of the re-revised survey. This re-revised survey was distributed to Office Managers of a periodontist in Virginia Beach, VA and two prosthodontists, one in Virginia Beach, VA and another in Hampton, VA. Twenty-five surveys were delivered to each specialist’s office on May 12, 1997 - a total of 75 surveys. Instructions to patients and Office Managers were identical to those described above. Forty surveys were distributed to patients between May 15, 1997 and July 10, 1997, and 31 completed surveys were returned (response rate = 77.5%). Of the 31 returned surveys, 6 were rejected because either the dependent variable item was not completed, or more than 5 of the 45 dependent variable items were not answered. Descriptive statistics for the independent variable and dependent variable items for this version of the survey are found in Table 6:

Table 6: Descriptive Variable Data Associated with Second Pretest of Survey

Variable	Mean	Standard Deviation	Valid N
Expectation regarding:			
Facilities be attractive (E1)	5.76	1.30	25
Doctor be dependable (E2)	6.84	.37	25
Employees willing to help (E3)	6.68	.56	25
Transactions should be safe (E4)	6.92	.28	25
Individual attention given patient (E5)	6.80	.50	25
Appointments should be convenient (E6)	6.00	1.04	25
Doctor should be competent (E7)	6.96	.20	25
Doctor communicates well (E8)	6.76	.66	25
Treatments as painless as possible (E9)	6.68	.62	25
Patients treated with respect (E10)	6.88	.33	25
Charges not too high (E11)	6.44	.96	25
Doctor trustable (E12)	6.92	.28	25
Services of highest quality (E13)	6.96	.20	25
Staff acts professionally (E14)	6.80	.41	25
Protection from infectious disease (E15)	6.96	.20	25
Importance of:			
Attractiveness of facilities (I1)	5.60	1.53	25
Dependability of doctor (I2)	6.84	.47	25
Willingness of employees to help (I3)	6.44	.92	25
Safety of transactions (I4)	6.71	.69	24
Individual attention given patient (I5)	6.72	.54	25
Convenient appointment times (I6)	5.96	1.14	25
Competence of doctor (I7)	7.00	.00	25
Doctor communicates well (I8)	6.72	.73	25
Treatments as painless as possible (I9)	6.48	.77	25
Patients treated with respect (I10)	6.80	.41	25
Charges not too high (I11)	6.08	1.26	25
Doctor trustable (I12)	7.00	.00	25
Services of highest quality (I13)	6.80	.65	25
Staff acts professionally (I14)	6.52	.77	25
Protection from infectious disease (I15)	6.96	.20	25
Perception of:			
Attractiveness of facilities (P1)	6.52	1.00	25
Dependability of doctor (P2)	1.54	1.69	24
Willingness of employees to help (P3)	6.76	.52	25
Safety of transactions (P4)	6.88	.45	24
Individual attention given patient (P5)	6.92	.28	25
Convenient appointment times (P6)	6.76	.83	25
Competence of doctor (P7)	6.92	.28	25
Doctor communicates well (P8)	6.92	.28	25
Treatments as painless as possible (P9)	6.84	.37	25
Patients treated with respect (P10)	6.96	.20	25
Charges not too high (P11)*	4.04	2.32	25
Doctor trustable (P12)	6.96	.20	25

Table 6 (continued)

Variable	Mean	Standard Deviation	Valid N
Services of highest quality (P13)	6.88	.33	24
Staff acts professionally (P14)	6.76	.52	25
Protection from infectious disease (P15)	6.92	.40	25
Overall measure of service quality *denotes negatively worded	96.08	6.26	25

Variance was obtained for all independent variable items except I7 and I12. More importantly, variance was obtained for the dependent variable item. Again, variance in responses to the two negatively-worded perceptual items (P2 and P11) was greater than for any other items.

Responses to demographic questions were similar to those obtained in the first revision to the survey: patients were predominantly female, married, and Caucasian, and the visit in which the survey was completed was not the first appointment with that dental specialist (although a majority of patients had been treated by the specialist for less than 2 years). Fewer than 25% of the patients completing the first revision of the survey had dental insurance, compared to more than 75% reporting dental insurance in the second pretest of the survey; only 22.2% of the patients completing the first revision of the survey reported dental treatment in the last 24 months had cost \$750 or more, while 91.6% of the patients in the second revision of the survey reported that dental treatment in the last 24 months had exceeded \$750. These differences in responses to the two surveys were attributed to the inclusion of patients of two prosthodontists in the pretesting of the second survey. Prosthodontists often treat patients requiring extensive reconstructive dentistry. Costs for

such extensive treatment would be expected to be high, and patients having dental insurance would be expected to undergo such treatment more easily than patients having no dental insurance.

Cronbach's (1951) Coefficient Alpha is a measure of internal scale reliability, and as such is widely used as a measure of reliability (DeVillis 1991). Coefficient Alpha for the various scales associated with the pretesting of the second version of the survey was computed, and are reported in Table 7:

Table 7: Coefficient Alpha of Second Pretest of Survey:

Scale	Alpha N = 23	Alpha reported by McAlexander, Kaldenberg and Koenig (1994) N = 346
weighted SERVQUAL	0.8027	0.82
unweighted SERVQUAL	*	0.82
weighted SERVPERF	*	0.91
unweighted SERVPERF	*	0.86
* not calculated (too few cases)		

The value obtained for coefficient alpha for the weighted SERVQUAL scale version of this survey compares favorably with that obtained by McAlexander, Kaldenberg and Koenig (1994), especially considering the difference in sample sizes used. Although this version of the survey differs slightly in wording from the survey employed by McAlexander, Kaldenberg and Koenig (1994), the fact that the reliability estimate - Cronbach's Coefficient Alpha - was computed to be essentially that obtained by McAlexander, Kaldenberg and Koenig (1994) demonstrates the generalizability of the scale's reliability across a wider range

of subjects (Spector 1992).

Cronbach's Alpha was also calculated for the SERVQUAL scale if individual items had been deleted from the survey. The SERVQUAL version of this survey would have been improved only if items P2 and P11 had been deleted. This change would have required the deletion of the associated expectation items (E2 and E11) and importance statements (I2 and I11). Deletion of item E2 would have improved coefficient alpha slightly; however, deletion of the other three items would each have decreased coefficient alpha. Therefore, no items were deleted from the survey.

One final revision of the survey was completed. The two negatively-worded perceptual questions were reworded into positive formats. The relatively high variance associated with responses to these two items on both versions of the survey was deemed convincing evidence that these two items' negative wording was confusing respondents. Also, in response to several requests which had been written in the margins of the previous survey, one additional category, widow(er) was added to marital status. The question regarding the amount spent on dental treatment in the last 24 months was changed to 12 months - it was thought that the amount spent in this more recent time period would be easier for patients to estimate more accurately. Finally, the wording of the end-anchors of the dependent variable question was revised one final time, by adding a middle anchor of "50 represents an average [name of type specialty]", and adding the parenthetical expression "(presumably, no [name of type of specialty] is perfect)" to the "100 represents the perfect [name of type of specialty]". This change in the wording of the end anchors of the dependent variable was accomplished in an attempt to further increase the variance associated with this

variable.

Data Collection

The original research plan was to have the patients of three periodontists, three prosthodontists and three endodontists participate in the survey. This particular “mix” of specialists proved impossible to obtain. There are fifteen periodontists practicing in the local area. The first three of these fifteen individuals who were contacted and asked to participate agreed to do so immediately and without hesitation. In addition, the Office Manager of the periodontist who had participated in the first pretest of the survey asked if their office could be included in the final survey. This was agreed to, and thus patients of 4 periodontists instead of 3 were surveyed. Two of the periodontists who agreed to participate in the final survey are in solo practice, and the other two are in group practice. Of the two periodontists in group practice, one was in a two-person group and the other in a three-person group. Thus, the four participating periodontists represented a range of practice “styles.” Three of the participating periodontists practice in Virginia Beach, VA, and the other periodontist practices in Portsmouth, VA.

There are four prosthodontists in the local area, one of whom had participated in the development of the survey. The remaining three prosthodontists were contacted regarding participation in the research; all three immediately agreed to participate. All of these individuals are in solo practice (i.e., there are no prosthodontists in local area in group practice). The participating prosthodontists, although not representing as divergent a range of practice “styles” as did the periodontists, do represent the only practice “style” available.

Two of the participating prosthodontists practice in Virginia Beach, VA, and the other prosthodontist practices in Chesapeake, VA.

There are six endodontists in the local area. The first endodontist who was contacted regarding participation in this research agreed immediately to participate. Unfortunately, none of the other five endodontists in the local area would consent to participate in this research. There are three endodontists in the Hampton/Newport News area, and one endodontist in the Williamsburg area. All four of these individuals were contacted and each declined to participate in this research. There are eleven endodontists in the Richmond area. All were contacted regarding participation in this research project. After multiple attempts to contact the Richmond endodontists, only one agreed to participate in this research. The distinct lack of enthusiasm regarding service quality evaluation research among the vast majority of endodontists contacted made it likely that endodontists as a specialty were in some way different from periodontists and prosthodontists, all of whom expressed enthusiasm for participating in this research. Therefore, the patients of only two endodontists were surveyed, and it was initially hypothesized that they would constitute an “outlier” group (i.e., that the results obtained from surveying patients of endodontists might be different from the results obtained from surveying the patients of periodontists and prosthodontists). Both of the participating endodontists were in solo practice, one in Virginia Beach, VA and the other in Richmond, VA.

Each dental specialist who agreed to participate in this research was promised an analysis of his particular survey results, explaining how his patients evaluated his service and how his practice’s service quality compared with the mean for other dental specialists in his

particular specialty. Each participating specialist was assured that every effort would be expended to maintain confidentiality of the results, and that only comparisons with overall specialty mean values would be released to other survey participants.

On August 25 and 26, 1997, 125 surveys were delivered to the office of each of the nine dental specialists who agreed to participate in this research (surveys were mailed to the Richmond endodontist's office August 18, 1997). Every participating dental specialist office received identical surveys, except that each group of surveys explicitly contained the name of the particular specialist whose office was distributing the survey. Each specialist's Office Manager was contacted personally (in the case of the Richmond endodontist, contact was by telephone). At this time, the methodology of the survey was explained and any questions the Office Manager had about the survey or the research itself were answered. It was stressed to each Office Manager that the purpose of this research was not to compare overall service quality rankings, but to examine how those rankings were determined. The necessity of obtaining as random a selection of patients as possible was discussed. Each office was informed that the first office to reach the goal of 100 completed surveys would receive a gift certificate for \$50 at the restaurant of their choice. Furthermore, all offices reaching the 100 completely filled-out goal would be entered into a drawing for an additional \$50 gift certificate, again at the restaurant of their choice.

Completed surveys were collected on a weekly basis from each specialists' office (completed surveys from the Richmond endodontist were returned postpaid by mail). Each office was supplied with stamped, self-addressed envelopes for patients to use should they not feel comfortable in returning the completed surveys to the Receptionist. Mailed surveys

were sent directly to the researcher. Data were collected from August 25 until November 3, with all participating offices notified on October 24, 1997 that data collection would cease on November 11, 1997. Mailed surveys were accepted until November 11, 1997, in order to ensure that patients who chose this method of response would have their responses included. Only three surveys were received by mail after the November 11, 1997 "cut off" date; these surveys were not included in the analysis. Table 8 shows the rate at which surveys were received (both those collected by hand and those received in the mail):

Table 8: Survey Returns, by Date

	September	October	November	Total
Doctor	1 9 26	3 13 22 26	3 11	
Periodontist #1	9 15 18	37 13 9 7	2 10	120
Periodontist #2	1 3 1*	0 0 12 0	5 3	25
Periodontist #3	12 13 20	29 25 11 0	1 6	125
Periodontist #4	<u>1 2 6*</u>	<u>0 4 2 0</u>	<u>0 0</u>	<u>15</u>
total all periodontists:	23 33 45	63 42 34 7	8 19	285
Prosthodontist #1	2 3 8*	0 2 6 0	0 0	21
Prosthodontist #2**	0 0 1	0 2 17 0	0 0	17
Prosthodontist #3	<u>2 3 7*</u>	<u>5 2 0 6</u>	<u>0 2</u>	<u>22</u>
total all prosthodontists:	4 6 16	5 6 23 6	0 2	60
Endodontist #1	6 6 11	3 0 4 1	1 0	32
Endodontist #2	<u>1 1 0*</u>	<u>0 2 1 1</u>	<u>1 0</u>	<u>7</u>
total all endodontists:	7 7 11	3 2 5 2	2 0	39
total all specialists:	34 46 72	71 50 62 15	10 21	384

* low number of returned surveys was personally discussed with the doctor at this point in time and it was requested that he discuss this with his Receptionist/Office Manager

** Prosthodontist #2's office was closed during September and November for vacation

A total of 384 surveys was received. Of these, 319 (83.1%) were completed

sufficiently for purposes of analysis. Reasons for rejection of surveys by the researcher were: (1) failure to answer the dependent variable - overall service quality assessment; (2) more than 5 of the 45 independent variable items missing; and (3) no correspondence between the individual independent variable items and the dependent variable. The third of these reasons requires additional explanation. Occasionally a respondent would answer the perceptual independent variable items with a score of 1 or 2 - a very negative assessment - but answer the dependent variable item with a score of 99 or 100 - a very high assessment. In these cases, it seemed obvious that the respondent had inadvertently “reversed” the scale in answering the dependent variable items: i.e., it did not seem possible to assess a doctor as being “poor” on virtually every individual attribute, while assessing the same doctor as “excellent” overall. Thus, cases where this pattern appeared were eliminated from the analysis. A breakdown of surveys rejected and the reason for the rejection appears in Table 9.

Table 9: Rejected Surveys and Reasons for Rejection, by Specialty

<u>Reason for Rejection</u>	<u>Specialty</u>			total
	perio	prosth	endo	
no dependent variable	38	3	3	44
more than 5 IV items missing	8	2	4	14
no correspondence between IV's and dependent variable	6	1	0	6
Totals	52	6	7	65

Overall, the survey response rate was considerably lower than expected, especially considering the enthusiasm with which the various specialists had agreed to participate in the

research. Periodontist #3's office was the first to achieve the 100 acceptably-completed surveys level; his office received a \$50 gift certificate. Because the number of survey responses was lower than expected - only 2 of the 9 participating offices achieved the goal of 100 acceptably-completed surveys - the idea of a drawing for the second \$50 gift certificate from among those offices reaching 100 acceptably-completed surveys was abandoned. Instead, \$50 gift certificates were sent to the offices of Periodontists #1 and #3, whose offices were the only two to reach the desired level of survey response. Each participating specialist was informed of his individual results by letter. Copies of all letters to participating dentists are attached as Appendix III: Letters to Participating Specialists.

Cronbach's (1951) Coefficient Alpha for the various scales associated with this final version of the survey were computed, and are reported in Table 10:

Table 10: Coefficient Alpha of Final Version of Survey:

Scale	Alpha	Alpha reported by McAlexander, Kaldenberg and Koenig (1994)
	N = 319	N = 346
weighted SERVQUAL	0.9167	0.82
unweighted SERVQUAL	0.8966	0.82
weighted SERVPERF	0.9159	0.91
unweighted SERVPERF	0.9154	0.86

For all service quality scales - SERVQUAL, SERVQUAL without importance weights, SERVPERF and SERVPERF without important weights - the Coefficient Alpha calculated for this sample was greater than that reported by McAlexander, Kaldenberg and Koenig (1994), even though the sample size obtained was slightly smaller.

Demographic analysis of the final sample revealed that, in most cases, it was quite similar to that of the two pretest samples. The respondents were again predominantly female, white, and married. Minorities were more represented, presumably because of the wider geographic dispersion of the participating specialists and the larger sample size. There were relatively fewer new patients than in either of the pretest. Generally speaking, the demographics of the final sample were similar to those reported in McAlexander, Kaldenberg and Koenig's (1994) study. A comparison of the demographic variables reported by McAlexander, Kaldenberg and Koenig (1994) and corresponding demographic variables associated with the sample used in this research are shown in Table 11:

Table 11: Demographic Variable Comparison

	McAlexander, Kaldenberg and Koenig (1994) sample	this sample
Seen doctor in last 6 months	82%	36%
Seen doctor in last year	93%	44%
Male	37%	31%
Female	63%	69%
Income greater than \$50,000	37%	82%
Have dental insurance	69%	57%

This sample's annual income was higher than that reported by McAlexander, Kaldenberg and Koenig (1994), as was the amount spent of recent dental treatment. McAlexander, Kaldenberg and Koenig (1994) reported a median amount spent on dental treatment in the previous 24 months was \$700; in this sample, 52% reported spending \$500 to \$1000 in the previous 12 months. These differences were attributed to the fact that treatment by specialists is generally more expensive than treatment performed by generalists (Kongstvedt

1997), both because the patients treated by specialists generally require more complex treatment (or it would be performed by general dentists) and because specialists tend to charge more for any given procedure (due to the specialists' additional training and expertise). Higher treatment costs would be expected to be associated with higher ability to pay (i.e., higher income levels).

An initial descriptive analysis of the data was conducted. Frequencies, means, and standard deviations were calculated for the dependent and all independent variables. Frequencies are reported in Tables 12 and 13, and means and standard deviations are reported in Table 14.

Table 12: Frequencies of Independent Variable Items

Variable	Frequency						
	1	2	3	4	5	6	7
Expectation regarding:							
Facilities be attractive (E1)	2	0	3	41	55	67	151
Doctor be dependable (E2)	1	0	0	2	1	31	284
Employees willing to help (E3)	1	0	0	2	7	44	265
Transactions should be safe (E4)	1	0	0	2	6	32	278
Individual attention given patient (E5)	1	0	0	4	10	49	250
Appointments should be convenient (E6)	4	0	0	13	0	80	162
Doctor should be competent (E7)	1	0	0	1	2	18	297
Doctor communicates well (E8)	1	0	0	2	9	41	265
Treatments as painless as possible (E9)	1	0	0	3	20	45	250
Patients treated with respect (E10)	1	0	0	1	4	39	274
Charges not too high (E11)	2	1	2	13	33	53	213
Doctor trustable (E12)	1	0	0	1	0	23	291
Services of highest quality (E13)	1	0	0	1	4	22	291
Staff acts professionally (E14)	1	0	0	4	7	44	263
Protection from infectious disease (E15)	1	0	0	1	0	13	304

Table 12 (continued)

Variable	Frequency						
Importance of:							
Attractiveness of facilities (I1)	11	3	12	34	77	61	120
Dependability of doctor (I2)	0	0	0	1	4	38	275
Willingness of employees to help (I3)	0	0	2	3	20	19	230
Safety of transactions (I4)	0	0	0	1	12	41	263
Individual attention given patient (I5)	0	0	0	3	23	45	247
Convenient appointment times (I6)	0	1	1	14	48	85	170
Competence of doctor (I7)	0	0	0	2	4	21	292
Doctor communicates well (I8)	0	0	0	3	5	54	256
Treatments as painless as possible (I9)	0	0	1	3	5	58	232
Patients treated with respect (I10)	0	0	0	1	7	35	276
Charges not too high (I11)	2	3	2	13	35	62	202
Doctor trustable (I12)	0	0	0	1	3	21	293
Services of highest quality (I13)	0	0	0	1	3	25	290
Staff acts professionally (I14)	0	0	0	5	14	54	246
Protection from infectious disease (I15)	0	0	0	1	1	14	302
Perception of:							
Attractiveness of facilities (P1)	0	0	2	22	44	67	184
Dependability of doctor (P2)	0	0	1	1	5	39	272
Willingness of employees to help (P3)	0	0	1	1	9	40	268
Safety of transactions (P4)	0	0	2	0	7	32	278
Individual attention given patient (P5)	0	0	0	1	7	39	272
Convenient appointment times (P6)	0	0	0	8	17	51	243
Competence of doctor (P7)	0	0	0	1	4	28	286
Doctor communicates well (P8)	0	0	0	1	8	32	278
Treatments as painless as possible (P9)	0	0	0	1	8	46	264
Patients treated with respect (P10)	0	1	0	3	1	37	275
Charges not too high (P11)	2	4	4	19	35	23	179
Doctor trustable (P12)	0	0	1	2	2	33	281
Services of highest quality (P13)	0	0	0	3	0	34	281
Staff acts professionally (P14)	0	0	0	4	8	39	271
Protection from infectious disease (P15)	0	0	0	1	4	25	288

Table 13: Frequencies of Dependent Variable Item (Overall Service Quality Measurement)

Value	Frequency	Value	Frequency
50	1	89	2
55	1	90	45
60	2	91	1
65	1	92	2
70	2	93	1
75	8	95	45
78	1	96	6
80	10	97	7
85	8	98	20
86	1	99	30
87	1	100	114
88	1		

Table 14: Means and Standard Deviations of Data

Variable	Mean	S.D.
Expectation regarding:		
Facilities be attractive (E1)	5.984	1.186
Doctor be dependable (E2)	6.859	0.510
Employees willing to help (E3)	6.781	0.590
Transactions should be safe (E4)	6.824	0.561
Individual attention given patient (E5)	6.723	0.656
Appointments should be convenient (E6)	6.163	1.095
Doctor should be competent (E7)	6.903	0.462
Doctor communicates well (E8)	6.777	0.602
Treatments as painless as possible (E9)	6.687	0.702
Patients treated with respect (E10)	6.824	0.532
Charges not too high (E11)	6.423	1.012
Doctor trustable (E12)	6.887	0.476
Services of highest quality (E13)	6.878	0.496
Staff acts professionally (E14)	6.762	0.629
Protection from infectious disease (E15)	6.931	0.421

Table 14 (continued)

Variable	Mean	S.D.
Importance of:		
Attractiveness of facilities (I1)	5.598	1.497
Dependability of doctor (I2)	6.846	0.418
Willingness of employees to help (I3)	6.626	0.701
Safety of transactions (I4)	6.786	0.512
Individual attention given patient (I5)	6.686	0.646
Convenient appointment times (I6)	6.273	0.930
Competence of doctor (I7)	6.890	0.401
Doctor communicates well (I8)	6.770	0.515
Treatments as painless as possible (I9)	6.629	0.692
Patients treated with respect (I10)	6.837	0.447
Charges not too high (I11)	6.354	1.071
Doctor trustable (I12)	6.906	0.351
Services of highest quality (I13)	6.893	0.365
Staff acts professionally (I14)	6.696	0.628
Protection from infectious disease (I15)	6.940	0.285
Perception of:		
Attractiveness of facilities (P1)	6.282	0.985
Dependability of doctor (P2)	6.823	0.483
Willingness of employees to help (P3)	6.796	0.525
Safety of transactions (P4)	6.831	0.510
Individual attention given patient (P5)	6.824	0.456
Convenient appointment times (P6)	6.658	0.695
Competence of doctor (P7)	6.878	0.389
Doctor communicates well (P8)	6.840	0.452
Treatments as painless as possible (P9)	6.796	0.482
Patients treated with respect (P10)	6.833	0.514
Charges not too high (P11)	6.214	1.158
Doctor trustable (P12)	6.853	0.463
Services of highest quality (P13)	6.865	0.417
Staff acts professionally (P14)	6.818	0.467
Protection from infectious disease (P15)	6.887	0.380
Overall Measure of Service Quality	94.690	7.918

In examining these frequencies and means, the similarity of responses for the vast majority of variables is striking. Looking at the expectation frequencies, the lack of dispersion of responses would have been even more noticeable, had one individual not responded at the level of all 1's. With the exception of items 1 (attractiveness of facilities),

6 (convenient appointment times) and 11 (charges not too high), the distribution of responses for expectations, importance weights, and perceptions are decidedly skewed toward higher scores. This situation is also evident in examining the mean scores and their standard deviations for expectation, importance weight and perception scores: with the exception of items 1, 6 and 11, the mean scores are all above 6.6 on a scale of 1-to-7, with standard deviations all less than 0.7, many less than 0.5. Only the expectation, importance weights and perception scores for items 1, 6 and 11 deviate from this trend: their means are between 5.6 and 6.4, with standard deviation between 0.9 and 1.5. Similarly, examination of the frequencies for the dependent variable scores is skewed toward high scores. The -2.43 skewness is obviously due to the high mean (94.69) and median (98.00) of the scores of the overall measure of service quality on a scale of 0-to-100.

Testing of Research Hypotheses

The first research hypothesis was:

H₁: the five dimensional factor structure of SERVQUAL will not be obtained for this data

To test this research hypothesis, the correlation matrix for the data was first inspected, to determine if sufficient intercorrelations existed among the independent variable items and the dependent variable item to permit a reasonable exploratory factor analysis of this data. The correlation matrix for this data set - which excludes cases deemed unsuitable for analysis - is shown in Appendix IV: Correlation Matrix of Scale Items.

Visual inspection of this correlation matrix was performed to determine if sufficient

item intercorrelation existed for meaningful factor analysis (Hair et al. 1995; Sharma 1996). Virtually all of the intercorrelations (92.7%) were significant at $\alpha = 0.05$. The Bartlett (1954) test for sphericity, a statistical test for intercorrelations among the variables (Hair et al. 1995), also demonstrated the existence of statistically significant correlations among the variables (at $p = 0.000$). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser 1970), which indicates the extent to which the measures of a construct belong together (i.e., a measure of homogeneity of variables), was 0.9076. Although there are no available statistical tests for the KMO measure, Kaiser and Rice (1974) describe results equal to or greater than 0.90 as marvelous. Thus, it appears that sufficient intercorrelations exist among the various items to permit meaningful factor analysis of this data.

Factor analyses of the summated importance-weighted SERVQUAL scores for the data set were performed. The principal components technique was selected because it extracts the maximum variance from the data - all the variance in the observed variables is analyzed; the Varimax rotation technique was selected because it maximizes the variance of the loadings on each factor, thus minimizing the complexity of the factors (Tabachnick and Fidell 1989). Principle components analysis with Varimax orthogonal rotation revealed two distinct factors. The results of this factor analysis are shown in Table 15:

Table 15: Factor Analysis of Summated SERVQUAL Scores

Communality	Factor	Eigenvalue	Pct of Var	Cum Pct
1.00000	1	8.47471	56.5	56.5
1.00000	2	1.03372	6.9	63.4
1.00000	3	.78876	5.3	68.6
1.00000	4	.78150	5.2	73.9
1.00000	5	.60946	4.1	77.9
1.00000	6	.52302	3.5	81.4
1.00000	7	.50843	3.4	84.8
1.00000	8	.43667	2.9	87.7
1.00000	9	.40135	2.7	90.4
1.00000	10	.33514	2.2	92.6
1.00000	11	.31985	2.1	94.8
1.00000	12	.26141	1.7	96.5
1.00000	13	.19461	1.3	97.8
1.00000	14	.17974	1.2	99.0
1.00000	15	.15160	1.0	100.0

In addition, an oblique rotation - oblimin - was also examined. Results of the oblique rotation analysis showed that the two factors obtained were only 29.4% correlated, confirming the appropriateness of the orthogonal solution. Based on these findings, Hypothesis 1 was strongly supported.

Hypothesis 2 was:

H₂: there will be no differences in mean scores obtained for the different dental specialities on SERVQUAL or SERVPERF

The appropriate analytical tool with which to test this hypothesis is analysis of variance (ANOVA). Assumptions involved in the use of ANOVA are (Neter, Wasserman and Kutman 1990):

- (1) normality of data;
- (2) homoscedasticity of data; and
- (3) independence of measures

These assumptions were tested using summated scores on the various scales - weighted and unweighted SERVQUAL and weighted and unweighted SERVPERF - as the dependent variable. To test the assumption of normality, the Kolmogorov-Smirnov test was performed. Table 16 shows the results of this test for normality.

Table 16: Results of Kolmogorov-Smirnov Test for Normality

Scale	statistic	p-value
weighted SERVQUAL	0.1842	0.000
unweighted SERVQUAL	0.1840	0.000
weighted SERVPERF	0.1917	0.000
unweighted SERVPERF	0.2653	0.000

The null hypothesis of the Kolmogorov-Smirnov test for normality is that the data is normally distributed. This null hypothesis must, for all scales, be rejected. While ANOVA is valid for modest violations of assumptions (Bowerman and O'Connell 1990), this violation of the normality assumption does not appear to be modest. However, the F test of one-way ANOVA is robust to violation of the normality assumption, provided that more than 20 degrees of freedom exist for error and that no outliers exist (Tabachnick and Fidell 1989). As both of these conditions hold, the violation of the normality assumption was not deemed to be a problem for analysis of the data using ANOVA.

The second assumption of ANOVA is that the data is homoscedastic. A test for homogeneity of variance which is not particularly dependent on the assumption of normality is the Levene test. This test was therefore performed on the data set, and yielded a Levene statistic of 0.4408, with a p-value of 0.6439. This p-value allowed the acceptance of the null hypothesis that the variances were equal.

The third assumption of ANOVA is that measures used are independent. In order to

avoid the introduction of dependence among the observations, proper gathering of the data is vital. The experimental design of this research went to great lengths to ensure that the expectations and importance scores were obtained from each respondent independently from the perception scores, in an effort to minimize any dependence of one set of scores on another, while at the same time gathering the entirety of the data from each respondent at one point in time.

Results of the comparison of the three dental specialties using one-way ANOVA are summarized in Table 17:

Table 17: ANOVA Comparisons of the Three Dental Specialties

Model	F value	p value
SERVQUAL	1.608	0.202
SERVQUAL without importance weights	2.369	0.095
SERVPERF	3.982	0.020
SERVPERF without importance weights	5.602	0.004

The null hypothesis for ANOVA is that there is no statistically significant difference in mean scores among or between the groups. Based on the above p-values, this null hypothesis must be rejected for either version of the SERVQUAL scale, but not for either version of the SERVPERF scale.

Evidence is thus mixed as to whether or not significant differences existed among the different specialties: SERVQUAL results (with or without importance weights) showed that statistically significant differences existed among the dental specialties, while SERVPERF results (with or without importance weights) demonstrate no statistically significant differences among the dental specialties. Removal of the importance weights from either the

SERVQUAL or SERVPERF models serves only to improve the statistical significance of this conclusion. Therefore, H_2 is not supported for SERVQUAL, but is supported for SERVPERF.

The third research hypothesis was:

H_3 : SERVPERF scores explain more of the variance in overall perceived service quality than will SERVQUAL scores for all dental specialists

Correlations were calculated between patients' measure of overall perceived service quality and their summed scores on SERVQUAL, SERVQUAL without importance weights, SERVPERF, and SERVPERF without importance weights. The correlation matrix obtained is shown as Table 18:

Table 18: Correlation Coefficients

	OVERALL	Weighted SERVQUAL	Unweighted SERQUAL	Weighted SERVPERF	Unweighted SERVPERF
OVERALL	1.0000 P= .	.3660 P= .000	.3523 P= .000	.4637 P= .000	.5897 P= .000
weighted SERVQUAL	.3660 P= .000	1.0000 P= .	.9876 P= .000	.2286 P= .000	.4687 P= .000
unweighted SERVQUAL	.3523 P= .000	.9876 P= .000	1.0000 P= .	.1851 P= .001	.4708 P= .000
weighted SERVPERF	.4637 P= .000	.2286 P= .000	.1851 P= .001	1.0000 P= .	.8407 P= .000
unweighted SERVPERF	.5897 P= .000	.4687 P= .000	.4708 P= .000	.8407 P= .000	1.0000 P= .

All correlations are highly significant. The correlations between the overall measure of perceived service quality and SERVPERF scores (with or without importance weights) are

higher than those between the overall measure of perceived service quality and SERVQUAL scores (with or without importance weights). The question is: "Are these differences in correlation coefficients significantly different?" A method to determine the answer to this question was suggested by a faculty member of the Old Dominion University Department of Mathematics and Statistics (Morgan, personal communication, 1998). The correlation coefficients were converted into z-scores via the Fisher z-transformation (Kanji 1993):

$$z_r = \frac{1}{2} \ln \frac{(1+r)}{(1-r)}$$

As the z statistic with over 300 degrees of freedom follows an approximately normal distribution, the formula for the calculation of 95% confidence intervals is (Daniel and Terrell 1989):

$$z_r \pm 1.96 \sigma_z$$

where

$$\sigma_z = \frac{1}{\sqrt{n-3}}$$

These calculations are summarized in Table 19:

Table 19: Confidence Intervals for Transformed Correlation Coefficients

Variables	r	z _r	Confidence Interval
OVERALL and weighted SERVQUAL	0.3660	0.3838	0.2735 to 0.4941
un-weighted SERVQUAL	0.3523	0.3681	0.2578 to 0.4784
weighted SERVPERF	0.4637	0.5020	0.3917 to 0.6123
un-weighted SERVPERF	0.5897	0.6687	0.5584 to 0.7790

Any two intervals which do not overlap provide statistical evidence of a significant difference between the two correlations. If any overlap exists, then the difference in

correlations cannot be deemed significant by this method. Based on this criterion, importance weighted SERVQUAL and SERVPERF scores are not significantly different. However, SERVQUAL scores and SERVPERF scores, if not importance-weighted, are significantly different. Unweighted SERVPERF scores are significantly more highly correlated with the overall measure of perceived service quality than are the not importance-weighted SERVQUAL scores. Unfortunately, this confidence interval method does not yield any numerical measure of significance regarding these observed differences. Therefore, a different approach - one which would yield a measure of significance regarding the differences - was suggested by Markowski (personal communication, 1998). What was needed was a measure of the correlation between the overall measure of service quality and the difference between two scale scores. If there is no significant difference between the two scale scores, then there will be no correlation between that difference and the overall measure of perceived service quality. However, each scale score is calculated differently. While all scales are summated measures, the components of each scale differ. The SERVPERF scale always includes the sum of the respondent's perception scores, but these may or may not be multiplied by the importance weights; the SERVPERF scores are always the sum of the difference between the perception scores and the expectation scores, these may or may not be multiplied by the importance weights. Thus, each scale score is of quite different magnitude. To account for this difference in magnitude, one of the scale scores being compared must be "re-scaled", in a manner analogous to normalizing a variable. For example, the confidence interval test above shows that there may be no significant difference between the importance-weighted SERVQUAL score and the importance weighted

SERVPERF score, because the confidence interval for the former is 0.2735 to 0.4941 and the confidence interval for the latter is 0.3917 to 0.6123. Because these confidence intervals overlap, it cannot be concluded that importance-weighted SERVQUAL scores are significantly different from importance-weighted SERVPERF scores, in terms of their correlation with the overall measure of perceived service quality. However, the requirement of non-overlap between the two confidence intervals to demonstrate a statistically significant difference in correlations is not a fully efficient use of the available data. Specifically, if there is little overlap of these intervals, the implication is that the correlations differ unless correlation of the overall measure of perceived service quality with the importance-weighted SERVQUAL scale score was at the high extreme of its confidence interval, while simultaneously the correlation of the overall measure of perceived service quality and importance-weighted SERVPERF was at the lower extreme of its confidence interval. Although this eventuality is unlikely, statistical significance cannot be demonstrated by this method in this case. To better examine this situation, it is necessary to calculate the correlation of the overall measure of perceived service quality and the re-scaled difference between the importance-weighted SERVQUAL and importance-weighted SERVPERF scores. Mathematically, the correlation (and associated p-value) of the correlation between the overall measure of perceived service quality and

$$\frac{\text{weighted SERVPERF} - \frac{\sigma_{\text{importance-weighted SERVPERF}}}{\sigma_{\text{importance-weighted SERVQUAL}}}}{\text{weighted SERVQUAL}}$$

was calculated. The equivalence of testing if this correlation is zero and H_3 is demonstrated in Appendix V.

The hypotheses associated with this statistical test are:

H_0 : the correlations between the overall measure of perceived service quality and importance-weighted SERVPERF are equal to the correlation between importance-weighted SERVQUAL and importance-weighted SERVPERF

H_A : the correlation are not equal

The various scales were re-scaled, and correlations calculated for the overall perceived service quality score and the difference between each of the scales. These results are shown in Table 20:

Table 20: Correlations between Overall Measure and Differences in Scale Scores

Scales	r	p
weighted SERVQUAL & un-weighted SERVQUAL	0.0695	0.229
weighted SERVQUAL & weighted SERVPERF	-0.0822	0.159
weighted SERVQUAL & un-weighted SERVPERF	-0.2310	0.000
un-weighted SERVQUAL & weighted SERVPERF	-0.0888	0.128
un-weighted SERVQUAL & un-weighted SERVPERF	-0.2439	0.000
weighted SERVPERF & un-weighted SERVPERF	-0.2498	0.000

Using the confidence interval method, at the 95% confidence level there were three significant differences demonstrated: (1) between weighted SERVQUAL and un-weighted SERVPERF, (2) between un-weighted SERVQUAL and un-weighted SERVPERF, and (3) between weighted and unweighted SERVPERF. Because all other scale comparisons had overlapping confidence intervals, no statistically valid differences were demonstrated by the confidence interval approach.

The “correlation between the overall measure and the scaled difference between scales” approach proved to be much more informative. All of the statistically significant results obtained via the confidence interval method were confirmed. However, not only did the second method confirm the confidence interval results, it clarified differences between

the various scale formulations, while providing p-values associated with those differences. At $\alpha = 0.05$, statistically significant differences existed among the measure of overall perceived service quality and the correlation between the following three scale formulations: (1) weighted SERVQUAL and un-weighted SERVPERF, (2) un-weighted SERVQUAL and un-weighted SERVPERF, and (3) weighted SERVQUAL and un-weighted SERVPERF.

The original formulation of both the SERVQUAL and SERVPERF scales included the use of importance weights. At $\alpha = 0.05$, there is no statistically significant difference between weighted SERVQUAL and weighted SERVPERF ($p = 0.159$). Therefore, H_3 must be rejected.

Chapter V: Discussion and Conclusion

This chapter consists of five sections: Discussion of Results, Implication of Results, Contribution of the Study, Limitations of the Study, and Suggestions for Further Research.

Discussion of Results:

Hypothesis 1 - the five-dimensional factor structure of SERVQUAL will not be obtained for this data - was strongly supported. Although Parasuraman, Zeithaml and Berry (1988) asserted that the importance-weighted SERVQUAL scale was appropriate for the general measurement of service quality, they never assert that its five factor structure would necessarily be obtained for any setting studied. Thus, the results of this study support the conclusion of Dabholkar, Thorpe and Rentz (1996) in their review of 10 studies using SERVQUAL - that the five factor structure of Parasuraman, Zeithaml and Berry (1988) was not generally supported. These results also do not support the results of McAlexander, Kaldenberg and Koenig's (1994) study of perceived service quality of general dentists in Oregon, which demonstrated a unidimensional factor structure. However, it must be noted that the two-dimensional factor structure obtained from this data is nearly unidimensional: the first factor extracted had an eigenvalue of 8.475 and accounted for 56.5% of the total variance, the second factor extracted had an eigenvalue of 1.03 and accounted for 6.9% of the total variance, and the remaining 13 extracted factors accounted for 35.6% of the total variance. The decision as to how many factors to consider appropriate is clearly a subjective one (Tabachnick and Fidell 1996), although some "guidelines" exist. Often, the practical

criteria used to determine the appropriate number of factors extracted by a factor analysis are two: a scree plot (eigenvalues plotted against number of factors) and a cut-off eigenvalue of 1.000. The scree plot method is obviously the more subjective of these two methods. Based upon a scree plot of this data, it is unclear whether a two-factor solution or a one-factor solution is more appropriate. Similarly, using the eigenvalue cut-off value of 1.000, a second factor may be appropriate, but because the second factor's eigenvalue is so close to 1.000, again the correct number of factors is somewhat questionable. In any event, this factor structure is quite similar to the unidimensional factor structure obtained by McAlexander, Kaldenberg and Koenig (1994) for the services of general dentists.

Regardless of whether the appropriate factor structure for perceived service quality for dentists (general practitioners or specialists) should properly exhibit a one- or two-dimensional structure, the inescapable conclusion based upon this data is that the factor structure is a relatively simple one. Based on these results and the results of McAlexander, Kaldenberg and Koenig (1994), adult patients do not evaluate dentists' service quality along several different and distinct dimensions, as they do for many other industries, but do so in a broad manner which does not lend itself to substantial differentiation. One explanation for the simple factor structure obtained would be to suggest that patients are not as interested in the process of obtaining specialist dental care as they are in the outcome - that they tolerate quite a bit merely to obtain satisfactory treatment. However, this explanation comes into question when one examines Table 14: Means and Standard Deviations of Data. The overall mean of all the expectation scores is 6.694, with an average standard deviation of 0.662; the overall mean of the importance weights is 6.649, with an average standard deviation of

0.630; the overall mean of the perceptions score is 6.750, with an average standard deviation of 0.559. The vast majority of patients clearly have quite high expectations and perceptions of the specialist dental treatment they are receiving, and consider virtually all the items as being of high importance. It therefore seems unreasonable to think that patients are “putting up” with much if anything in terms of their specialty dental treatment. Instead, it is more likely that patients simply lack the tools necessary to evaluate specialist dental treatment on a multidimensional basis, but instead simply develop some overall or gestalt type of evaluation.

Hypothesis 2 - there will be no differences in mean scores obtained for the different dental specialties on SERVQUAL or SERVPERF - was not supported for SERVQUAL but was supported for SERVPERF. In other words, there were no statistically significant differences in mean SERVPERF scores for the three dental specialties examined, but there were statistically significant differences in mean SERVQUAL scores for these dental specialties. McAlexander, Kaldenberg and Koenig's (1994) study of adult patients of general dentists also demonstrated significant differences in patients' SERVQUAL and SERVPERF scores. This research found no significant difference among the three dental specialties examined in terms of patient perceptions - whether weighted by importance or not so weighted (SERVPERF) - alone, but statistically significant difference among the three dental specialties when the gap between perceptions and expectations - whether weighted by importance or not so weighted- was considered (SERVPERF). Apparently, the three specialties differ in terms of their patients' expectations, even though patients' perceptions of the specialties are quite similar.

It should also be noted that McAlexander, Kaldenberg and Koenig (1994) reported that the inclusion of importance weights led to statistically significant, albeit marginal, improvement in their model. These results demonstrate the opposite - that inclusion of importance weights, whether in the SERVQUAL or SERVPERF models, leads to decreased significance of the correlations between the various scale formulations and the measure of overall perceived service quality. The overall mean of all the importance weight items was 6.649, with an average standard deviation of 0.630 and a range of 5.598 to 6.890. This mean item score of 5.598 was the lowest item score obtained of all items: expectation, importance weights, and perceptions. Furthermore, the average standard deviation associated with this item is the highest standard deviation associated with all items. Clearly, the importance item "attractiveness of facilities" (the item with the mean importance weight of 5.598) is the major determinant of the variance among the importance weight items. Thus, one possible explanation of the decrease in model fit when the importance weights are included lies in the realm of social desirability bias. Patients may feel that they should not be concerned with the specialists' physical facilities, and therefore rate the importance of this variable artificially lower than they otherwise would. Inclusion in the analysis of an item which was closer to being a truly random variable would certainly explain why the subsequent model was a poorer one.

Hypothesis 3 - SERVPERF scores explain more of the variance in overall perceived service quality than will SERVQUAL scores for all dental specialists - was not statistically supported at $\alpha = 0.05$. Although importance-weighted SERVPERF did correlate higher with the overall measure of service quality ($r = 0.5897$) than did importance-weighted

SERVQUAL ($r = 0.3660$), the difference between these correlations was demonstrated not to be statistically significant ($p = 0.159$). McAlexander, Kaldenberg and Koenig (1994), in their examination of perceived service quality of general dentists, also found that importance-weighted SERVPERF scores explained more of the variance in perceived service quality than did importance-weighted SERVQUAL scores, but they did not investigate whether or not these differences were statistically significant. Thus, this research agrees with the conclusion of McAlexander, Kaldenberg and Koenig (1994) that the SERVPERF model explains more of the variance in overall perceived service quality than does the SERVQUAL model, although the difference is not statistically significant. McAlexander, Kaldenberg and Koenig (1994, page 38) suggested that their findings could be due to “uniformly high expectations across all SERVQUAL dimensions.” This research also demonstrated uniformly high expectation item scores (mean of all expectation items was 6.694, with a standard deviation of 0.662), however the importance weighing items and perception items also demonstrated uniformly high scores (overall means of 6.649 and 6.750, respectively) and similar standard deviations (0.630 and 0.559, respectively). Thus, uniformly high expectation scores do not appear to be a sufficient explanation for which service quality scale accounts for more of the variance in overall perceived service quality. Although the difference between the SERVPERF and SERVQUAL models is not statistically significant for this data, the clear implication of these results is that perceptions alone may well be more important determinants of patients’ evaluations of perceived service quality for dental specialists than are the other components of the SERVQUAL scale: importance weights and expectations.

Implications of Results:

In all previous studies which utilized the SERVQUAL scale, respondents' expectation scores, perception scores, and importance weights were obtained at the same "sitting," after the performance of the service in question. Because the subjects had to remember what their expectations were prior to receiving the service - after their perceptions of the service had been formed - this methodological approach is likely to have resulted in a confounding of subjects' reported expectations and perceptions. Furthermore, virtually all previous SERVQUAL and SERVPERF research employed surveys which were mailed to and from respondents. The delay involved between subjects actually experiencing the service and their subsequent completion of a mailed survey may have had some further effect on subjects' responses; i.e., one would expect some additional confounding of patients' expectations, perceptions and importance weights when all of these items were completed after a passage of time. The research design employed in this study measured the subjects' expectations and importance weights before the performance of the service, and the subjects' perceptions regarding the service after the service was performed. Furthermore, the vast majority of the respondents in this survey completed the research instrument immediately before and after the service was experienced (i.e., there was no delay, lengthy or not, between experiencing the service and completing the research instrument). As a consequence, the results of this research provided "cleaner" measures of perceptions and expectations than those obtained in any previous study - a decided methodological improvement.

A basic question being examined in the SERVQUAL versus SERVPERF research is whether the more parsimonious approach (SERVPERF) is an equal or better measure of

perceived service quality than the more lengthy approach (SERVQUAL). The SERVQUAL survey instrument is two to three times longer than the SERVPERF survey instrument, depending on whether or not both expectations and importance weights are requested. Obviously, respondents are less likely to complete long surveys than they are to complete shorter ones, and the inclusion of items which do not contribute significantly to a survey is inappropriate. Also, there is certainly an element of “wear out” on respondents of longer surveys. Thus, the more parsimonious survey is normally preferred to the more lengthy one. This determination of whether the shorter service quality survey is acceptable, or whether the longer version is necessary for adequate measurement is especially important if the service quality measure is required as a part of a more complex model, because in this case respondents will probably be required to complete multiple scales, and parsimony of each research instrument becomes of even more importance.

However, as noted by Parasuraman, Zeithaml and Berry (1991), the use of all three components - expectations, perceptions and importance weights - may well yield the most managerially relevant information. If one inspects the letters sent to the participating dental specialists (Appendix III: Letters to Participating Specialists), it quickly becomes obvious that the bulk of the information communicated to these dentists about how their patients evaluated the services they received would not have been available had the expectations portion of the survey been omitted. Specifically, the most managerially important information communicated to the participating dental specialists concerned whether or not gaps existed between their patients’ expectations and perceptions, and if so, the extent of these gaps. The purpose for which any study is undertaken must always be kept firmly in

mind - while no researcher wants to request respondents to complete an overly-lengthy survey, shortening the research instrument to the point that managerially-relevant parts are omitted may result in a waste of time, money and effort.

Contributions of the Study:

This research contributed to the service quality measurement literature in several ways. A minor contribution was that this research added to the large body of previous research demonstrating that SERVQUAL does not necessarily demonstrate a five factor structure for all industries; i.e. subjects have more or less complex evaluative criteria for different industries, instead of utilizing one “generic” evaluative structure. More significant was the fact that this research demonstrated a method of obtaining a “cleaner” measure of expectations - i.e., expectations are less confounded with perceptions - than has any other study to date. Based on this “cleaner” measure of perceptions and expectations, it is gratifying that the major conclusion of this study - that SERVPERF accounts for more of the variance in perceived service quality of dental specialists than does SERVQUAL - agrees with the previous findings for general dentists (McAlexander, Kaldenberg and Koenig 1994). The amount of confounding between expectation measures and perception measures speculated to exist in mailed surveys appears not to have been substantial enough to significantly influence the results. Furthermore, although the results with respect to whether SERVQUAL or SERVPERF better accounts for patients of dental specialists’ perceived service quality are not statistically significant at $\alpha = 0.05$, they are suggestive that SERVPERF is a better measure of perceived service quality for dental specialists. This

result, combined with that obtained by McAlexander, Kaldenberg and Koenig (1994), would lend support to the hypothesis that SERVPERF may be a better model for the evaluation of perceived service quality for adult patients of all dentists; i.e., SERVPERF is a better general model than SERVQUAL, at least in terms of variance accounted for, for adult dentistry.

Limitations of the Study:

A major limitation of the study involves the scale used. The survey instrument was a revision of the one used by McAlexander, Kaldenberg and Koenig (1994), itself a modification of the SERVQUAL scale. However, McAlexander, Kaldenberg and Koenig (1994, page 36) created their instrument “through consultation with ... participating dentists” and [it] “reflected dimensions that they [the dentists] believed to be important to their dental practices...”. Since doctors’ conception of what is important to patients frequently differs from what the patients themselves consider to be important (Swartz and Brown 1989), the selection of the items themselves used in this survey instrument may not truly reflect what dental patients consider to be important in the evaluation of dental service quality. Also, it is important to note that the original version of SERVQUAL (Parasuraman, Zeithaml and Berry 1988) used multiple measures for each of its dimensions: tangibility, responsiveness and assurance had four items each, and reliability and empathy had five items each, for a total of 22 items. The adaptation of SERVQUAL on which this research was based (McAlexander, Kaldenberg and Koenig 1994) used only one item from the SERVQUAL dimensions of tangibility, reliability, responsiveness and assurance, and two items from the SERVQUAL dimension of empathy - a total of only six items from the original SERVQUAL

scale. This omission of multiple items tapping into each of the SERVQUAL dimensions unfortunately violated the theory of scale development (DeVellis 1991). Thus, it is impossible to truly fault the SERVQUAL scale as being inadequate in the measurement of various dimensions of perceived service quality of dental specialists (or general dentists, for that matter). Only 40% of the items in the scale employed (6 of 15) were directly related to those items developed by Parasuraman, Zeithaml and Berry (1988). The fault may thus lie with the particular adaptation of the SERVQUAL scale used in this research.

Further evidence of a problem with this particular adaptation of the SERVQUAL scale's appropriateness with respect to the measurement of perceived service quality by dental patients is apparent when exactly how much of the variance in the measure of overall perceived service quality is accounted for by the scale. Regardless of which measurement instrument (SERVQUAL or SERVPERF) is examined and whether or not importance weights are included, the amount of variance in the overall measure of perceived service quality accounted for by the scale can best be described as small. If the correlations obtained between the various scale measures and overall perceived service quality are themselves squared, the variance accounted for by the various service quality models varies from a low of 0.1241 to a high of 0.3477. Thus, the best model considered (unweighted SERVPERF) fails to account for almost two thirds of the variance in the measure of overall perceived service quality. These results give further credence to the argument that the specific items included in the measurement scale used inadequately measure the construct of perceived service quality. Again, the fact that 60% of the scale items (9 of 15) were developed by consultation with dentists instead of with dental patients may be the cause for the small

amount of variance in patients' perceived overall service quality. It may have been that the independent variable items, many of which were based upon dentists' conceptualizations of what was important in dental service quality, are simply not good criteria for how dental patients actually evaluate dental specialists' service quality. Focus groups of dental patients should be employed to determine if additional or substitute scale items would be more appropriate for a scale which purported to measure patients' perceived service quality.

The present study is based on only a moderate sample size (319 usable responses) from patients of a few doctors (nine) in a limited geographic area (southeastern Virginia). Certainly, additional results based upon a larger sample from numerous dental specialists practicing in different localities in the United States would, to the extent that they agree with the present results, make these conclusions more generalizable. More specifically, the number of prosthodontic and endodontic patients participating in this research was much smaller than the number of periodontal patients. It may be that the number of patients of specialists other than periodontists was inadequate to demonstrate any differences among the specialists.

Because such a limited number of responses (387, of which 319 were usable) were obtained over an approximate 2.5 month period, there is certainly the possibility of bias in terms of the sample surveyed. Although the receptionists at each dental specialists' office participating in the survey were cautioned regarding the need for as random a sample of patients as possible, the number of completed surveys per participating dental specialist received each week ranged from a high of 37 to a low of 0, with a mean of 4.3. Although it is impossible to determine with certainty how many patients per week each of the dental

specialists treated, the number completing surveys was obviously a small percentage of the total. These low response rates certainly indicate the possibility of both selection and non-response biases.

Recommendations for Future Research:

The number of prosthodontic and endodontic patients was small, both in absolute terms and as a percentage of the total patients surveyed. Additional research using substantially larger numbers of endodontic and prosthodontic patients is certainly indicated. The high proportion of periodontic patients in the sample may have served to mask any differences in perceived service quality evaluation among patients of the three dental specialties examined.

The possibility of various forms of sample bias has previously been discussed. To eliminate these possible biases, agreement that all patients receiving treatment for some defined period of time were to be surveyed would certainly be an improvement over the method employed in this research, where patient selection was entirely at the discretion of individuals relatively uninterested in the research. While this approach would not eliminate the possibility of non-response bias, it would certainly eliminate selection bias.

This research was based on the McAlexander, Kaldenberg and Koenig (1994) study of general dentists in Oregon. However, McAlexander, Kaldenberg and Koenig's (1994) research employed a typical mailed survey instrument, which must have led to the confounding of patients' expectations, importance weights, and perceptions, at least to some extent. Replication of McAlexander, Kaldenberg and Koenig's (1994) research (i.e.,

surveying patients of general dentists) using the research design employed in this study is certainly indicated. Further research in this area of perceived service quality measurement instruments could also be undertaken by examining SERVQUAL and SERVPERF responses of a specific group of patients seeking care from both general dentists and dental specialists, perhaps by having patients seeking specialist care also complete a survey regarding the service quality of their general dentist. These strictly dental replications and extensions will hopefully make the perceived service quality measurement controversy more clear, at least with respect to this particular industry.

Although these results demonstrated that patients of periodontists, prosthodontists, and endodontists tend to use perceptions more than they do expectations and/or importance weights to evaluate overall service quality, these results did not achieve statistical significance at $\alpha = 0.05$. It is unclear, however, whether these results would prove to be statistically significant if the sample size was increased, or whether the results simply mean that different patients evaluate dental specialists' service quality in different ways. Discriminant analysis of this and similar data is indicated to determine if significantly different groups of patients exist with respect to their perceived service quality evaluative mechanisms.

In addition to the recommendations above for replication of the study on which this research is based and replication of this research itself, there are some additional extensions which should prove interesting and informative to both the marketing and health care disciplines. With respect to health care, extension of this line of research to other health care services could be important from the standpoint of generalizability. The obvious first step

would be to extend this line of research to patients of other health care practitioners, such as chiropractors, physical therapists, and veterinarians. To the extent that the findings of this research are confirmed, health care practitioners wishing to examine how their patients evaluate their service quality might be expected to have more faith in a general health care model than in a discipline-specific one. Marketing academics would be interested in an even further extension of this research: an extension to other industries. Assuming that results of studies based on patients of these additional health practitioners are consistent with results already reported here and elsewhere in the literature, a further extension to other professional services outside the health care field - engineers, architects, lawyers, etc. - would be warranted. It may well be that the conclusions of this study can be applied to other professional services and not simply health care services. Assuming that results of studies of additional professional service providers are consistent with the results obtained in this research, a further extension of this line of research to other, high-credence services such as those of stock brokers, financial consultants, and funeral home directors might further demonstrate that the conclusions of this research may apply to all high credence services.

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Appendix I: Surveys and Associated Documents

Survey 1:
Survey of McAlexander, Kaldenberg and Koenig (1994)

DENTAL STUDY QUESTIONNAIRE

EXPECTATION QUESTIONS

DIRECTIONS: Please show the extent to which you think dental practices, in general, should possess the following features. If you strongly agree that dental practices should possess a feature, circle number 7. If you strongly disagree, circle number 1. If your feelings are not strong, circle one of the numbers in the middle. There are no right or wrong answers.

E1. A dentist's physical facilities should be visually appealing.	1 2 3 4 5 6 7
E2. A dentist should be dependable.	1 2 3 4 5 6 7
E3. A dentist's employees should be willing to help you.	1 2 3 4 5 6 7
E4. You should always feel safe in your transactions with a dentist.	1 2 3 4 5 6 7
E5. A dentist should give you individual attention.	1 2 3 4 5 6 7
E6. You should always be able to schedule an appointment with a dentist for a time that is convenient.	1 2 3 4 5 6 7
E7. A dentist should be competent.	1 2 3 4 5 6 7
E8. A dentist should communicate well with patients.	1 2 3 4 5 6 7
E9. A dentist should make treatments as painless as possible.	1 2 3 4 5 6 7
E10. A dentist should treat you with respect.	1 2 3 4 5 6 7
E11. A dentist's charges should not be too high.	1 2 3 4 5 6 7
E12. You should be able to trust a dentist.	1 2 3 4 5 6 7
E13. A dentist should provide service of the highest quality.	1 2 3 4 5 6 7
E14. A dentist's office staff should always act in a professional manner.	1 2 3 4 5 6 7
E15. A dentist should take every precaution required to protect me from infectious diseases.	1 2 3 4 5 6 7

IMPORTANCE QUESTIONS

DIRECTIONS: Please rate the following in terms of their importance to you in your selection of a periodontist. (7-point scale where 1 is least important and 7 is most important).

I1. Visually appealing physical facilities	1 2 3 4 5 6 7
I2. A dependable dentist	1 2 3 4 5 6 7
I3. Helpful employees	1 2 3 4 5 6 7
I4. Safe transactions	1 2 3 4 5 6 7
I5. Individual attention	1 2 3 4 5 6 7
I6. Ability to schedule an appointment that is convenient	1 2 3 4 5 6 7
I7. A competent dentist	1 2 3 4 5 6 7
I8. A dentist who communicated well	1 2 3 4 5 6 7
I9. Painless dental treatments	1 2 3 4 5 6 7
I10. Being treated with respect	1 2 3 4 5 6 7
I11. Cost of treatment	1 2 3 4 5 6 7
I12. A dentist I can trust	1 2 3 4 5 6 7
I13. Service of the highest quality	1 2 3 4 5 6 7
I14. An office staff that acts in a professional manner	1 2 3 4 5 6 7
I15. Protection from infectious diseases	1 2 3 4 5 6 7

PERFORMANCE QUESTIONS

DIRECTIONS: The following set of statements relates to your feelings about Dr. [Name]. For each statement, please show the extent to which you believe Dr. [Name] or his practice has the feature described in the statement. If you strongly agree, circle number 7. If you strongly disagree, circle number 1. If your feelings are not strong, circle one of the numbers in the middle.

- | | | | | | | | |
|--|---|---|---|---|---|---|---|
| P1. Dr. [Name]'s physical facilities are visually appealing. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P2. Dr. [Name] is not dependable. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P3. Employees of Dr. [Name] are always willing to help you. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P4. You feel safe in your transactions with Dr. [Name]. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P5. Dr. [Name] gives you individual attention. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P6. I can usually schedule an appointment for a time that is good for me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P7. Dr. [Name] is very competent. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P8. Dr. [Name] communicates very well with me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P9. Dr. [Name] makes dental treatments as painless as possible. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P10. Dr. [Name] always treats me with respect. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P11. The fees Dr [Name] charges are too high. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P12. I trust Dr. [Name]. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P13. The service Dr. [Name] provides is of the highest quality. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P14. Dr. [Name]'s office employees always act in a professional manner. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P15. Dr. [Name] takes every precaution required to protect me from infectious disease. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Patient Cover Letter

I'm a graduate student at Old Dominion University and need your help. My dissertation research examines how adult patients of dental specialists evaluate their specialist's service quality. Your attitudes and opinions are very important to the successful completion of this research.

Please complete the front and back of the first page of the questionnaire (Expectation and Importance Questions) before today's dental treatment. After today's dental treatment is completed, please answer the front and back of the second page of the questionnaire (Performance Questions, Overall Evaluation, and Demographic Questions). After completion of the entire questionnaire, seal it in the envelope provided and return it to the Receptionist. Neither your dental specialist or any of his staff will know anything about how you answered this questionnaire.

Thanks for expressing your important opinions!

Dental Research Survey
Old Dominion University
Department of Business Administration
Norfolk, Virginia 23529

Survey 2:
First Adaptation of Questionnaire

DENTAL STUDY QUESTIONNAIRE

EXPECTATION QUESTIONS

DIRECTIONS: Please show the extent to which you think periodontal dental practices, in general, should possess the following features. If you strongly agree that periodontal dental practices should possess a feature, circle number 7. If you strongly disagree, circle number 1. If your feelings are not strong, circle one of the numbers in the middle. There are no right or wrong answers.

E1. A periodontist's physical facilities should be visually appealing.	1	2	3	4	5	6	7
E2. A periodontist should be dependable.	1	2	3	4	5	6	7
E3. A periodontist's employees should be willing to help you.	1	2	3	4	5	6	7
E4. You should always feel safe in your transactions with a periodontist.	1	2	3	4	5	6	7
E5. A periodontist should give you individual attention.	1	2	3	4	5	6	7
E6. You should always be able to schedule an appointment with a periodontist for a time that is convenient.	1	2	3	4	5	6	7
E7. A periodontist should be competent.	1	2	3	4	5	6	7
E8. A periodontist should communicate well with patients.	1	2	3	4	5	6	7
E9. A periodontist should make treatments as painless as possible.	1	2	3	4	5	6	7
E10. A periodontist should treat you with respect.	1	2	3	4	5	6	7
E11. A periodontist's charges should not be too high.	1	2	3	4	5	6	7
E12. You should be able to trust a periodontist.	1	2	3	4	5	6	7
E13. A periodontist should provide service of the highest quality.	1	2	3	4	5	6	7
E14. A periodontist's office staff should always act in a professional manner.	1	2	3	4	5	6	7
E15. A periodontist should take every precaution required to protect me from infectious diseases.	1	2	3	4	5	6	7

IMPORTANCE QUESTIONS

DIRECTIONS: Please rate the following in terms of their importance to you in your selection of a periodontist. (7-point scale where 1 is least important and 7 is most important).

I1. Visually appealing physical facilities	1	2	3	4	5	6	7
I2. A dependable periodontist	1	2	3	4	5	6	7
I3. Helpful employees	1	2	3	4	5	6	7
I4. Safe transactions	1	2	3	4	5	6	7
I5. Individual attention	1	2	3	4	5	6	7
I6. Ability to schedule an appointment that is convenient	1	2	3	4	5	6	7
I7. A competent periodontist	1	2	3	4	5	6	7
I8. A periodontist who communicated well	1	2	3	4	5	6	7
I9. Painless periodontal treatments	1	2	3	4	5	6	7
I10. Being treated with respect	1	2	3	4	5	6	7
I11. Cost of treatment	1	2	3	4	5	6	7
I12. A periodontist I can trust	1	2	3	4	5	6	7
I13. Service of the highest quality	1	2	3	4	5	6	7
I14. An office staff that acts in a professional manner	1	2	3	4	5	6	7
I15. Protection from infectious diseases	1	2	3	4	5	6	7

PERFORMANCE QUESTIONS

DIRECTIONS: The following set of statements relates to your feelings about Dr. _____. For each statement, please show the extent to which you believe Dr. _____ or his practice has the feature described in the statement. If you strongly agree, circle number 7. If you strongly disagree, circle number 1. If your feelings are not strong, circle one of the numbers in the middle.

- P1. Dr. _____'s physical facilities are visually appealing. 1 2 3 4 5 6 7
- P2. Dr. _____ is not dependable. 1 2 3 4 5 6 7
- P3. Employees of Dr. _____ are always willing to help you. 1 2 3 4 5 6 7
- P4. You feel safe in your transactions with Dr. _____. 1 2 3 4 5 6 7
- P5. Dr. _____ gives you individual attention. 1 2 3 4 5 6 7
- P6. I can usually schedule an appointment for a time that is good for me. 1 2 3 4 5 6 7
- P7. Dr. _____ is very competent. 1 2 3 4 5 6 7
- P8. Dr. _____ communicates very well with me. 1 2 3 4 5 6 7
- P9. Dr. _____ makes periodontic treatments as painless as possible. 1 2 3 4 5 6 7
- P10. Dr. _____ always treats me with respect. 1 2 3 4 5 6 7
- P11. The fees Dr. _____ charges are too high. 1 2 3 4 5 6 7
- P12. I trust Dr. _____. 1 2 3 4 5 6 7
- P13. The service Dr. _____ provides is of the highest quality. 1 2 3 4 5 6 7
- P14. Dr. _____'s office employees always act in a professional manner. 1 2 3 4 5 6 7
- P15. Dr. _____ takes every precaution required to protect me from infectious disease. 1 2 3 4 5 6 7

OVERALL EVALUATION

DIRECTIONS: Please rate your evaluation of the overall service quality you have received at Dr. _____'s office, using the same scale as above (1 = poor, 7 = excellent):

- 1 2 3 4 5 6 7

DEMOGRAPHIC QUESTIONS

1. Is this your first visit to Dr. _____? yes no (If "yes," skip to question 3)
2. For how long have you been treated by Dr. _____?
- | | |
|---|--|
| <input type="checkbox"/> less than 6 months | <input type="checkbox"/> more than 6 months but less than 1 year |
| <input type="checkbox"/> more than 1 year but less than 2 years | <input type="checkbox"/> more than 2 years but less than 3 years |
| <input type="checkbox"/> more than 3 years | |
3. Is your dental treatment covered by insurance? yes no
4. How much have you spent on dental services (including the amount paid by your insurance, if any) in the last 12 months?
- | | |
|--|--|
| <input type="checkbox"/> less than \$500 | <input type="checkbox"/> \$500 or more but less than \$1000 |
| <input type="checkbox"/> \$1000 or more but less than \$1500 | <input type="checkbox"/> \$1500 or more but less than \$2000 |
| <input type="checkbox"/> \$2000 or more but less than \$2500 | <input type="checkbox"/> \$2500 or more but less than \$3000 |
| <input type="checkbox"/> \$3500 or more but less than \$4000 | <input type="checkbox"/> \$4500 or more but less than \$5000 |
| <input type="checkbox"/> or more | <input type="checkbox"/> \$5000 |
5. What was your total annual household income (before taxes) last year?
- | | |
|--|--|
| <input type="checkbox"/> less than \$10,000 | <input type="checkbox"/> more than \$10,000 but less than \$20,000 |
| <input type="checkbox"/> more than \$20,000 but less than \$30,000 | <input type="checkbox"/> more than \$30,000 but less than \$40,000 |
| <input type="checkbox"/> more than \$40,000 but less than \$50,000 | <input type="checkbox"/> more than \$50,000 but less than \$60,000 |
| <input type="checkbox"/> more than \$60,000 but less than \$70,000 | <input type="checkbox"/> more than \$70,000 but less than \$80,000 |
| <input type="checkbox"/> more than \$80,000 but less than \$90,000 | <input type="checkbox"/> more than 90,000 but less than \$100,000 |
| <input type="checkbox"/> more than \$100,000 | |
6. What is your gender? Male Female
7. Please select the ethnic/racial group to which you belong.
- | | | | |
|------------------------------------|--|---|-----------------------------------|
| <input type="checkbox"/> Caucasian | <input type="checkbox"/> Native American | <input type="checkbox"/> African-American | <input type="checkbox"/> Hispanic |
| <input type="checkbox"/> American | <input type="checkbox"/> Asian-American | <input type="checkbox"/> Other (Please explain) _____ | |
8. What is your marital status?
- | | | | |
|---------------------------------|----------------------------------|-----------------------------------|------------------------------------|
| <input type="checkbox"/> single | <input type="checkbox"/> married | <input type="checkbox"/> divorced | <input type="checkbox"/> separated |
|---------------------------------|----------------------------------|-----------------------------------|------------------------------------|

Survey 3:
Final Version of Survey

DENTAL STUDY QUESTIONNAIRE

EXPECTATION QUESTIONS

DIRECTIONS: Please show the extent to which you think [name of specialty] dental practices, in general, should possess the following features. If you strongly agree that [name of specialty] dental practices should possess a feature, circle number 7. If you strongly disagree, circle number 1. If your feelings are not strong, circle one of the numbers in the middle. There are no right or wrong answers.

- | | |
|--|---------------|
| E1. An [name of specialty]'s physical facilities should be visually appealing. | 1 2 3 4 5 6 7 |
| E2. An [name of specialty] should be dependable. | 1 2 3 4 5 6 7 |
| E3. An [name of specialty]'s employees should be willing to help you. | 1 2 3 4 5 6 7 |
| E4. You should always feel safe in your transactions with an [name of specialty]. | 1 2 3 4 5 6 7 |
| E5. An [name of specialty] should give you individual attention. | 1 2 3 4 5 6 7 |
| E6. You should always be able to schedule an appointment with
an [name of specialty] for a time that is convenient. | 1 2 3 4 5 6 7 |
| E7. An [name of specialty] should be competent. | 1 2 3 4 5 6 7 |
| E8. An [name of specialty] should communicate well with patients. | 1 2 3 4 5 6 7 |
| E9. An [name of specialty] should make treatments as painless as possible. | 1 2 3 4 5 6 7 |
| E10. An [name of specialty] should treat you with respect. | 1 2 3 4 5 6 7 |
| E11. An [name of specialty]'s charges should not be too high. | 1 2 3 4 5 6 7 |
| E12. You should be able to trust an [name of specialty]. | 1 2 3 4 5 6 7 |
| E13. An [name of specialty] should provide service of the highest quality. | 1 2 3 4 5 6 7 |
| E14. An [name of specialty]'s office staff should always act in a professional manner. | 1 2 3 4 5 6 7 |
| E15. An [name of specialty] should take every precaution required to protect you from
infectious diseases. | 1 2 3 4 5 6 7 |

IMPORTANCE QUESTIONS

DIRECTIONS: Please rate the following in terms of their importance to you in your selection of an [name of specialty]. (7-point scale where 1 is least important and 7 is most important).

- | | |
|---|---------------|
| I1. Visually appealing physical facilities | 1 2 3 4 5 6 7 |
| I2. A dependable [name of specialty] | 1 2 3 4 5 6 7 |
| I3. Helpful employees | 1 2 3 4 5 6 7 |
| I4. Safe transactions | 1 2 3 4 5 6 7 |
| I5. Individual attention | 1 2 3 4 5 6 7 |
| I6. Ability to schedule an appointment that is convenient | 1 2 3 4 5 6 7 |
| I7. A competent [name of specialty] | 1 2 3 4 5 6 7 |
| I8. An [name of specialty] who communicated well | 1 2 3 4 5 6 7 |
| I9. Painless [name of specialty] treatments | 1 2 3 4 5 6 7 |
| I10. Being treated with respect | 1 2 3 4 5 6 7 |
| I11. Cost of treatment | 1 2 3 4 5 6 7 |
| I12. An [name of specialty] I can trust | 1 2 3 4 5 6 7 |
| I13. Service of the highest quality | 1 2 3 4 5 6 7 |
| I14. An office staff that acts in a professional manner | 1 2 3 4 5 6 7 |
| I15. Protection from infectious diseases | 1 2 3 4 5 6 7 |

PERFORMANCE QUESTIONS

DIRECTIONS: The following set of statements relates to your feelings about Dr. _____. For each statement, please show the extent to which you believe Dr. _____ or his practice has the feature described in the statement. If you strongly agree, circle number 7. If you strongly disagree, circle number 1. If your feelings are not strong, circle one of the numbers in the middle.

- | | | | | | | | |
|---|---|---|---|---|---|---|---|
| P1. Dr. _____'s physical facilities are visually appealing. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P2. Dr. _____ is dependable. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P3. Employees of Dr. _____ are always willing to help you. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P4. You feel safe in your transactions with Dr. _____. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P5. Dr. _____ gives you individual attention. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P6. I can usually schedule an appointment for a time that is good for me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P7. Dr. _____ is very competent. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P8. Dr. _____ communicates very well with me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P9. Dr. _____ makes [name of specialty] treatments as painless as possible. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P10. Dr. _____ always treats me with respect. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P11. The fees Dr. _____ charges are not too high. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P12. I trust Dr. _____. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P13. The service Dr. _____ provides is of the highest quality. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P14. Dr. _____'s office employees always act in a professional manner. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P15. Dr. _____ takes every precaution required to protect me from infectious disease. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

OVERALL EVALUATION

DIRECTIONS: Even if this is your first visit to Dr. _____, please rate the overall service quality of your experience at Dr. _____'s office on a scale of 0 to 100, where 0 represents the worst possible [name of specialty], 50 represents an average [name of specialty], and 100 represents the perfect [name of specialty] (presumably, no [name of specialty] is perfect).

Overall Evaluation Score: _____

DEMOGRAPHIC QUESTIONS

1. Is this your first visit to Dr. ____? yes no (If "yes," skip to question 3)
2. For how long have you been treated by Dr. ____?
- | | |
|---|--|
| <input type="checkbox"/> less than 6 months | <input type="checkbox"/> more than 6 months but less than 1 year |
| <input type="checkbox"/> more than 1 year but less than 2 years | <input type="checkbox"/> more than 2 years but less than 3 years |
| <input type="checkbox"/> more than 3 years | |
3. Is your dental treatment covered by insurance? yes no
4. How much have you spent on dental services (including the amount paid by your insurance, if any) in the last 12 months?
- | | |
|--|--|
| <input type="checkbox"/> less than \$500 | <input type="checkbox"/> \$500 or more but less than \$1000 |
| <input type="checkbox"/> \$1000 or more but less than \$1500 | <input type="checkbox"/> \$1500 or more but less than \$2000 |
| <input type="checkbox"/> \$2000 or more but less than \$2500 | <input type="checkbox"/> \$2500 or more but less than \$3000 |
| <input type="checkbox"/> \$3500 or more but less than \$4000 | <input type="checkbox"/> \$4500 or more but less than \$5000 |
| <input type="checkbox"/> \$5000 or more | |
5. What was your total annual household income (before taxes) last year?
- | | |
|--|--|
| <input type="checkbox"/> less than \$10,000 | <input type="checkbox"/> more than \$10,000 but less than \$20,000 |
| <input type="checkbox"/> more than \$20,000 but less than \$30,000 | <input type="checkbox"/> more than \$30,000 but less than \$40,000 |
| <input type="checkbox"/> more than \$40,000 but less than \$50,000 | <input type="checkbox"/> more than \$50,000 but less than \$60,000 |
| <input type="checkbox"/> more than \$60,000 but less than \$70,000 | <input type="checkbox"/> more than \$70,000 but less than \$80,000 |
| <input type="checkbox"/> more than \$80,000 but less than \$90,000 | <input type="checkbox"/> more than 90,000 but less than \$100,000 |
| <input type="checkbox"/> more than \$100,000 | |
6. What is your gender? Male Female
7. Please select the ethnic/racial group to which you belong.
- | | | |
|--|--|---|
| <input type="checkbox"/> Caucasian | <input type="checkbox"/> Native American | <input type="checkbox"/> African-American |
| <input type="checkbox"/> Hispanic American | <input type="checkbox"/> Asian-American | <input type="checkbox"/> Other (Please explain) _____ |
8. What is your marital status?
- | | | | |
|--|----------------------------------|-----------------------------------|------------------------------------|
| <input type="checkbox"/> single | <input type="checkbox"/> married | <input type="checkbox"/> divorced | <input type="checkbox"/> separated |
| <input type="checkbox"/> widow/widower | | | |

INSTRUCTIONS FOR RECEPTIONIST

Dear Receptionist.

I am a general dentist who is pursuing a Ph.D. at Old Dominion University. Dr. _____ has agreed to help me in my dissertation research by allowing his patients to complete the enclosed surveys. Please ask patients to complete the front and back of the first page of the questionnaire before receiving any dental treatment, and the front and back of the second page of the questionnaire after receiving today's dental treatment. When the questionnaire has been completed, the patient should seal it in one of the envelopes provided and return it to you. Please keep the sealed envelopes and I'll pick up them up about once a week.

I've provided you with approximately 125 questionnaires. To satisfactorily complete my research, I'll need 100 completely filled out questionnaires from your office. The 25 "extra" questionnaires are in case some patients do not complete all of their questionnaires.

To compensate you and the other members of the staff for the time that administering this questionnaire will take, I will provide the office a gift certificate for \$50 good for lunch at the restaurant of your choice when I have received 100 completely filled out questionnaires. In addition, the first office to reach the 100 completely filled out questionnaires goal will receive an additional gift certificate for \$50 for lunch at the restaurant of your choice (approximately 10 specialists' offices are participating in this research). When I stop by your office each week, I'll let you know how many completely-filled-out questionnaires I've received from your office, and thus how your office stands with respect to the second \$50 gift certificate.

If you have any questions about the research or require additional questionnaires, please call me at 460-0906. If I'm not available to take your call, leave a message and I'll get back to you (usually within the day).

Sincerely,

David P. Paul, III, D.D.S.

Appendix II: Demographics

Appendix II: Demographic Data of Pretests

Variable	Range	First Pre-test Questionnaire		Second Pre-test Questionnaire	
		N	Valid %	N	Valid %
Gender	male	4	21.1	4	16.0
	female	15	78.9	21	84.0
Have Insur- ance?	yes	14	77.8	19	76.0
	no	4	22.2	6	24.0
	.	1	5.3		
How long treated by this doctor?	< 6 mo	10	52.6	8	36.4
	6-12 mo	0	0.0	3	13.6
	1-2 yr	1	5.3	5	22.7
	2-3 yr	2	10.5	1	4.5
	3+ years	6	31.6	5	20.0
	.			3	
Dental treatment cost in last 24 months?	< \$100	3	16.7	0	0.0
	\$100-250	3	16.7	1	4.0
	\$250-500	1	5.6	0	0.0
	\$500-750	4	22.2	1	4.0
	\$750-1k	3	16.7	3	12.0
	\$1k+	0		19	79.2
	.	1		1	
Annual Income	<\$10k	0	0.0	0	0.0
	\$10k-20k	2	11.1	2	8.0
	\$20k-30k	2	11.1	0	0.0
	\$30k-40k	1	5.3	2	8.0
	\$40k-50k	3	16.7	8	40.0
	\$50k-60k	1	5.3	2	8.0
	\$60k-70k	3	16.7	3	15.0
	\$70k-80k	1	5.3	1	4.0
	\$80k-90k	2	11.1	0	0.0
	\$90k-10k	0	0.0	0	0.0
	\$100k+	3	16.7	2	8.0
	.	1		5	

Appendix II: Demographic Data of Pretests (continued):

		First Pre-test Questionnaire		Second Pre-test Questionnaire	
Marital Status	single	1	5.3	3	12.0
	married	13	68.4	16	64.0
	divorced	4	21.1	7	12.0
	separated	1	5.3	5	20.0
Race	Caucasian	13	68.4	22	88.0
	Native Amer.	0	0.0	0	0.0
	African Amer.	6	31.6	3	12.0
	Hispanic Amer.	0	0.0	0	0.0
	Asian Amer.	0	0.0	0	0.0
	Other	0	0.0	0	0.0
First visit to this doctor?	yes	1	5.3	2	8.0
	no	18	94.7	23	92.0

Demographic Data of Final Sample

Variable	Range	N	Valid %
Gender	male	97	30.4
	female	213	66.8
	.	8	
Have insurance?	yes	182	57.1
	no	125	39.3
	.	3	
How long treated by this doctor?	< 6 mo	109	34.2
	6-12 mo	24	7.5
	1-2 yr	17	5.3
	2-3 yr	30	9.4
	3+ years	120	37.6
	.	19	
Dental treatment cost in last 12 months?	< \$500	101	31.7
	\$500-1000	57	17.9
	\$1000-1500	70	21.9
	\$1500-2000	18	5.6
	\$2000-2500	20	6.3
	\$2500-3000	12	3.8
	\$3000-3500	11	3.4
	\$3500-4000	6	1.9
	\$4000-4500	7	2.2
	\$5000+	2	0.6
.	15		
Annual Income	<\$10k	13	4.1
	\$10k-20k	16	5.0
	\$20k-30k	41	12.9
	\$30k-40k	40	12.5
	\$40k-50k	54	16.9
	\$50k-60k	32	10.0
	\$60k-70k	26	8.2
	\$70k-80k	20	6.3
	\$80k-90k	17	5.3
	\$90k-10k	8	2.5
	\$100k+	27	8.5
.	25		

Demographic Data of Final Sample (continued)

Variable	Range	N	Valid %
Marital Status	single	37	11.6
	married	213	66.8
	divorced	29	9.1
	separated	8	2.5
	widow(er)	24	7.5
	.	8	
Race	Caucasian	239	74.9
	Native Amer.	8	2.5
	African Amer.	43	13.5
	Hispanic Amer.	9	2.8
	Asian Amer.	5	1.6
	Other	4	1.3
	.	11	
First visit to this doctor?	yes	54	16.9
	no	257	80.6
	.	8	

Appendix III: Letters to Participating Specialists

December 26, 1997

Dr. [periol]

Virginia Beach, VA 23451

Dear [periol],

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All Periodontists</u>
gender	males	31	84
	females	83	187
have insurance	yes	61	161
	no	50	105
treatment time	< 6 mo	38	124
	6 mo - 1 yr	17	28
	1 yr - 2 yr	6	16
	2 yr - 3 yr	7	21
	> 3 yrs	42	104
marital status	single	10	34
	married	83	183
	divorced	9	27
	separated	1	6
	widow(er)	10	21
first visit?	yes	12	41
	no	99	228

race	Caucasian	85	199
	Native Amer.	2	10
	African Amer.	21	42
	Hispanic Amer.	1	8
	Asian-Amer.	2	5
	Other	2	4

Here is a breakdown of the responses to the questions about your practice. I have "grouped" the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 120 of your patients, with 259 total periodontal patients responding to the survey. Of course, all patients did not answer every question.

	<u>Your Patients</u>	<u>All Perio patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	6.04	5.98
importance	5.80	5.76
perceptions	6.30	6.39
Reliability		
- dependability of doctor (question 2):		
expectations	6.95	6.77
importance	6.86	6.74
perceptions	6.81	6.79
Responsiveness		
- employees willing to help (question 3):		
expectations	6.91	6.72
importance	6.74	6.57
perceptions	6.79	6.79
- doctor communicates well with patients (question 8):		
expectations	6.89	6.70
importance	6.84	6.69
perceptions	6.88	6.81

Assurance

- patients feel safe (question 4):

expectations	6.89	6.74
importance	6.87	6.73
perceptions	6.81	6.80

Empathy

- patients given individual attention (question 5):

expectations	6.86	6.64
importance	6.78	6.58
perceptions	6.85	6.79

- appointments available at convenient times (question 6):

expectations	6.28	6.15
importance	6.25	6.24
perceptions	6.74	6.71

- doctor trusted (question 12):

expectations	6.81	6.79
importance	6.93	6.80
perceptions	6.84	6.81

Dental questions

- treatments as painless as possible (question 9):

expectations	6.80	6.61
importance	6.72	6.53
perceptions	6.82	6.78

- precautions to protect patient from infectious disease (question 15):

expectations	6.98	6.83
importance	6.96	6.83
perceptions	6.92	6.86

Overall “professional” questions

- competence of doctor (question 7):

expectations	6.98	6.83
importance	6.97	6.77
perceptions	6.91	6.84

- patient treated with respect (question 10):

expectations	6.89	6.74
importance	6.89	6.73
perceptions	6.87	6.81

- fees too high (question 11):

expectations	6.66	6.37
importance	6.57	6.29
perceptions	6.06	6.27

- service of highest quality (question 13):

expectations	6.92	6.79
importance	6.93	6.80
perceptions	6.84	6.81

- staff acts professionally (question 14):

expectations	6.85	6.69
importance	6.78	6.61
perceptions	6.84	6.79

It was striking to me that your practice scored above the mean regarding expectations, importance and perceptions for virtually every question! The only two instances where this was not the case were regarding patients’ perceptions of your physical facility (your mean was 6.30 versus overall periodontal mean of 6.39) and patients’ perceptions that your fees are too high (your mean score was 6.06 versus overall periodontal mean of 6.27). So, while I might suggest that you consider “sprucing up” your office a bit to improve your patients’ perceptions in that area, I must confess that I see no other area covered by this survey where you should be concerned about your practice!

Again, I want to thank you and your staff for participating so enthusiastically in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of friends like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

December 26, 1997

Dr. [perio2]
355
Portsmouth, VA 23704

Dear [perio2]

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All Periodontists</u>
gender	males	7	84
	females	18	187
have insurance	yes	17	161
	no	8	105
treatment time	< 6 mo	0	124
	6 mo - 1 yr	3	28
	1 yr - 2 yr	2	16
	2 yr - 3 yr	3	21
	> 3 yrs	14	104
marital status	single	1	34
	married	15	183
	divorced	5	27
	separated	1	6
	widow(er)	3	21
first visit?	yes	0	41
	no	25	228

race	Caucasian	21	199
	Native Amer.	1	10
	African Amer.	2	42
	Hispanic Amer.	0	8
	Asian-Amer.	0	5
	Other	0	4

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 25 of your patients, with 259 total periodontal patients responding to the survey. Of course, all patients did not answer every question.

	<u>Your Patients</u>	<u>All Perio patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	5.88	5.98
importance	5.50	5.76
perceptions	6.08	6.39
Reliability		
- dependability of doctor (question 2):		
expectations	6.68	6.77
importance	6.86	6.74
perceptions	6.46	6.79
Responsiveness		
- employees willing to help (question 3):		
expectations	6.56	6.72
importance	6.38	6.57
perceptions	6.60	6.79
- doctor communicates well with patients (question 8):		
expectations	6.48	6.70
importance	6.48	6.69
perceptions	6.48	6.81

Assurance

- patients feel safe (question 4):

expectations	6.72	6.74
importance	6.71	6.73
perceptions	6.56	6.80

Empathy

- patients given individual attention (question 5):

expectations	6.40	6.64
importance	6.42	6.58
perceptions	6.36	6.79

- appointments available at convenient times (question 6):

expectations	5.76	6.15
importance	5.92	6.24
perceptions	6.64	6.71

- doctor trusted (question 12):

expectations	6.72	6.79
importance	6.72	6.80
perceptions	6.48	6.81

Dental questions

- treatments as painless as possible (question 9)

expectations	6.40	6.61
importance	6.29	6.53
perceptions	6.44	6.78

- precautions to protect patient from infectious disease (question 15):

expectations	6.76	6.83
importance	6.64	6.83
perceptions	6.60	6.86

Overall “professional” questions

- competence of doctor (question 7):

expectations	6.76	6.83
importance	6.44	6.77
perceptions	6.56	6.84

- patient treated with respect (question 10):

expectations	6.68	6.74
importance	6.67	6.73
perceptions	6.52	6.81

- fees too high (question 11):

expectations	6.20	6.37
importance	5.96	6.29
perceptions	6.24	6.27

- service of highest quality (question 13):

expectations	6.64	6.79
importance	6.48	6.80
perceptions	6.52	6.81

- staff acts professionally (question 14):

expectations	6.60	6.69
importance	6.54	6.61
perceptions	6.56	6.79

It is extremely difficult to draw statistically meaningful conclusions from the responses from your patients, because the total number of questionnaires returned was so small. Although your scores were generally below the mean scores for all periodontal patients, in many areas your patients' perception scores were above their expectation scores, showing that you were meeting or exceeding what your patients' expectations. However, this was not the situation for questions 1, 4, 7, 10, 12, 13, and 15, and you might want to consider examining your practice in these areas.

Again, I want to thank you and your staff for participating in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of friends like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

December 26, 1997

Dr. [perio3]

Norfolk, VA 23502

Dear [perio3],

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All Periodontists</u>
gender	males	43	84
	females	76	187
have insurance	yes	76	161
	no	41	105
treatment time	< 6 mo	48	124
	6 mo - 1 yr	6	28
	1 yr - 2 yr	8	16
	2 yr - 3 yr	9	21
	> 3 yrs	45	104
marital status	single	20	34
	married	76	183
	divorced	13	27
	separated	4	6
	widow(er)	7	21
first visit?	yes	27	41
	no	92	228

race	Caucasian	82	199
	Native Amer.	6	10
	African Amer.	18	42
	Hispanic Amer.	7	8
	Asian-Amer.	2	5
	Other	2	4

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 125 of your patients, with 259 total periodontal patients responding to the survey. Of course, all patients did not answer every question.

	<u>Your Patients</u>	<u>All Perio patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	6.02	5.98
importance	5.64	5.76
perceptions	6.52	6.39
Reliability		
- dependability of doctor (question 2):		
expectations	6.65	6.77
importance	6.67	6.74
perceptions	6.82	6.79
Responsiveness		
- employees willing to help (question 3):		
expectations	6.62	6.72
importance	6.46	6.57
perceptions	6.78	6.79
- doctor communicates well with patients (question 8):		
expectations	6.60	6.70
importance	6.62	6.69
perceptions	6.78	6.81

Assurance

- patients feel safe (question 4):

expectations	6.66	6.74
importance	6.64	6.73
perceptions	6.81	6.80

Empathy

- patients given individual attention (question 5):

expectations	6.49	6.64
importance	6.46	6.58
perceptions	6.78	6.79

- appointments available at convenient times (question 6):

expectations	6.11	6.15
importance	6.15	6.24
perceptions	6.78	6.71

- doctor trusted (question 12):

expectations	6.70	6.79
importance	6.71	6.80
perceptions	6.82	6.81

Dental questions

- treatments as painless as possible (question 9)

expectations	6.52	6.61
importance	6.43	6.53
perceptions	6.78	6.78

- precautions to protect patient from infectious disease (question 15):

expectations	6.73	6.83
importance	6.77	6.83
perceptions	6.84	6.86

Overall “professional” questions

- competence of doctor (question 7):

expectations	6.68	6.83
importance	6.67	6.77
perceptions	6.81	6.84

- patient treated with respect (question 10):

expectations	6.62	6.74
importance	6.63	6.73
perceptions	6.79	6.81

- fees too high (question 11):

expectations	6.19	6.37
importance	6.13	6.29
perceptions	6.46	6.27

- service of highest quality (question 13):

expectations	6.69	6.79
importance	6.73	6.80
perceptions	6.82	6.81

- staff acts professionally (question 14):

expectations	6.60	6.69
importance	6.50	6.61
perceptions	6.78	6.79

Virtually all of your patients’ perception, expectation and importance scores were at or near the overall mean scores for all periodontists participating in the study. I believe that this was caused in large part because your patients participated so willingly in the study! In other words, so many of the responses were from your patients that the overall mean of the scores could not help but be close to your individual mean score on each question. However, the significant observation that I made from these results was that in every case, your patients’ perceptions scores were higher than their expectation scores. In other words, in every category studies in this research, you are meeting or exceeding your patients’ expectations!

Again, I want to thank you and your staff for participating so enthusiastically in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of friends like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

December 26, 1997

Dr. [perio4]

Virginia Beach, VA 23452

Dear [perio4],

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All Periodontists</u>
gender	males	3	84
	females	14	187
have insurance	yes	7	161
	no	6	105
treatment time	< 6 mo	8	124
	6 mo - 1 yr	1	28
	1 yr - 2 yr	0	16
	2 yr - 3 yr	2	21
	> 3 yrs	3	104
marital status	single	3	34
	married	9	183
	divorced	0	27
	separated	0	6
	widow(er)	1	21
first visit?	yes	2	41
	no	12	228

race	Caucasian	11	199
	Native Amer.	1	10
	African Amer.	1	42
	Hispanic Amer.	0	8
	Asian-Amer.	1	5
	Other	0	4

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 15 of your patients, with 259 total periodontal patients responding to the survey. Of course, all patients did not answer every question.

	<u>Your Patients</u>	<u>All Perio patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	5.33	5.98
importance	5.20	5.76
perceptions	5.86	6.39
Reliability		
- dependability of doctor (question 2):		
expectations	6.40	6.77
importance	6.47	6.74
perceptions	6.21	6.79
Responsiveness		
- employees willing to help (question 3):		
expectations	6.33	6.72
importance	6.47	6.57
perceptions	6.36	6.79
- doctor communicates well with patients (question 8):		
expectations	6.54	6.70
importance	6.33	6.69
perceptions	6.78	6.81

Assurance

- patients feel safe (question 4):

expectations	6.33	6.74
importance	6.40	6.73
perceptions	6.54	6.80

Empathy

- patients given individual attention (question 5):

expectations	6.64	6.64
importance	6.20	6.58
perceptions	6.54	6.79

- appointments available at convenient times (question 6):

expectations	5.93	6.15
importance	6.87	6.24
perceptions	6.57	6.71

- doctor trusted (question 12):

expectations	6.46	6.79
importance	6.53	6.80
perceptions	6.82	6.81

Dental questions

- treatments as painless as possible (question 9)

expectations	6.20	6.61
importance	6.21	6.53
perceptions	6.54	6.78

- precautions to protect patient from infectious disease (question 15):

expectations	6.60	6.83
importance	6.53	6.83
perceptions	6.43	6.86

Overall “professional” questions

- competence of doctor (question 7):

expectations	6.93	6.83
importance	6.53	6.77
perceptions	6.43	6.84

- patient treated with respect (question 10):

expectations	6.53	6.74
importance	6.47	6.73
perceptions	6.43	6.81

- fees too high (question 11):

expectations	5.80	6.37
importance	5.93	6.29
perceptions	5.85	6.27

- service of highest quality (question 13):

expectations	6.53	6.79
importance	6.47	6.80
perceptions	6.29	6.81

- staff acts professionally (question 14):

expectations	6.40	6.69
importance	6.33	6.61
perceptions	6.46	6.79

For 9 of the 15 questions, your patients’ perception scores were higher than their expectation scores - in other words, your practice is meeting or exceeding patients’ expectations in these areas. However, for questions 2, 5, 7, 10, 13 and 15, the reverse is true. You might want to examine your practice in these areas. However, I personally can’t have a lot of confidence in these results. Your “statistical universe” (the number of questionnaires completed by your patients) is much too low to allow any statistically significant conclusions to be drawn. Also, I noted to you previously (when we discussed the results obtained from my first questionnaire) that your patients were overwhelmingly impressed with your practice! I sincerely believe that, while you might want to consider these results as something to think

about, you should not be overly concerned with them. I only wish that your Virginia Beach patients had been more willing to participate in the research, so that we could get a better picture of how they evaluate your practice.

Again, I want to thank you and your staff for participating in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of friends like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

December 26, 1997

Dr. [prosth1]

Chesapeake, VA 23320

Dear [prosth1],

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All prosthodontists</u>
gender	males	8	20
	females	11	37
have insurance	yes	19	30
	no	1	18
treatment time	< 6 mo	3	9
	6 mo - 1 yr	1	4
	1 yr - 2 yr	3	3
	2 yr - 3 yr	2	6
	> 3 yrs	11	35
marital status	single	4	6
	married	13	38
	divorced	3	6
	separated	0	1
	widow(er)	0	8
first visit?	yes	2	3
	no	18	56

race	Caucasian	15	49
	Native Amer.	1	2
	African Amer.	4	6
	Hispanic Amer.	0	1
	Asian-Amer.	0	0
	Other	0	0

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 21 of your patients, with 60 total prosthodontic patients responding to the survey. Of course, all patients did not answer every question.

	<u>Your Patients</u>	<u>All Prosth patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	5.95	6.05
importance	5.29	5.53
perceptions	5.00	5.73
Reliability		
- dependability of doctor (question 2):		
expectations	6.57	6.85
importance	6.62	6.81
perceptions	6.35	6.64
Responsiveness		
- employees willing to help (question 3):		
expectations	6.29	6.60
importance	6.19	6.41
perceptions	6.05	6.49
- doctor communicates well with patients (question 8):		
expectations	6.57	6.68
importance	6.52	6.69
perceptions	6.40	6.65

Assurance

- patients feel safe (question 4):

expectations	6.38	6.73
importance	6.29	6.64
perceptions	6.25	6.62

Empathy

- patients given individual attention (question 5):

expectations	6.57	6.66
importance	6.57	6.66
perceptions	6.45	6.65

- appointments available at convenient times (question 6):

expectations	6.05	6.03
importance	6.38	6.19
perceptions	5.25	6.09

- doctor trusted (question 12):

expectations	6.67	6.87
importance	6.81	6.92
perceptions	6.65	6.76

Dental questions

- treatments as painless as possible (question 9)

expectations	6.19	6.63
importance	6.24	6.58
perceptions	6.10	6.56

- precautions to protect patient from infectious disease (question 15):

expectations	6.76	6.92
importance	6.81	6.92
perceptions	6.35	6.65

Overall “professional” questions

- competence of doctor (question 7):

expectations	6.71	6.87
importance	6.71	6.85
perceptions	6.45	6.69

- patient treated with respect (question 10):

expectations	6.67	6.77
importance	6.76	6.80
perceptions	6.50	6.60

- fees too high (question 11):

expectations	6.38	6.38
importance	6.24	6.11
perceptions	5.75	6.56

- service of highest quality (question 13):

expectations	6.71	6.88
importance	6.76	6.86
perceptions	6.55	6.73

- staff acts professionally (question 14):

expectations	6.38	6.62
importance	6.38	6.59
perceptions	6.26	6.56

For all of the 15 questions, your patients’ perception scores were lower than their expectation scores - in other words, your practice is not meeting patients’ expectations in these areas. The largest “gaps” appear to be in the areas of fees and convenient appointment times. Also, in the vast majority of categories, your practice’s scores are below the overall mean of all prosthodontic practices. These results may indicate a need for you and your staff to explain your services and policies to your patients more completely. However, I can’t have a lot of confidence in these results. Your “statistical universe” (the number of questionnaires completed by your patients) is much too low to allow any statistically significant conclusions to be drawn. I sincerely believe that, while you might want to consider these results as

something to think about, you should not be overly concerned with them.

Again, I want to thank you and your staff for participating in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of friends like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

December 26, 1997

Dr. [prosth2]

Virginia Beach, VA 23464

Dear [prosth2],

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All prosthodontists</u>
gender	males	5	20
	females	12	37
have insurance	yes	5	30
	no	11	18
treatment time	< 6 mo	4	9
	6 mo - 1 yr	1	4
	1 yr - 2 yr	0	3
	2 yr - 3 yr	4	6
	> 3 yrs	7	35
marital status	single	1	6
	married	11	38
	divorced	0	6
	separated	0	1
	widow(er)	5	8
first visit?	yes	0	3
	no	17	56

race	Caucasian	14	49
	Native Amer.	1	2
	African Amer.	1	6
	Hispanic Amer.	0	1
	Asian-Amer.	0	0
	Other	0	0

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 17 of your patients, with 60 total prosthodontic patients responding to the survey. Of course, all patients did not answer every question.

	<u>Your Patients</u>	<u>All Prosth patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	6.35	6.05
importance	6.13	5.53
perceptions	6.50	5.73
Reliability		
- dependability of doctor (question 2):		
expectations	6.57	6.85
importance	6.81	6.81
perceptions	7.00	6.64
Responsiveness		
- employees willing to help (question 3):		
expectations	6.81	6.60
importance	6.75	6.41
perceptions	6.76	6.49
- doctor communicates well with patients (question 8):		
expectations	6.88	6.68
importance	6.88	6.69
perceptions	7.00	6.65

Assurance

- patients feel safe (question 4):

expectations	7.00	6.73
importance	7.00	6.64
perceptions	7.00	6.62

Empathy

- patients given individual attention (question 5):

expectations	6.76	6.66
importance	6.88	6.66
perceptions	6.94	6.65

- appointments available at convenient times (question 6):

expectations	6.00	6.03
importance	6.44	6.19
perceptions	6.94	6.09

- doctor trusted (question 12):

expectations	7.00	6.87
importance	7.00	6.92
perceptions	7.00	6.76

Dental questions

- treatments as painless as possible (question 9)

expectations	6.94	6.63
importance	6.94	6.58
perceptions	7.00	6.56

- precautions to protect patient from infectious disease (question 15):

expectations	7.00	6.92
importance	6.86	6.92
perceptions	7.00	6.65

Overall "professional" questions

- competence of doctor (question 7):

expectations	7.00	6.87
importance	7.00	6.85
perceptions	7.00	6.69

- patient treated with respect (question 10):

expectations	6.76	6.77
importance	6.94	6.80
perceptions	6.62	6.60

- fees too high (question 11):

expectations	6.59	6.38
importance	6.31	6.11
perceptions	6.63	6.56

- service of highest quality (question 13):

expectations	7.00	6.88
importance	7.00	6.86
perceptions	6.68	6.73

- staff acts professionally (question 14):

expectations	6.82	6.62
importance	6.88	6.59
perceptions	6.81	6.56

For about half of the questions (numbers 1, 2, 5, 6, 8, 9, 10 and 13), your patients' perception scores were lower than their expectation scores - in other words, your practice is not meeting patients' expectations in these areas. In the vast majority of categories, your practice's scores are above the overall mean of all prosthodontic practices. These results may indicate a need for you and your staff to explain your services and policies to your patients more completely. However, I can't have a lot of confidence in these results. Your "statistical universe" (the number of questionnaires completed by your patients) is much too low to allow any statistically significant conclusions to be drawn. This is especially obvious when you note the large number of your scores that equal 7. The only way that an average score

to equal 7 is for all responses to be 7's! This is possible only when the number of responses is low. I sincerely believe that, while you might want to consider these results as something to think about, you should not be overly concerned with them. I only wish that we were able to obtain a larger number of responses, so that the analysis would be more statistically significant.

Again, I want to thank you and your staff for participating in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of friends like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

December 26, 1997

Dr. [prosth3]

Virginia Beach, VA 23454

Dear [prosth3],

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All prosthodontists</u>
gender	males	7	20
	females	15	37
have insurance	yes	6	30
	no	16	18
treatment time	< 6 mo	2	9
	6 mo - 1 yr	2	4
	1 yr - 2 yr	0	3
	2 yr - 3 yr	0	6
	> 3 yrs	17	35
marital status	single	1	6
	married	14	38
	divorced	3	6
	separated	1	1
	widow(er)	3	8
first visit?	yes	1	3
	no	21	56

race	Caucasian	20	49
	Native Amer.	0	2
	African Amer.	1	6
	Hispanic Amer.	1	1
	Asian-Amer.	0	0
	Other	0	0

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 22 of your patients, with 60 total prosthodontic patients responding to the survey. Of course, all patients did not answer every question.

	<u>Your Patients</u>	<u>All Prosth patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	5.91	6.05
importance	5.32	5.53
perceptions	5.91	5.73
Reliability		
- dependability of doctor (question 2):		
expectations	7.00	6.85
importance	7.00	6.81
perceptions	6.64	6.64
Responsiveness		
- employees willing to help (question 3):		
expectations	6.77	6.60
importance	6.36	6.41
perceptions	6.59	6.49
- doctor communicates well with patients (question 8):		
expectations	6.64	6.68
importance	6.73	6.69
perceptions	6.59	6.65

Assurance

- patients feel safe (question 4):

expectations	6.86	6.73
importance	6.73	6.64
perceptions	6.55	6.62

Empathy

- patients given individual attention (question 5):

expectations	6.67	6.66
importance	6.55	6.66
perceptions	6.59	6.65

- appointments available at convenient times (question 6):

expectations	6.05	6.03
importance	5.81	6.19
perceptions	6.18	6.09

- doctor trusted (question 12):

expectations	6.95	6.87
importance	6.95	6.92
perceptions	6.68	6.76

Dental questions

- treatments as painless as possible (question 9)

expectations	6.82	6.63
importance	6.64	6.58
perceptions	6.64	6.56

- precautions to protect patient from infectious disease (question 15):

expectations	7.00	6.92
importance	7.00	6.92
perceptions	6.71	6.65

Overall "professional" questions

- competence of doctor (question 7):

expectations	6.91	6.87
importance	6.86	6.85
perceptions	6.68	6.69

- patient treated with respect (question 10):

expectations	6.86	6.77
importance	6.73	6.80
perceptions	6.64	6.60

- fees too high (question 11):

expectations	6.23	6.38
importance	6.27	6.11
perceptions	5.41	6.56

- service of highest quality (question 13):

expectations	6.95	6.88
importance	6.86	6.86
perceptions	6.68	6.73

- staff acts professionally (question 14):

expectations	6.68	6.62
importance	6.83	6.59
perceptions	6.64	6.56

For the vast majority of the questions (all but numbers 1 and 12), your patients' perception scores were lower than their expectation scores - in other words, your practice is not meeting patients' expectations in these areas. Generally speaking, your scores were about the same as the overall average scores for all prosthodontic practices, with one notable exception. Your patients' perception score on the subject of fees is significantly lower than the average. This may indicate a need for you and your staff to better explain the value that patients receive in exchange for the fee that they are charged. However, I can't have a lot of confidence in these results. Your "statistical universe" (the number of questionnaires completed by your patients) is much too low to allow any statistically significant conclusions

to be drawn. This is especially obvious when you note the large number of your scores that equal 7. The only way that an average score to equal 7 is for all responses to be 7's! This is possible only when the number of responses is low. I sincerely believe that, while you might want to consider these results as something to think about, you should not be overly concerned with them. I only wish that we were able to obtain a larger number of responses, so that the analysis would be more statistically significant.

Again, I want to thank you and your staff for participating in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of friends like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

NOTE TO USERS

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UMI

race	Caucasian	31	36
	Native Amer.	0	0
	African Amer.	1	3
	Hispanic Amer.	0	0
	Asian-Amer.	0	0
	Other	0	0

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 32 of your patients, with 39 total prosthodontic patients responding to the survey. Of course, all patients did not answer every question.

As is obvious from even a cursory inspection of these figures, it has proven extremely difficult to convince endodontists to participate in this research. I only wish there had been more endodontic patients’ responses to the survey, so that you would be able to see some more meaningful comparisons with your own patients.

	<u>Your Patients</u>	<u>All Endo patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	6.16	6.10
importance	5.31	5.31
perceptions	6.40	6.28
Reliability		
- dependability of doctor (question 2):		
expectations	6.90	6.87
importance	6.83	6.81
perceptions	6.84	6.72
Responsiveness		
- employees willing to help (question 3):		
expectations	6.84	6.79
importance	6.73	6.68
perceptions	6.88	6.75

- doctor communicates well with patients (question 8):

expectations	6.81	6.82
importance	6.80	6.76
perceptions	6.78	6.67

Assurance

- patients feel safe (question 4):

expectations	6.90	6.87
importance	6.61	6.58
perceptions	6.88	6.78

Empathy

- patients given individual attention (question 5):

expectations	6.84	6.89
importance	6.74	6.74
perceptions	6.84	6.78

- appointments available at convenient times (question 6):

expectations	6.35	6.29
importance	5.57	6.46
perceptions	6.71	6.72

- doctor trusted (question 12):

expectations	6.90	6.92
importance	6.90	6.89
perceptions	6.88	6.78

Dental questions

- treatments as painless as possible (question 9)

expectations	6.87	6.74
importance	6.87	6.89
perceptions	6.81	6.72

- precautions to protect patient from infectious disease (question 15):

expectations	6.97	6.97
importance	7.00	6.97
perceptions	6.87	6.89

Overall “professional” questions

- competence of doctor (question 7):

expectations	6.94	6.92
importance	6.97	6.97
perceptions	6.90	6.83

- patient treated with respect (question 10):

expectations	6.90	6.92
importance	6.87	6.84
perceptions	6.88	6.81

- fees too high (question 11):

expectations	6.61	6.53
importance	6.60	6.38
perceptions	6.13	5.92

- service of highest quality (question 13):

expectations	6.90	6.84
importance	6.90	6.76
perceptions	6.84	6.75

- staff acts professionally (question 14):

expectations	6.84	6.84
importance	6.83	6.78
perceptions	6.88	6.89

As noted previously, your patients’ scores in this survey “drive” the averages for endodontic practices, so comparisons of your scores and the overall mean of all endodontic patients’ responses is essentially meaningless. However, some generalizations regarding your

patients' scores is possible, although such generalizations must be taken with some degree of caution - the number of your patients from whom I obtained responses is rather low to make statistically valid conclusions! However, generally speaking, your patients' perception scores are generally higher than their expectations scores (all but questions 1, 3, 6, and 14). Thus, in most areas, your practice is meeting or exceeding your patients' expectations. You might wish to review the areas in which your patients' expectations are not being met: physical facilities (question 1), employee's helpfulness (question 3), appointment scheduling (question 6), and office staff's professional manner (question 14).

Again, I want to thank you and your staff for participating so enthusiastically in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of colleagues like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

December 26, 1997

Dr. [endo2]

Virginia Beach, VA 23451

Dear [endo2],

I have finally completed the data analysis of the questionnaires you were kind enough to allow to be distributed to your patients. I apologize for this taking so long - I had planned to get this information to you early in December, but the analysis took longer than I anticipated. I hope that this information is useful to you. If you have any questions, please give me a call!

First, here are the demographics of the patients who responded. Only you can tell if they are truly representative of your overall patient population.

		<u>Your Patients</u>	<u>All endodontists</u>
gender	males	1	11
	females	6	28
have insurance	yes	6	18
	no	1	21
treatment time	< 6 mo	6	24
	6 mo - 1 yr	0	1
	1 yr - 2 yr	0	2
	2 yr - 3 yr	1	6
	> 3 yrs	0	4
marital status	single	1	5
	married	4	22
	divorced	0	2
	separated	1	2
	widow(er)	0	7
first visit?	yes	6	17
	no	1	22

race	Caucasian	5	36
	Native Amer.	0	0
	African Amer.	2	3
	Hispanic Amer.	0	0
	Asian-Amer.	0	0
	Other	0	0

Here is a breakdown of the responses to the questions about your practice. I have “grouped” the questions so that the analysis will (hopefully) be more meaningful to you. These results are based on responses by 7 of your patients, with 39 total endodontic patients responding to the survey. Of course, all patients did not answer every question.

As is obvious from even a cursory inspection of these figures, it has proven extremely difficult to convince endodontists to participate in this research. I only wish there had been more of your patients’ responding to the survey, so that you would be able to see some more meaningful comparisons with patients of other endodontists.

	<u>Your Patients</u>	<u>All Endo patients</u>
Tangibility		
- appeal of physical facilities (question 1):		
expectations	5.86	6.10
importance	5.29	5.31
perceptions	5.57	6.28
Reliability		
- dependability of doctor (question 2):		
expectations	6.71	6.87
importance	6.71	6.81
perceptions	6.17	6.72
Responsiveness		
- employees willing to help (question 3):		
expectations	6.71	6.79
importance	6.43	6.68
perceptions	6.17	6.75

- doctor communicates well with patients (question 8):

expectations	6.86	6.82
importance	6.57	6.76
perceptions	6.14	6.67

Assurance

- patients feel safe (question 4):

expectations	6.71	6.87
importance	6.43	6.58
perceptions	6.33	6.78

Empathy

- patients given individual attention (question 5):

expectations	7.00	6.89
importance	6.71	6.74
perceptions	6.50	6.78

- appointments available at convenient times (question 6):

expectations	6.00	6.29
importance	6.00	6.46
perceptions	6.83	6.72

- doctor trusted (question 12):

expectations	7.00	6.92
importance	6.86	6.89
perceptions	6.33	6.78

Dental questions

- treatments as painless as possible (question 9)

expectations	6.14	6.74
importance	7.00	6.89
perceptions	6.43	6.72

- precautions to protect patient from infectious disease (question 15):

expectations	7.00	6.97
importance	6.86	6.97
perceptions	7.00	6.89

Overall "professional" questions

- competence of doctor (question 7):

expectations	6.86	6.92
importance	7.00	6.97
perceptions	6.57	6.83

- patient treated with respect (question 10):

expectations	7.00	6.92
importance	6.71	6.84
perceptions	6.43	6.81

- fees too high (question 11):

expectations	6.14	6.53
importance	5.43	6.38
perceptions	4.60	5.92

- service of highest quality (question 13):

expectations	6.57	6.84
importance	6.00	6.76
perceptions	6.43	6.75

- staff acts professionally (question 14):

expectations	6.86	6.84
importance	6.83	6.78
perceptions	6.86	6.89

Unfortunately, the extremely small number of responses I received from your patients makes valid statistical conclusions impossible. However, some generalizations regarding your patients' scores is possible, although such generalizations must be taken with a great deal of

caution. Generally speaking, your patients' perception scores are lower than their expectations scores (all but questions 6, 14, and 15). Thus, in most areas, your practice is not meeting or exceeding your patients' expectations. Areas in which your practice is meeting or exceeding patients' expectations are: convenient appointment times, professional acting office staff, and protection of patients from infectious disease. One area in particular stands out - fees. From the analysis of question 11 (see above), the gap between your patients' expectations and perceptions regarding your fees is substantial - in fact, this was the largest gap found between patients' expectations and perceptions for all dentists' patients in the entire survey! It thus appears that your patients do not understand the value they receive in exchange for the fee they are charged. While your sample size was the smallest of all dentists who agreed to participate in this survey, there is only one chance in three that this particular result is due to some random effect (i.e., p-value for this particular test = 0.348). Some additional attention by you and your staff in this area seems indicated. Unfortunately, your small sample size made analysis of your other expectation-perception gaps meaningless.

Again, I want to thank you and your staff for agreeing to participate in my dissertation research. At this time, I hope to defend my dissertation early in March. There is no way that I could hope to complete this research without the assistance of colleagues like you!

Sincerely,

David P. Paul, III, D.D.S., M.B.A.

Appendix IV: Correlation Matrix of Scale Items

	E1	E2	E3	E4	E5	E6
Expectations regarding:						
Facilities be attractive (E1)	1.0000	.3657	.3728	.3078	.2769	.3120
	p=.	p=.000	p=.000	p=.000	p=.000	p=.000
Doctor be dependable (E2)	.3657	1.0000	.7961	.7594	.6197	.3060
	p=.000	p=.	p=.000	p=.000	p=.000	p=.000
Employees willing to help (E3)	.3728	.7961	1.0000	.8237	.6323	.3768
	p=.000	p=.000	p=.	p=.000	p=.000	p=.000
Transactions should be safe (E4)	.3078	.7594	.8237	1.0000	.6137	.3383
	p=.000	p=.000	p=.000	p=.	p=.000	p=.000
Individual attention given patient (E5)	.2769	.6197	.6323	.6137	1.0000	.3890
	p=.000	p=.000	p=.000	p=.000	p=.	p=.000
Appointments should be convenient (E6)	.3120	.3060	.3768	.3383	.3890	1.0000
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.
Doctor should be competent (E7)	.2898	.7954	.7402	.7702	.6199	.3170
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Doctor communicates well (E8)	.3521	.5839	.6502	.6297	.5625	.4226
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Treatments as painless as possible (E9)	.3758	.5967	.6081	.6342	.4669	.4062
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Patients treated with respect (E10)	.3144	.7078	.7080	.7278	.6018	.3619
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Charges not too high (E11)	.2659	.3111	.3984	.3328	.3312	.4322
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Doctor trustable (E12)	.3143	.7511	.7183	.7736	.5741	.2830
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Services of highest quality (E13)	.2855	.7151	.7034	.7586	.6007	.3204
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Staff acts professionally (E14)	.3365	.6203	.6467	.6470	.5280	.2482
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Protection from infectious disease (E15)	.2433	.7449	.6347	.6533	.5445	.2492
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Importance of:						
Attractiveness of facilities (I1)	.6586	.1355	.1775	.0803	.0715	.2454
	p=.000	p=.015	p=.001	p=.152	p=.203	p=.000
Dependability of doctor (I2)	.2869	.4738	.4753	.4211	.3468	.2333
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Willingness of employees to help (I3)	.2771	.2652	.4318	.3438	.3183	.2686
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Safety of transactions (I4)	.2131	.3415	.4476	.4608	.2730	.2306
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Individual attention given patient (I5)	.2524	.2471	.3469	.2725	.5401	.2905
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Convenient appointment times (I6)	.3375	.1145	.1782	.1281	.2428	.5765
	p=.000	p=.041	p=.001	p=.022	p=.000	p=.000
Competence of doctor (I7)	.1882	.4008	.3897	.4031	.3260	.1697
	p=.001	p=.000	p=.000	p=.000	p=.000	p=.002
Doctor communicates well (I8)	.2956	.3316	.3928	.3390	.3116	.2646
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000

(Coefficient/(Cases) / 2-tailed Significance)

". "is printed if a coefficient cannot be computed

	E1	E2	E3	E4	E5	E6
Treatments as painless as possible (I9)	.2818	.2775	.3218	.2997	.2578	.2655
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Patients treated with respect (I10)	.3157	.3818	.4364	.3619	.3368	.2728
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Charges not too high (I11)	.2619	.1263	.1931	.1770	.1753	.2883
	p=.000	p=.024	p=.001	p=.002	p=.002	p=.000
Doctor trustable (I12)	.2152	.4527	.5074	.4745	.3482	.1546
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.006
Services of highest quality (I13)	.2141	.4259	.4022	.3689	.3674	.2009
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Staff acts professionally (I14)	.2849	.3075	.3795	.3030	.2998	.1956
	p=.000	p=.000	p=.000	p=.000	p=.000	p=.000
Protection from infectious disease (I15)	.1450	.3742	.3702	.3859	.2805	.0906
	p=.010	p=.000	p=.000	p=.000	p=.000	p=.106
Perception of:						
Attractiveness of facility (P1)	.4131	.2298	.2746	.2150	.1519	.0884
	p=.000	p=.000	p=.000	p=.000	p=.007	p=.115
Dependability of doctor (P2)	.1747	.3073	.3052	.2682	.2220	.0367
	p=.002	p=.000	p=.000	p=.000	p=.000	p=.513
Willingness of employees to help (P3)	.1413	.2446	.3424	.3156	.1457	.0033
	p=.012	p=.000	p=.000	p=.000	p=.009	p=.954
Safety of transactions (P4)	.1255	.2463	.2313	.2143	.1598	.0270
	p=.025	p=.000	p=.000	p=.000	p=.004	p=.631
Individual attention given patient (P5)	.1228	.1907	.2538	.2232	.2570	.0826
	p=.028	p=.001	p=.000	p=.000	p=.000	p=.141
Convenient appointment times (P6)	.1461	.1918	.3380	.3051	.1638	.1353
	p=.009	p=.001	p=.000	p=.000	p=.003	p=.016
Competence of doctor (P7)	.0980	.2138	.2661	.3043	.1868	.0542
	p=.081	p=.000	p=.000	p=.000	p=.001	p=.334
Doctor communicates well (P8)	.1187	.1476	.2575	.2736	.1682	.0846
	p=.034	p=.008	p=.000	p=.000	p=.003	p=.131
Treatments as painless as possible (P9)	.1376	.2028	.2738	.2861	.2087	.1049
	p=.014	p=.000	p=.000	p=.000	p=.000	p=.061
Patients treated with respect (P10)	.1188	.2337	.2623	.2604	.2268	.0268
	p=.034	p=.000	p=.000	p=.000	p=.000	p=.633
Charges not too high (P11)	.1678	.1152	.1794	.1596	.0748	.0174
	p=.003	p=.040	p=.001	p=.004	p=.183	p=.757
Doctor trustable (P12)	.1162	.2716	.1923	.2392	.1653	.0227
	p=.038	p=.000	p=.001	p=.000	p=.003	p=.686
Services of highest quality (P13)	.1731	.2060	.1732	.1402	.1499	.0406
	p=.002	p=.000	p=.002	p=.012	p=.007	p=.470
Staff acts professionally (P14)	.1708	.2088	.2427	.2256	.1324	-.0095
	p=.002	p=.000	p=.000	p=.000	p=.018	p=.866
Protection from infectious disease (P15)	.1560	.2745	.2817	.2310	.1890	.0287
	p=.005	p=.000	p=.000	p=.000	p=.001	p=.609
Overall service quality (OA)	.1089	.0935	.1591	.1165	.0712	.0050
	p=.052	p=.095	p=.004	p=.038	p=.205	p=.930

(Coefficient / (Cases) / 2-tailed Significance)

". "is printed if a coefficient cannot be computed

	E7	E8	E9	E10	E11	E12	E3	E14	E15
E1	.2898 p=.000	.3521 p=.000	.3758 p=.000	.3144 p=.000	.2659 p=.000	.3143 p=.000	.2855 p=.000	.3365 p=.000	.2433 p=.000
E2	.7954 p=.000	.5839 p=.000	.5967 p=.000	.7078 p=.000	.3111 p=.000	.7511 p=.000	.7151 p=.000	.6203 p=.000	.7449 p=.000
E3	.7402 p=.000	.6502 p=.000	.6081 p=.000	.7080 p=.000	.3984 p=.000	.7183 p=.000	.7034 p=.000	.6467 p=.000	.6347 p=.000
E4	.7702 p=.000	.6297 p=.000	.6342 p=.000	.7278 p=.000	.3328 p=.000	.7736 p=.000	.7586 p=.000	.6470 p=.000	.6533 p=.000
E5	.6199 p=.000	.5625 p=.000	.4669 p=.000	.6018 p=.000	.3312 p=.000	.5741 p=.000	.6007 p=.000	.5280 p=.000	.5445 p=.000
E6	.3170 p=.000	.4226 p=.000	.4062 p=.000	.3619 p=.000	.4322 p=.000	.2830 p=.000	.3204 p=.000	.2482 p=.000	.2492 p=.000
E7	1.0000 p=.	.7130 p=.000	.6132 p=.000	.8118 p=.000	.3369 p=.000	.8508 p=.000	.8393 p=.000	.6768 p=.000	.8208 p=.000
E8	.7130 p=.000	1.0000 p=.	.6249 p=.000	.7520 p=.000	.4391 p=.000	.6829 p=.000	.6775 p=.000	.5745 p=.000	.6211 p=.000
E9	.6132 p=.000	.6249 p=.000	1.0000 p=.	.6264 p=.000	.3946 p=.000	.6103 p=.000	.6303 p=.000	.5424 p=.000	.5326 p=.000
E10	.8118 p=.000	.7520 p=.000	.6264 p=.000	1.0000 p=.	.3449 p=.000	.7792 p=.000	.7876 p=.000	.6632 p=.000	.7166 p=.000
E11	.3369 p=.000	.4391 p=.000	.3946 p=.000	.3449 p=.000	1.0000 p=.	.3353 p=.000	.3523 p=.000	.3718 p=.000	.3321 p=.000
E12	.8508 p=.000	.6829 p=.000	.6103 p=.000	.7792 p=.000	.3353 p=.000	1.0000 p=.	.8744 p=.000	.6882 p=.000	.8395 p=.000
E13	.8393 p=.000	.6775 p=.000	.6303 p=.000	.7876 p=.000	.3523 p=.000	.8744 p=.000	1.0000 p=.	.6722 p=.000	.7869 p=.000
E14	.6768 p=.000	.5745 p=.000	.5424 p=.000	.6632 p=.000	.3718 p=.000	.6882 p=.000	.6722 p=.000	1.0000 p=.	.6138 p=.000
E15	.8208 p=.000	.6211 p=.000	.5326 p=.000	.7166 p=.000	.3321 p=.000	.8395 p=.000	.7869 p=.000	.6138 p=.000	1.0000 p=.
I1	.0433 p=.441	.1061 p=.058	.1998 p=.000	.0807 p=.150	.1271 p=.023	.0595 p=.289	.0309 p=.582	.1416 p=.011	-.0142 p=.800
I2	.3783 p=.000	.3261 p=.000	.3178 p=.000	.4014 p=.000	.1614 p=.004	.3727 p=.000	.3492 p=.000	.3268 p=.000	.2254 p=.000
I3	.2560 p=.000	.3783 p=.000	.2865 p=.000	.3540 p=.000	.2193 p=.000	.2883 p=.000	.2658 p=.000	.3745 p=.000	.1145 p=.041
I4	.2703 p=.000	.3038 p=.000	.3308 p=.000	.2897 p=.000	.2308 p=.000	.3278 p=.000	.2927 p=.000	.3343 p=.000	.1644 p=.003
I5	.2555 p=.000	.3695 p=.000	.2608 p=.000	.3421 p=.000	.2160 p=.000	.2432 p=.000	.2725 p=.000	.3880 p=.000	.1166 p=.037
I6	.0910 p=.105	.2824 p=.000	.3191 p=.000	.1477 p=.008	.3368 p=.000	.0551 p=.327	.0861 p=.125	.1758 p=.002	.0000 p=1.000
I7	.5019 p=.000	.4586 p=.000	.3354 p=.000	.4396 p=.000	.1125 p=.045	.4293 p=.000	.4224 p=.000	.3821 p=.000	.2713 p=.000
I8	.3288 p=.000	.5094 p=.000	.3268 p=.000	.3917 p=.000	.1961 p=.000	.3186 p=.000	.2839 p=.000	.4326 p=.000	.1732 p=.002

(Coefficient / (Cases) / 2-tailed Significance)
 "." is printed if a coefficient cannot be computed

	E7	E8	E9	E10	E11	E12	E13	E14	E15
I9	.2592 p=.000	.3500 p=.000	.5795 p=.000	.3158 p=.000	.2202 p=.000	.2355 p=.000	.2692 p=.000	.2999 p=.000	.1160 p=.038
I10	.3492 p=.000	.4140 p=.000	.3077 p=.000	.4872 p=.000	.2294 p=.000	.3729 p=.000	.3779 p=.000	.3982 p=.000	.2239 p=.000
I11	.0697 p=.214	.1857 p=.001	.2067 p=.000	.0928 p=.098	.5226 p=.000	.0660 p=.240	.0877 p=.118	.1536 p=.006	.0264 p=.638
I12	.4472 p=.000	.3627 p=.000	.3017 p=.000	.4843 p=.000	.1386 p=.013	.5012 p=.000	.4936 p=.000	.3688 p=.000	.3173 p=.000
I13	.3669 p=.000	.2923 p=.000	.3601 p=.000	.4211 p=.000	.1820 p=.001	.3650 p=.000	.4836 p=.000	.3683 p=.000	.2996 p=.000
I14	.2444 p=.000	.3026 p=.000	.2610 p=.000	.3287 p=.000	.2128 p=.000	.3170 p=.000	.2840 p=.000	.5321 p=.000	.1581 p=.005
I15	.3849 p=.000	.3067 p=.000	.2829 p=.000	.4275 p=.000	.1087 p=.053	.3904 p=.000	.4371 p=.000	.2707 p=.000	.4103 p=.000
P1	.1363 p=.015	.1801 p=.001	.1738 p=.002	.1547 p=.006	.1067 p=.057	.2087 p=.000	.1674 p=.003	.2001 p=.000	.0849 p=.130
P2	.2046 p=.000	.1888 p=.001	.1795 p=.001	.1970 p=.000	.0225 p=.689	.2824 p=.000	.1853 p=.001	.1820 p=.001	.1563 p=.005
P3	.2160 p=.000	.2151 p=.000	.2356 p=.000	.2764 p=.000	.0526 p=.349	.3102 p=.000	.2420 p=.000	.2713 p=.000	.1494 p=.008
P4	.2099 p=.000	.1748 p=.002	.2025 p=.000	.2027 p=.000	.0380 p=.499	.2836 p=.000	.2285 p=.000	.2167 p=.000	.1648 p=.003
P5	.2469 p=.000	.2490 p=.000	.1910 p=.001	.2741 p=.000	.0238 p=.672	.2705 p=.000	.2384 p=.000	.2263 p=.000	.1331 p=.017
P6	.2192 p=.000	.3059 p=.000	.3275 p=.000	.2451 p=.000	.1792 p=.001	.2631 p=.000	.2067 p=.000	.2877 p=.000	.1339 p=.017
P7	.3005 p=.000	.2620 p=.000	.2735 p=.000	.2753 p=.000	.0504 p=.370	.3326 p=.000	.2642 p=.000	.2273 p=.000	.1975 p=.000
P8	.2266 p=.000	.2529 p=.000	.2184 p=.000	.2491 p=.000	.0852 p=.129	.2669 p=.000	.2073 p=.000	.2197 p=.000	.1236 p=.027
P9	.2215 p=.000	.2358 p=.000	.3128 p=.000	.2647 p=.000	.0794 p=.157	.2847 p=.000	.1982 p=.000	.2648 p=.000	.1320 p=.018
P10	.2885 p=.000	.2249 p=.000	.2587 p=.000	.2616 p=.000	.2074 p=.000	.2843 p=.000	.2525 p=.000	.2376 p=.000	.2078 p=.000
P11	.0800 p=.154	.1423 p=.011	.1021 p=.069	.0815 p=.147	.0480 p=.393	.1126 p=.044	.0347 p=.537	.1435 p=.010	-.0148 p=.792
P12	.2121 p=.000	.1665 p=.003	.2059 p=.000	.2138 p=.000	.0248 p=.659	.2527 p=.000	.1679 p=.003	.1923 p=.001	.1896 p=.001
P13	.1601 p=.004	.1693 p=.002	.1880 p=.001	.2045 p=.000	.0144 p=.798	.2559 p=.000	.1480 p=.008	.1646 p=.003	.1258 p=.025
P14	.1508 p=.007	.1822 p=.001	.2475 p=.000	.2378 p=.000	.1287 p=.022	.2750 p=.000	.1751 p=.002	.3121 p=.000	.1277 p=.023
P15	.1878 p=.001	.1797 p=.001	.2203 p=.000	.2124 p=.000	.0722 p=.198	.2596 p=.000	.1767 p=.002	.2552 p=.000	.1671 p=.003
OA	.0854 p=.128	.1304 p=.020	.1028 p=.067	.0825 p=.141	.1405 p=.012	.1192 p=.033	.0696 p=.215	.0811 p=.148	.0332 p=.555

(Coefficient / (Cases) / 2-tailed Significance)

". "is printed if a coefficient cannot be computed

	I1	I2	I3	I4	I5	I6	I7	I8	I9
E1	.6586 p=.000	.2869 p=.000	.2771 p=.000	.2131 p=.000	.2524 p=.000	.3375 p=.000	.1882 p=.001	.2956 p=.000	.2818 p=.000
E2	.1355 p=.015	.4738 p=.000	.2652 p=.000	.3415 p=.000	.2471 p=.000	.1145 p=.041	.4008 p=.000	.3316 p=.000	.2775 p=.000
E3	.1775 p=.001	.4753 p=.000	.4318 p=.000	.4476 p=.000	.3469 p=.000	.1782 p=.001	.3897 p=.000	.3928 p=.000	.3218 p=.000
E4	.0803 p=.152	.4211 p=.000	.3438 p=.000	.4608 p=.000	.2725 p=.000	.1281 p=.022	.4031 p=.000	.3390 p=.000	.2997 p=.000
E5	.0715 p=.203	.3468 p=.000	.3183 p=.000	.2730 p=.000	.5401 p=.000	.2428 p=.000	.3260 p=.000	.3116 p=.000	.2578 p=.000
E6	.2454 p=.000	.2333 p=.000	.2686 p=.000	.2306 p=.000	.2905 p=.000	.5765 p=.000	.1697 p=.002	.2646 p=.000	.2655 p=.000
E7	.0433 p=.441	.3783 p=.000	.2560 p=.000	.2703 p=.000	.2555 p=.000	.0910 p=.105	.5019 p=.000	.3288 p=.000	.2592 p=.000
E8	.1061 p=.058	.3261 p=.000	.3783 p=.000	.3038 p=.000	.3695 p=.000	.2824 p=.000	.4586 p=.000	.5094 p=.000	.3500 p=.000
E9	.1998 p=.000	.3178 p=.000	.2865 p=.000	.3308 p=.000	.2608 p=.000	.3191 p=.000	.3354 p=.000	.3268 p=.000	.5795 p=.000
E10	.0807 p=.150	.4014 p=.000	.3540 p=.000	.2897 p=.000	.3421 p=.000	.1477 p=.008	.4396 p=.000	.3917 p=.000	.3158 p=.000
E11	.1271 p=.023	.1614 p=.004	.2193 p=.000	.2308 p=.000	.2160 p=.000	.3368 p=.000	.1125 p=.045	.1961 p=.000	.2202 p=.000
E12	.0595 p=.289	.3727 p=.000	.2883 p=.000	.3278 p=.000	.2432 p=.000	.0551 p=.327	.4293 p=.000	.3186 p=.000	.2355 p=.000
E13	.0309 p=.582	.3492 p=.000	.2658 p=.000	.2927 p=.000	.2725 p=.000	.0861 p=.125	.4224 p=.000	.2839 p=.000	.2692 p=.000
E14	.1416 p=.011	.3268 p=.000	.3745 p=.000	.3343 p=.000	.3880 p=.000	.1758 p=.002	.3821 p=.000	.4326 p=.000	.2999 p=.000
E15	-.0142 p=.800	.2254 p=.000	.1145 p=.041	.1644 p=.003	.1166 p=.037	.0000 p=1.000	.2713 p=.000	.1732 p=.002	.1160 p=.038
I1	1.0000 p=.	.3186 p=.000	.3819 p=.000	.2572 p=.000	.2950 p=.000	.4192 p=.000	.1567 p=.005	.3542 p=.000	.3167 p=.000
I2	.3186 p=.000	1.0000 p=.	.5545 p=.000	.4944 p=.000	.4418 p=.000	.2777 p=.000	.5198 p=.000	.5374 p=.000	.4962 p=.000
I3	.3819 p=.000	.5545 p=.000	1.0000 p=.	.5888 p=.000	.5516 p=.000	.4275 p=.000	.4701 p=.000	.6347 p=.000	.4311 p=.000
I4	.2572 p=.000	.4944 p=.000	.5888 p=.000	1.0000 p=.	.4255 p=.000	.3004 p=.000	.4822 p=.000	.4928 p=.000	.3709 p=.000
I5	.2950 p=.000	.4418.5516 p=.000	.5516 p=.000	.4255 p=.000	1.0000 p=.	.4415 p=.000	.4615 p=.000	.6006 p=.000	.3777 p=.000
I6	.4192 p=.000	.2777 p=.000	.4275 p=.000	.3004 p=.000	.4415 p=.000	1.0000 p=.	.2742 p=.000	.4103 p=.000	.3960 p=.000
I7	.1567 p=.005	.5198 p=.000	.4701 p=.000	.4822 p=.000	.4615 p=.000	.2742 p=.000	1.0000 p=.	.5783 p=.000	.3725 p=.000
I8	.3542 p=.000	.5374 p=.000	.6347 p=.000	.4928 p=.000	.6006 p=.000	.4103 p=.000	.5783 p=.000	1.0000 p=.	.5014 p=.000

(Coefficient / (Cases) / 2-tailed Significance)

". "is printed if a coefficient cannot be computed

	I1	I2	I3	I4	I5	I6	I7	I8	I9
I9	.3167 p=.000	.4962 p=.000	.4311 p=.000	.3709 p=.000	.3777 p=.000	.3960 p=.000	.3725 p=.000	.5014 p=.000	1.0000 p=.
I10	.3200 p=.000	.6583 p=.000	.5715 p=.000	.4789 p=.000	.5957 p=.000	.3417 p=.000	.6016 p=.000	.6330 p=.000	.5033 p=.000
I11	.2892 p=.000	.1779 p=.001	.3343 p=.000	.3226 p=.000	.3286 p=.000	.4328 p=.000	.1566 p=.005	.2991 p=.000	.2835 p=.000
I12	.1670 p=.003	.6316 p=.000	.3936 p=.000	.4996 p=.000	.4249 p=.000	.1265 p=.024	.6412 p=.000	.4554 p=.000	.4123 p=.000
I13	.1996 p=.000	.5522 p=.000	.3596 p=.000	.4662 p=.000	.4312 p=.000	.2062 p=.000	.521 p=.000	2.4049 p=.000	.3393 p=.000
I14	.3824 p=.000	.5052 p=.000	.7380 p=.000	.5145 p=.000	.5933 p=.000	.3575 p=.000	.4912 p=.000	.6587 p=.000	.4242 p=.000
I15	.0759 p=.176	.4768 p=.000	.2806 p=.000	.4070 p=.000	.3415 p=.000	.0960 p=.087	.5746 p=.000	.3344 p=.000	.2841 p=.000
P1	.3878 p=.000	.3199 p=.000	.3764 p=.000	.3500 p=.000	.2376 p=.000	.2177 p=.000	.2298 p=.000	.3266 p=.000	.2593 p=.000
P2	.1146 p=.041	.3483 p=.000	.2651 p=.000	.3679 p=.000	.2282 p=.000	.0725 p=.196	.3380 p=.000	.2792 p=.000	.2185 p=.000
P3	.1114 p=.047	.3727 p=.000	.4069 p=.000	.4231 p=.000	.2557 p=.000	.0690 p=.219	.2965 p=.000	.2916 p=.000	.3083 p=.000
P4	.0587 p=.296	.3200 p=.000	.2616 p=.000	.3314 p=.000	.2102 p=.000	.0445 p=.428	.2776 p=.000	.2466 p=.000	.2116 p=.000
P5	.0758 p=.177	.2870 p=.000	.3247 p=.000	.2590 p=.000	.2819 p=.000	.0761 p=.175	.3413 p=.000	.3099 p=.000	.2592 p=.000
P6	.1303 p=.020	.3166 p=.000	.4093 p=.000	.4579 p=.000	.2434 p=.000	.2125 p=.000	.2823 p=.000	.3820 p=.000	.3278 p=.000
P7	.0610 p=.277	.3094 p=.000	.2809 p=.000	.2820 p=.000	.2094 p=.000	.0229 p=.684	.3970 p=.000	.2674 p=.000	.2495 p=.000
P8	.0674 p=.230	.3027 p=.000	.2870 p=.000	.2626 p=.000	.1831 p=.001	.0517 p=.357	.3022 p=.000	.2745 p=.000	.2203 p=.000
P9	.0953 p=.089	.2971 p=.000	.3414 p=.000	.3637 p=.000	.1980 p=.000	.1034 p=.065	.3072 p=.000	.3054 p=.000	.3646 p=.000
P10	.0391 p=.487	.3046 p=.000	.2110 p=.000	.2713 p=.000	.2120 p=.000	.0427 p=.447	.3377 p=.000	.2956 p=.000	.2587 p=.000
P11	.1203 p=.032	.1523 p=.006	.2300 p=.000	.1960 p=.000	.1733 p=.002	.1302 p=.020	.1522 p=.006	.2370 p=.000	.1158 p=.039
P12	.0549 p=.329	.3055 p=.000	.2462 p=.000	.2942 p=.000	.2235 p=.000	.0498 p=.375	.3362 p=.000	.2933 p=.000	.2101 p=.000
P13	.1185 p=.034	.2777 p=.000	.2675 p=.000	.2782 p=.000	.1806 p=.001	.0538 p=.339	.2497 p=.000	.2360 p=.000	.2382 p=.000
P14	.1035 p=.065	.2752 p=.000	.3386 p=.000	.3025 p=.000	.1853 p=.001	.0493 p=.380	.2288 p=.000	.2835 p=.000	.2360 p=.000
P15	.1349 p=.016	.3260 p=.000	.2654 p=.000	.2971 p=.000	.1623 p=.004	.0423 p=.451	.2484 p=.000	.2366 p=.000	.2807 p=.000
OA	.0699 p=.213	.1669 p=.003	.1676 p=.003	.2105 p=.000	.0436 p=.438	-.0133 p=.813	.1794 p=.001	.1447 p=.010	.1674 p=.003

(Coefficient / (Cases) / 2-tailed Significance)

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	I10	I11	I12	I13	I14	I15	P1	P2	P3
E1	.3157 p=.000	.2619 p=.000	.2152 p=.000	.2141 p=.000	.2849 p=.000	.1450 p=.010	.4131 p=.000	.1747 p=.002	.1413 p=.012
E2	.3818 p=.000	.1263 p=.024	.4527 p=.000	.4259 p=.000	.3075 p=.000	.3742 p=.000	.2298 p=.000	.3073 p=.000	.2446 p=.000
E3	.4364 p=.000	.1931 p=.001	.5074 p=.000	.4022 p=.000	.3795 p=.000	.3702 p=.000	.2746 p=.000	.3052 p=.000	.3424 p=.000
E4	.3619 p=.000	.1770 p=.002	.4745 p=.000	.3689 p=.000	.3030 p=.000	.3859 p=.000	.2150 p=.000	.2682 p=.000	.3156 p=.000
E5	.3368 p=.000	.1753 p=.002	.3482 p=.000	.3674 p=.000	.2998 p=.000	.2805 p=.000	.1519 p=.007	.2220 p=.000	.1457 p=.009
E6	.2728 p=.000	.2883 p=.000	.1546 p=.006	.2009 p=.000	.1956 p=.000	.0906 p=.106	.0884 p=.115	.0367 p=.513	.0033 p=.954
E7	.3492 p=.000	.0697 p=.214	.4472 p=.000	.3669 p=.000	.2444 p=.000	.3849 p=.000	.1363 p=.015	.2046 p=.000	.2160 p=.000
E8	.4140 p=.000	.1857 p=.001	.3627 p=.000	.2923 p=.000	.3026 p=.000	.3067 p=.000	.1801 p=.001	.1888 p=.001	.2151 p=.000
E9	.3077 p=.000	.2067 p=.000	.3017 p=.000	.3601 p=.000	.2610 p=.000	.2829 p=.000	.1738 p=.002	.1795 p=.001	.2356 p=.000
E10	.4872 p=.000	.0928 p=.098	.4843 p=.000	.4211 p=.000	.3287 p=.000	.4275 p=.000	.1547 p=.006	.1970 p=.000	.2764 p=.000
E11	.2294 p=.000	.5226 p=.000	.1386 p=.013	.1820 p=.001	.2128 p=.000	.1087 p=.053	.1067 p=.057	.0225 p=.689	.0526 p=.349
E12	.3729 p=.000	.0660 p=.240	.5012 p=.000	.3650 p=.000	.3170 p=.000	.3904 p=.000	.2087 p=.000	.2824 p=.000	.3102 p=.000
E13	.3779 p=.000	.0877 p=.118	.4936 p=.000	.4836 p=.000	.2840 p=.000	.4371 p=.000	.1674 p=.003	.1853 p=.001	.2420 p=.000
E14	.3982 p=.000	.1536 p=.006	.3688 p=.000	.3683 p=.000	.5321 p=.000	.2707 p=.000	.2001 p=.000	.1820 p=.001	.2713 p=.000
E15	.2239 p=.000	.0264 p=.638	.3173 p=.000	.2996 p=.000	.1581 p=.005	.4103 p=.000	.0849 p=.130	.1563 p=.005	.1494 p=.008
I1	.3200 p=.000	.2892 p=.000	.1670 p=.003	.1996 p=.000	.3824 p=.000	.0759 p=.176	.3878 p=.000	.1146 p=.041	.1114 p=.047
I2	.6583 p=.000	.1779 p=.001	.6316 p=.000	.5522 p=.000	.5052 p=.000	.4768 p=.000	.3199 p=.000	.3483 p=.000	.3727 p=.000
I3	.5715 p=.000	.3343 p=.000	.3936 p=.000	.3596 p=.000	.7380 p=.000	.2806 p=.000	.3764 p=.000	.2651 p=.000	.4069 p=.000
I4	.4789 p=.000	.3226 p=.000	.4996 p=.000	.4662 p=.000	.5145 p=.000	.4070 p=.000	.3500 p=.000	.3679 p=.000	.4231 p=.000
I5	.5957 p=.000	.3286 p=.000	.4249 p=.000	.4312 p=.000	.5933 p=.000	.3415 p=.000	.2376 p=.000	.2282 p=.000	.2557 p=.000
I6	.3417 p=.000	.4328 p=.000	.1265 p=.024	.2062 p=.000	.3575 p=.000	.0960 p=.087	.2177 p=.000	.0725 p=.196	.0690 p=.219
I7	.6016 p=.000	.1566 p=.005	.6412 p=.000	.5212 p=.000	.4912 p=.000	.5746 p=.000	.2298 p=.000	.3380 p=.000	.2965 p=.000
I8	.6330 p=.000	.2991 p=.000	.4554 p=.000	.4049 p=.000	.6587 p=.000	.3344 p=.000	.3266 p=.000	.2792 p=.000	.2916 p=.000

(Coefficient / (Cases) / 2-tailed Significance)

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	I10	I11	I12	I13	I14	I15	P1	P2	P3
I9	.5033 p=.000	.2835 p=.000	.4123 p=.000	.3393 p=.000	.4242 p=.000	.2841 p=.000	.2593 p=.000	.2185 p=.000	.3083 p=.000
I10	1.0000 p=.	.2392 p=.000	.6247 p=.000	.5678 p=.000	.6629 p=.000	.4659 p=.000	.2762 p=.000	.2451 p=.000	.2867 p=.000
I11	.2392 p=.000	1.0000 p=.	.1471 p=.009	.2255 p=.000	.3288 p=.000	.1314 p=.019	.1821 p=.001	.0381 p=.498	.0784 p=.163
I12	.6247 p=.000	.1471 p=.009	1.0000 p=.	.6577 p=.000	.4410 p=.000	.6974 p=.000	.2403 p=.000	.3839 p=.000	.3731 p=.000
I13	.5678 p=.000	.2255 p=.000	.6577 p=.000	1.0000 p=.	.4479 p=.000	.6030 p=.000	.1801 p=.001	.3032 p=.000	.2636 p=.000
I14	.6629 p=.000	.3288 p=.000	.4410 p=.000	.4479 p=.000	1.0000 p=.	.3543 p=.000	.3220 p=.000	.2852 p=.000	.3357 p=.000
I15	.4659 p=.000	.1314 p=.019	.6974 p=.000	.6030 p=.000	.3543 p=.000	1.0000 p=.	.1934 p=.001	.2883 p=.000	.3171 p=.000
P1	.2762 p=.000	.1821 p=.001	.2403 p=.000	.1801 p=.001	.3220 p=.000	.1934 p=.001	1.0000 p=.	.5170 p=.000	.5489 p=.000
P2	.2451 p=.000	.0381 p=.498	.3839 p=.000	.3032 p=.000	.2852 p=.000	.2883 p=.000	.5170 p=.000	1.0000 p=.	.7666 p=.000
P3	.2867 p=.000	.0784 p=.163	.3731 p=.000	.2636 p=.000	.3357 p=.000	.3171 p=.000	.5489 p=.000	.7666 p=.000	1.0000 p=.
P4	.2370 p=.000	.0352 p=.531	.3144 p=.000	.2404 p=.000	.2508 p=.000	.3621 p=.000	.4767 p=.000	.7714 p=.000	.7388 p=.000
P5	.2757 p=.000	.0376 p=.504	.3481 p=.000	.2272 p=.000	.2740 p=.000	.3056 p=.000	.3905 p=.000	.6058 p=.000	.5851 p=.000
P6	.2857 p=.000	.1630 p=.004	.2671 p=.000	.2277 p=.000	.3589 p=.000	.2294 p=.000	.5543 p=.000	.5409 p=.000	.6353 p=.000
P7	.2284 p=.000	.0137 p=.808	.4216 p=.000	.2398 p=.000	.2075 p=.000	.3868 p=.000	.3853 p=.000	.6039 p=.000	.5695 p=.000
P8	.2132 p=.000	.0524 p=.351	.3412 p=.000	.1634 p=.003	.2272 p=.000	.2672 p=.000	.3845 p=.000	.5093 p=.000	.4985 p=.000
P9	.2689 p=.000	.0489 p=.384	.3151 p=.000	.2696 p=.000	.2935 p=.000	.2543 p=.000	.4331 p=.000	.5387 p=.000	.4942 p=.000
P10	.3189 p=.000	.1810 p=.001	.3480 p=.000	.2901 p=.000	.2122 p=.000	.3603 p=.000	.3406 p=.000	.4886 p=.000	.4237 p=.000
P11	.1405 p=.012	.2054 p=.000	.1271 p=.023	.0987 p=.078	.2150 p=.000	.0188 p=.738	.3381 p=.000	.3546 p=.000	.3562 p=.000
P12	.2789 p=.000	.0358 p=.524	.3015 p=.000	.2977 p=.000	.2565 p=.000	.3142 p=.000	.3951 p=.000	.7322 p=.000	.6653 p=.000
P13	.2697 p=.000	.0362 p=.519	.2782 p=.000	.2565 p=.000	.2629 p=.000	.1963 p=.000	.4534 p=.000	.7144 p=.000	.5922 p=.000
P14	.2792 p=.000	.0788 p=.160	.2787 p=.000	.2731 p=.000	.3681 p=.000	.2247 p=.000	.4465 p=.000	.5958 p=.000	.6684 p=.000
P15	.2799 p=.000	.0363 p=.518	.2971 p=.000	.2302 p=.000	.2506 p=.000	.2274 p=.000	.4551 p=.000	.6619 p=.000	.5930 p=.000
OA	.0897 p=.110	.0943 p=.093	.1886 p=.001	.1213 p=.030	.1379 p=.014	.1470 p=.009	.4448 p=.000	.4977 p=.000	.4482 p=.000

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	P4	P5	P6	P7	P8	P9	P10	P11	P12
E1	.1255 p=.025	.1228 p=.028	.1461 p=.009	.0980 p=.081	.1187 p=.034	.1376 p=.014	.1188 p=.034	.1678 p=.003	.1162 p=.038
E2	.2463 p=.000	.1907 p=.001	.1918 p=.001	.2138 p=.000	.1476 p=.008	.2028 p=.000	.2337 p=.000	.1152 p=.040	.2716 p=.000
E3	.2313 p=.000	.2538 p=.000	.3380 p=.000	.2661 p=.000	.2575 p=.000	.2738 p=.000	.2623 p=.000	.1794 p=.001	.1923 p=.001
E4	.2143 p=.000	.2232 p=.000	.3051 p=.000	.3043 p=.000	.2736 p=.000	.2861 p=.000	.2604 p=.000	.1596 p=.004	.2392 p=.000
E5	.1598 p=.004	.2570 p=.000	.1638 p=.003	.1868 p=.001	.1682 p=.003	.2087 p=.000	.2268 p=.000	.0748 p=.183	.1653 p=.003
E6	.0270 p=.631	.0826 p=.141	.1353 p=.016	.0542 p=.334	.0846 p=.131	.1049 p=.061	.0268 p=.633	.0174 p=.757	.0227 p=.686
E7	.2099 p=.000	.2469 p=.000	.2192 p=.000	.3005 p=.000	.2266 p=.000	.2215 p=.000	.2885 p=.000	.0800 p=.154	.2121 p=.000
E8	.1748 p=.002	.2490 p=.000	.3059 p=.000	.2620 p=.000	.2529 p=.000	.2358 p=.000	.2249 p=.000	.1423 p=.011	.1665 p=.003
E9	.2025 p=.000	.1910 p=.001	.3275 p=.000	.2735 p=.000	.2184 p=.000	.3128 p=.000	.2587 p=.000	.1021 p=.069	.2059 p=.000
E10	.2027 p=.000	.2741 p=.000	.2451 p=.000	.2753 p=.000	.2491 p=.000	.2647 p=.000	.2616 p=.000	.0815 p=.147	.2138 p=.000
E11	.0380 p=.499	.0238 p=.672	.1792 p=.001	.0504 p=.370	.0852 p=.129	.0794 p=.157	.2074 p=.000	.0480 p=.393	.0248 p=.659
E12	.2836 p=.000	.2705 p=.000	.2631 p=.000	.3326 p=.000	.2669 p=.000	.2847 p=.000	.2843 p=.000	.1126 p=.044	.2527 p=.000
E13	.2285 p=.000	.2384 p=.000	.2067 p=.000	.2642 p=.000	.2073 p=.000	.1982 p=.000	.2525 p=.000	.0347 p=.537	.1679 p=.003
E14	.2167 p=.000	.2263 p=.000	.2877 p=.000	.2273 p=.000	.2197 p=.000	.2648 p=.000	.2376 p=.000	.1435 p=.010	.1923 p=.001
E15	.1648 p=.003	.1331 p=.017	.1339 p=.017	.1975 p=.000	.1236 p=.027	.1320 p=.018	.2078 p=.000	-.0148 p=.792	.1896 p=.001
I1	.0587 p=.296	.0758 p=.177	.1303 p=.020	.0610 p=.277	.0674 p=.230	.0953 p=.089	.0391 p=.487	.1203 p=.032	.0549 p=.329
I2	.3200 p=.000	.2870 p=.000	.3166 p=.000	.3094 p=.000	.3027 p=.000	.2971 p=.000	.3046 p=.000	.1523 p=.006	.3055 p=.000
I3	.2616 p=.000	.3247 p=.000	.4093 p=.000	.2809 p=.000	.2870 p=.000	.3414 p=.000	.2110 p=.000	.2300 p=.000	.2462 p=.000
I4	.3314 p=.000	.2590 p=.000	.4579 p=.000	.2820 p=.000	.2626 p=.000	.3637 p=.000	.2713 p=.000	.1960 p=.000	.2942 p=.000
I5	.2102 p=.000	.2819 p=.000	.2434 p=.000	.2094 p=.000	.1831 p=.001	.1980 p=.000	.2120 p=.000	.1733 p=.002	.2235 p=.000
I6	.0445 p=.42	.0761 8p=.175	.2125 p=.000	.0229 p=.684	.0517 p=.357	.1034 p=.065	.0427 p=.447	.1302 p=.020	.0498 p=.375
I7	.2776 p=.000	.3413 p=.000	.2823 p=.000	.3970 p=.000	.3022 p=.000	.3072 p=.000	.3377 p=.000	.1522 p=.006	.3362 p=.000
I8	.2466 p=.000	.3099 p=.000	.3820 p=.000	.2674 p=.000	.2745 p=.000	.3054 p=.000	.2956 p=.000	.2370 p=.000	.2933 p=.000

(Coefficient / (Cases) / 2-tailed Significance)

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	P4	P5	P6	P7	P8	P9	P10	P11	P12
I9	.2116 p=.000	.2592 p=.000	.3278 p=.000	.2495 p=.000	.2203 p=.000	.3646 p=.000	.2587 p=.000	.1158 p=.039	.2101 p=.000
I10	.2370 p=.000	.2757 p=.000	.2857 p=.000	.2284 p=.000	.2132 p=.000	.2689 p=.000	.3189 p=.000	.1405 p=.012	.2789 p=.000
I11	.0352 p=.531	.0376 p=.504	.1630 p=.004	.0137 p=.808	.0524 p=.351	.0489 p=.384	.1810 p=.001	.2054 p=.000	.0358 p=.524
I12	.3144 p=.000	.3481 p=.000	.2671 p=.000	.4216 p=.000	.3412 p=.000	.3151 p=.000	.3480 p=.000	.1271 p=.023	.3015 p=.000
I13	.2404 p=.000	.2272 p=.000	.2277 p=.000	.2398 p=.000	.1634 p=.003	.2696 p=.000	.2901 p=.000	.0987 p=.078	.2977 p=.000
I14	.2508 p=.000	.2740 p=.000	.3589 p=.000	.2075 p=.000	.2272 p=.000	.2935 p=.000	.2122 p=.000	.2150 p=.000	.2565 p=.000
I15	.3621 p=.000	.3056 p=.000	.2294 p=.000	.3868 p=.000	.2672 p=.000	.2543 p=.000	.3603 p=.000	.0188 p=.738	.3142 p=.000
P1	.4767 p=.000	.3905 p=.000	.5543 p=.000	.3853 p=.000	.3845 p=.000	.4331 p=.000	.3406 p=.000	.3381 p=.000	.3951 p=.000
P2	2.7714 p=.000	.6058 p=.000	.5409 p=.000	.6039 p=.000	.5093 p=.000	.5387 p=.000	.4886 p=.000	.3546 p=.000	.7322 p=.000
P3	.7388 p=.000	.5851 p=.000	.6353 p=.000	.5695 p=.000	.4985 p=.000	.4942 p=.000	.4237 p=.000	.3562 p=.000	.6653 p=.000
P4	1.0000 p=.	.6823 p=.000	.5719 p=.000	.6549 p=.000	.5507 p=.000	.5116 p=.000	.5165 p=.000	.3062 p=.000	.6930 p=.000
P5	.6823 p=.000	1.0000 p=.	.5043 p=.000	.7285 p=.000	.7030 p=.000	.6383 p=.000	.5619 p=.000	.3571 p=.000	.5625 p=.000
P6	.5719 p=.000	.5043 p=.000	1.0000 p=.	.4839 p=.000	.4865 p=.000	.5708 p=.000	.3774 p=.000	.3605 p=.000	.3904 p=.000
P7	.6549 p=.000	.7285 p=.000	.4839 p=.000	1.0000 p=.	.7647 p=.000	.6883 p=.000	.5929 p=.000	.2465 p=.000	.6152 p=.000
P8	.5507 p=.000	.7030 p=.000	.4865 p=.000	.7647 p=.000	1.0000 p=.	.6739 p=.000	.5519 p=.000	.3002 p=.000	.4588 p=.000
P9	.5116 p=.000	.6383 p=.000	.5708 p=.000	.6883 p=.000	.6739 p=.000	1.0000 p=.	.5005 p=.000	.2814 p=.000	.4717 p=.000
P10	.5165 p=.000	.5619 p=.000	.3774 p=.000	.5929 p=.000	.5519 p=.000	.5005 p=.000	1.0000 p=.	.1838 p=.001	.4830 p=.000
P11	.3062 p=.000	.3571 p=.000	.3605 p=.000	.2465 p=.000	.3002 p=.000	.2814 p=.000	.1838 p=.001	1.0000 p=.	.3466 p=.000
P12	.6930 p=.000	.5625 p=.000	.3904 p=.000	.6152 p=.000	.4588 p=.000	.4717 p=.000	.4830 p=.000	.3466 p=.000	1.0000 p=.
P13	.6610 p=.000	.6690 p=.000	.4371 p=.000	.6731 p=.000	.5366 p=.000	.5832 p=.000	.4980 p=.000	.3340 p=.000	.7121 p=.000
P14	.5956 p=.000	.5579 p=.000	.5727 p=.000	.5859 p=.000	.4877 p=.000	.5614 p=.000	.3872 p=.000	.3452 p=.000	.5738 p=.000
P15	.5818 p=.000	.6470 p=.000	.4721 p=.000	.6924 p=.000	.6090 p=.000	.6297 p=.000	.4845 p=.000	.2838 p=.000	.5309 p=.000
OA	.3970 p=.000	.4638 p=.000	.4017 p=.000	.4690 p=.000	.4954 p=.000	.5013 p=.000	.5619 p=.000	.2961 p=.000	.4519 p=.000

(Coefficient / (Cases) / 2-tailed Significance)

"." is printed if a coefficient cannot be computed

	P13	P14	P15	OA
E1	.1731 p=.002	.1708 p=.002	.1560 p=.005	.1089 p=.052
E2	.2060 p=.000	.2088 p=.000	.2745 p=.000	.0935 p=.095
E3	.1732 p=.002	.2427 p=.000	.2817 p=.000	.1591 p=.004
E4	.1402 p=.012	.2256 p=.000	.2310 p=.000	.1165 p=.038
E5	.1499 p=.007	.1324 p=.018	.1890 p=.001	.0712 p=.205
E6	.0406 p=.470	-.0095 p=.866	.0287 p=.609	.0050 p=.930
E7	.1601 p=.004	.1508 p=.007	.1878 p=.001	.0854 p=.128
E8	.1693 p=.002	.1822 p=.001	.1797 p=.001	.1304 p=.020
E9	.1880 p=.001	.2475 p=.000		.2203.1028 p=.067
E10	.2045 p=.000	.2378 p=.000	.2124 p=.000	.0825 p=.141
E11	.0144 p=.798	.1287 p=.022	.0722 p=.198	.1405 p=.012
E12	.2559 p=.000	.2750 p=.000	.2596 p=.000	.1192 p=.033
E13	.1480 p=.008	.1751 p=.002	.1767 p=.00	.0696 2p=.215
E14	.1646 p=.003	.3121 p=.000	.2552 p=.000	.0811 p=.148
E15	.1258 p=.025	.1277 p=.023	.1671 p=.003	.0332 p=.555
I1	.1185 p=.034	.1035 p=.065	.1349 p=.016	.0699 p=.213
I2	.2777 p=.000	.2752 p=.000	.3260 p=.000	.1669 p=.003
I3	.2675 p=.000	.3386 p=.000	.2654 p=.000	.1676 p=.003
I4	.2782 p=.000	.3025 p=.000	.2971 p=.000	.2105 p=.000
I5	.1806 p=.000	.1853 p=.001	.1623 p=.004	.0436 p=.438
I6	.0538 p=.339	.0493 p=.380	.0423 p=.451	-.0133 p=.813
I7	.2497 p=.000	.2288 p=.000	.2484 p=.000	.1794 p=.001
I8	.2360 p=.000	.2835 p=.000	.2366 p=.000	.1447 p=.010

(Coefficient / (Cases) / 2-tailed Significance)

"." is printed if a coefficient cannot be computed

	P13	P14	P15	OA
I9	.2382 p=.000	.2360 p=.000	.2807 p=.000	.1674 p=.003
I10	.2697 p=.000	.2792 p=.000	.2799 p=.000	.0897 p=.110
I11	.0362 p=.519	.0788 p=.160	.0363 p=.518	.0943 p=.093
I12	.2782 p=.000	.2787 p=.000	.2971 p=.000	.1886 p=.001
I13	.2565 p=.000	.2731 p=.000	.2302 p=.000	.1213 p=.030
I14	.2629 p=.000	.3681 p=.000	.2506 p=.000	.1379 p=.014
I15	.1963 p=.000	.2247 p=.000	.2274 p=.000	.1470 p=.009
P1	.4534 p=.000	.4465 p=.000	.4551 p=.000	.4448 p=.000
P2	.7144 p=.000	.5958 p=.000	.6619 p=.000	.4977 p=.000
P3	.5922 p=.000	.6684 p=.000	.5930 p=.000	.4482 p=.000
P4	.6610 p=.000	.5956 p=.000	.5818 p=.000	.3970 p=.000
P5	.6690 p=.000	.5579 p=.000	.6470 p=.000	.4638 p=.000
P6	.4371 p=.000	.5727 p=.000	.4721 p=.000	.4017 p=.000
P7	.6731 p=.000	.5859 p=.000	.6924 p=.000	.4690 p=.000
P8	.5366 p=.000	.4877 p=.000	.6090 p=.000	.4954 p=.000
P9	.5832 p=.000	.5614 p=.000	.6297 p=.000	.5013 p=.000
P10	.4980 p=.000	.3872 p=.000	.4845 p=.000	.5619 p=.000
P11	.3340 p=.000	.3452 p=.000	.2838 p=.000	.2961 p=.000
P12	.7121 p=.000	.5738 p=.000	.5309 p=.000	.4519 p=.000
P13	.0000 p=.	.6325 p=.000	.7773 p=.000	.4945 p=.000
P14	.6325 p=.000	1.0000 p=.	.6452 p=.000	.3901 p=.000
P15	.7773 p=.000	.6452 p=.000	1.0000 p=.	.4921 p=.000
OA	.4945 p=.000	.3901 p=.000	.4921 p=.000	1.0000 p=.

(Coefficient / (Cases) / 2-tailed Significance)
 "." is printed if a coefficient cannot be computed

Appendix V: Derivation of Markowski Correlation

In Chapter IV, we presented a statistical test to determine if there is any difference between two related population correlations. Here, we present the justification for this methodology.

Let X_1 and X_2 denote the summed scores from the two scales and let X_3 be the measure of overall quality. Define RHO_1 to be the correlation between X_1 and X_3 , and let RHO_2 be the correlation between X_2 and X_3 . We wish to develop a method of testing the null hypothesis that $RHO_1=RHO_2$.

Now, define SIG_1 , SIG_2 , and SIG_3 to be the standard deviations of X_1 , X_2 , and X_3 , respectively. Then, $RHO_1=RHO_2$ if and only if

$$\text{cov}(X_1, X_2) / (SIG_1)(SIG_2) = \text{cov}(X_1, X_3) / (SIG_1)(SIG_3) \quad (1)$$

from which it follows that

$$\text{cov}(X_1, X_2) = \text{cov}(X_1, X_3)(SIG_2) / (SIG_3) \quad (2)$$

Now, using the definition of covariance and some algebraic simplification of (2) results in

$$\text{cov}(X_1, X_2 - X_3(SIG_2) / (SIG_3)) = 0 \quad (3)$$

Finally, using the fact that $\text{corr}(X, Y) = 0$ if and only if $\text{cov}(X, Y) = 0$, it follows that (3) is equivalent to

$$\text{corr}(X_1, X_2 - X_3(SIG_2) / (SIG_3)) = 0 \quad (4)$$

By the equivalence of (1) and (4), we conclude that $RHO_1=RHO_2$ if and only if (4) holds. Therefore, testing whether the two related correlations are equal can be accomplished by testing whether the correlation defined in (4) is equal to zero as was done in Chapter IV.

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April, 1998

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Duties begin Fall, 1998

Social Security Number: 225-74-6548

2. Education:

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Norfolk, Virginia 23529

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Successful Oral Dissertation Defense, March 6, 1998
(formal Commencement in August, 1998)

Dissertation Committee:

Dr. John B. Ford, Professor of Marketing and International Business, Chairman

Dr. Earl D. Honeycutt, Jr., Professor of Marketing

Dr. Edward Markowski, Professor of Management Information Systems

M.B.A. with emphasis in Marketing, December 1993

Post Professional Study: DePaul Hospital
Department of Dentistry
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Norfolk, Virginia 23505
General Practice Residency, 1975-76

Dental Licensure: Virginia #4912 (1975)

Professional Study: Medical College of Virginia
School of Dentistry
Richmond, Virginia
D.D.S., 1975

Undergraduate Study: Hampden-Sydney College
Hampden-Sydney, Virginia
B.Sc., 1970, Chemistry/Mathematics

3. Employment:

Private practice of dentistry from July 1976 to present.

4. Professional Organizations/Activities/Service (Dental):

American Dental Association

Member (#125-750-457) since 1975

Virginia Dental Association

Member since 1975

Fellow, 1996

Member, Search Committee for Board of Dentistry Candidates, 1997

Member, Nominating Committee, 1996

Co-Chairman, Scientific Session Committee, Annual State Meeting, 1994

Member, Continuing Education Committee, 1991-1995

Delegate, Tidewater Component, Virginia Dental Association Annual State Meeting, 1987-

Tidewater Dental Association

Member since 1975

Member, Simmons Award Committee, 1997-1998

Member, Nominating Committee, 1996-1997

Chairman, Constitution and By-Laws Committee, 1996-1997

Chairman of Delegation to Virginia Dental Association Annual Meeting, Tidewater Component, 1996

President, 1995-1996

President-Elect, 1994-1995

Treasurer, 1993-1994

Recording Secretary, 1992-1993

Chairman, Dental Continuing Education Committee, 1990-1995

Chairman, Directory Committee, 1988

Member, Executive Committee, 1987-1992

Southeastern Dental Symposium (Spring Meeting)

General Chairman, 1991-1995

Advertising Chairman, 1988-1995

Program Printing Chairman, 1988-1995

Chairman, United Way Committee, 1985-1988

(in 1988, the Tidewater Dental Association led the nation in average gift by dentists)

Other Dental Organizations

Selected for Fellowship, American College of Dentists, 1998

Consultant, Tidewater Community College regarding development of 3 courses: Dental Office Management, Advanced Office Management, and Basic Dental Procedures for the Receptionist and the Patient

Coordinator, Summer 1996

Fellow, International College of Dentists, 1992

Fellow, Pierre Fauchard Academy, 1986

Fellow, Royal Society of Health (England), 1983
 Fellow, Academy of General Dentistry, 1982
 Member, Board of Directors, Virginia Academy of General
 Dentistry, 1986-1993
 Member, American Association of Forensic Dentists
 Dental Consultant, Office of the Chief Medical Examiner, Commonwealth
 of Virginia, Tidewater District
 Member, American Society for Geriatric Dentistry
 Member, American Association of Hospital Dentists
 Past President, Tidewater Dental Study Club
 Old Dominion University School of Dental Hygiene
 Adjunct Associate Professor, 1997-
 Adjunct Clinical Associate Professor, 1994-
 Adjunct Assistant Professor, 1979-1994
 Medical College of Virginia School of Dentistry
 Clinical Instructor, Department of General and Preventive
 Dentistry (now Department of General Dentistry), 1978-
 1985
 DePaul Medical Center
 Active Staff, 1976-1998
 Program Director, Dental General Practice Residency, 1986-1988
 Assistant Program Director, Dental General Practice Residency,
 1976-1986
 Assistant Chairman, Department of Dentistry, 1983-85
 Chairman, Admission Committee, Dental General Practice
 Residency Program 1976-1979, 1980-1988

5. Professional Organizations/Activities/Service (Business):

Adjunct Graduate Faculty, Averett College, Department of Business
 Administration, 1997-
 Adjunct Instructor, Old Dominion University Department of Management and
 Marketing, 1995-1996
 Member
 Academy of Marketing Science
 American Marketing Association
 Southern Marketing Association
 Services Marketing Special Interest Group, American Marketing
 Association
 Beta Gamma Sigma (national business honor society)
 Mu Kappa Tau (national marketing honor society)

Discussant,

Services Marketing Tract, Academy of Marketing Science Multicultural Conference, 1996

Reviewer

Services Marketing Tract, Academy of Marketing Science Conference, 1998

Channels, Retailing and Services Tract, Southern Marketing Association Meeting, 1997

special issue of the Journal of Business and Industrial Marketing (*Marketing Intangibles: Business-to-Business Services and Service Business*), 1997

Services Marketing Tract, Eighth Biennial World Marketing Congress, Academy of Marketing Science, Kuala Lumpur, 1997

special issue of Psychology and Marketing on Relationship Marketing, 1997

Services Marketing Tract, Academy of Marketing Science National Conference, 1997

Marketing Communication and Services Marketing Tracts, Academy of Marketing Science Multicultural Marketing Conference, 1996

Academy of International Business, U.S. Northeast Section Annual Conference, 1996

Doctoral Consortium Fellow, Southern Marketing Association November 1996, New Orleans, LA

Selected as Outstanding Doctoral-Level Student in School of Business and Public Administration, 1997-1998

Nominated for Outstanding Graduate Teaching Award (University-wide competition), 1997-1998

Outstanding Graduate Teaching Award, School of Business and Public Administration, 1997-1998

Nominated for Outstanding Teaching Award, School of Business and Public Administration, 1995-1996 and 1996-1997

Tutor for Fundamentals of Mathematical Economics (graduate course)

6. Publications

Refereed Journals and Book Chapters

Paul, David P., III and Earl D. Honeycutt, Jr., "Marketing and Original Equipment Manufacturers," to be published by The Handbook of Technology Management as a book chapter, August, 1998.

Paul, David P., III, Earl D. Honeycutt, Jr., and Christopher D. Colburn (1997), "Medicare: Past, Present and Future", Health Marketing Quarterly, 15 (1), 69-93.

- Paul, David P., III (1997), "Dental Practice Location: Some Aspects of the Importance of Selection of Place," Health Marketing Quarterly, 14 (4), 55-69.
- Paul, David P., III and Earl D. Honeycutt, Jr. (1997), "Managed Health Care: A Review of Recent Literature and Suggestions for Future Research," Journal of Hospital Marketing, 11 (2), 13-37.
- Paul, David P., III and Earl D. Honeycutt, Jr. (1996), "Health Care Marketing: Doctors to Patients and Hospitals to Doctors," Journal of Hospital Marketing, 11 (1), 65-80.
- Paul, David P., III and Earl D. Honeycutt, Jr. (1995), "An Analysis of the Hospital-Patient Marketing Relationship in the Health Care Industry," Journal of Hospital Marketing, 10 (1), 35-49.

Refereed Conference Proceedings

- Friedman, Marshall M., David P. Paul, III, and Santosh Choudhury "A Comparison of White and African-American Attitudes Toward Their HMO," submitted to the Academy of Marketing Science Multicultural Conference, Montreal, Canada, September 1998.
- Honeycutt, Earl D., Robert A. Luton, David P. Paul, III, and John B. Ford (1997), "The Appeal of a Personal Selling Career in Slovakia: Implications for Global Marketers," Enhancing Knowledge Development in Marketing, Volume 8, Global Issues in Sales and Sales Management Tract, Summer Educators' Conference, 259-265.
- Paul, David P., III, John B. Ford, and Earl D. Honeycutt, Jr. (1996), "A Two-Pronged Marketing Approach to the U.S. Healthcare Crisis," in Marketing: Moving Toward the 21st Century, Elnora W. Staurt, David I. Ortinou, and Ellen M. Moore, eds., Southern Marketing Association, Rock Hill, SC, 98-101.
- Paul, David P., III, Earl D. Honeycutt, Jr. and C. P. Rao (1996), "Entry Barriers to the Medical and Dental Professions," in Marketing: Moving Toward the 21st Century, Elnora W. Staurt, David I. Ortinou, and Ellen M. Moore, eds., Southern Marketing Association, Rock Hill, SC, 104-108.

Paul, David P., III (1996), "American Dentistry: How Will Free Trade Agreements Affect Licensure?" in Northeast Review of International Business Research (Proceedings of the 1996 Academy of International Business, U.S. Northeast Regional Conference), page 81 (published as an abstract).

Non-refereed Articles

Paul, David P., III (1996), "Vacancies on the Virginia Board of Dentistry," Tide Dent News, 38 (1), 2.

Paul, David P., III (1996), "Don't Miss It!," Tide Dent News, 37 (4), 1-2.

Paul, David P., III (1996), "The President's Corner," Tide Dent News, 37 (3), 1-2.

Russo, Sam and David P. Paul, III (1990), "Video Library," Tide Dent News, 33 (4), 3.

Paul, David P., III (1988), "DePaul Ends Dental Residency," Tide Dent News, 31 (3), 2.

Paul, David P., III (1987), "DePaul Hospital Dental General Practice Residency," Tide Dent News, 30 (6), 2.

Paul, David P., III (1986), "Clinical Update - DePaul Hospital," Tide Dent News, 30 (4), 3.

Paul, David P., III (1986), "Meet the New DePaul Residents," Tide Dent News, 30 (3), 5.

Paul, David P., III (1985), "It's That Time of Year Again," Tide Dent News, 29 (3), 4.

Paul, David P., III, (1984), "Letter to the Editor," Journal of Prosthetic Dentistry, 51, 286.

Paul, David P., III (1983), "DePaul Residency Program," Tide Dent News, 27 (3), 5.

Paul, David P., III (1979), "Letter to the Editor," Journal of Plastic and Reconstructive Surgery, 64, 818.

7. Presentations Made

Honeycutt, Earl D., Robert A. Luton, David P. Paul, III, and John B. Ford (1997), "The Appeal of a Personal Selling Career in Slovakia: Implications for Global Marketers," Global Issues in Sales and Sales Management Tract, American Marketing Association Summer Educators' Conference.

Paul, David P., III (1997), "Tips for Successfully Completing Your Doctoral Studies," Doctoral Student Consortium, Old Dominion University Graduate School of Business and Public Administration, April 25 (one of only two doctoral students asked to present a topic to this group - all other presentations were made by graduate faculty)

Paul, David P., III, Earl D. Honeycutt, Jr. and C. P. Rao (1996), "Entry Barriers to the Medical and Dental Professions," Annual Meeting of the Southern Marketing Association, November 9.

Paul, David P., III, John B. Ford, and Earl D. Honeycutt, Jr. (1996), "A Two-Pronged Marketing Approach to the U.S. Healthcare Crisis," Annual Meeting of the Southern Marketing Association, November 9.

Paul, David P., III (1996), "American Dentistry: How Will Free Trade Agreements Affect Licensure?", the Academy of International Business Annual Conference (U.S. Northeast Region), June 7.

Paul, David P., III (1988), "Computer Applications in Dentistry," DePaul Hospital, March 24.

Paul, David P., III (1987), "Margin Placement of Crowns," DePaul Hospital, Aug 20.

Paul, David P., III (1987), "Selection/Placement of Pins," DePaul Hospital, Jan 29.

Paul, David P., III (1986), "Dentistry as a Career," Norfolk Public Schools, May 7.

Paul, David P., III (1985), "Complex Prosthodontic Cases," DePaul Hospital, Nov 7.

Paul, David P., III (1985), "Partial Denture Design," DePaul Hospital, March 29.

Paul, David P., III (1984), "Fixed Partial Dentures," DePaul Hospital, Sept 6.

Paul, David P., III (1983), "Trouble-Shooting Complete Dentures," DePaul Hospital, Aug 11.

Paul, David P., III (1983), "Denture Design and Impressions," DePaul Hospital, March 31.

Paul, David P., III (1982), "Collecting Accounts Receivable," DePaul Hospital, Sept 26.

Paul, David P., III and Herbert J. Sipe (1969), "Hückel-Omega Molecular Orbital Calculations of Spin Density Distribution in Radical Anions", American Chemical Society, Southeast Regional Meeting.

8. Courses Taken in Doctoral Program:

Marketing

Marketing 801: Seminar in Marketing Concepts

Marketing 802: Seminar in Marketing Theory

*Marketing 823: Seminar in Sales Management

Marketing 824: Seminar in Buyer Behavior

Marketing 826: Seminar in International Marketing Problems

Marketing 827: Seminar in Marketing Planning and Strategy

*Marketing 828: Seminar in Marketing of Services

*Marketing 895: Selected Topics in Marketing

Marketing 899: Dissertation Research

Economics:

Economics 525: Introduction to Mathematical Economics

Economics 801: Advanced Economic Analysis: Microeconomics

Economics 803: Advanced Economic Analysis: Macroeconomics

Economics 852: International Trade

*Economics 895: Topics in Economics (Health Care Economics)

Methodology:

Marketing 800: Research Methods

Decision Sciences 811: Regression/Multivariate Analysis

Decision Sciences 812: Advanced Statistical Analysis for Business

*Psychology 826: Quantitative Methods (LISERAL)

*Economics 806: Econometric Theory

*Statistics 505: SAS - An Introduction to Data Handling

Other:

- *Community Health Professions 635: Managed Health Care
- *Community Health Professions 773: Development of Grants and Contracts in the Health Professions
- *Health Sciences 820: Health Care Delivery Systems

Language/Cultural:

- French 313: French Civilization
- French 366: French for Business

NOTE: courses marked with an asterisk were electives taken in addition to those courses required for the Ph.D. in Marketing

8. Teaching Experience:

Business Administration

- Marketing Management (MBA Program), Averett College, Fall 1997 and Spring 1998 (3 sections)
- Marketing Policy and Strategy (undergraduate capstone course for marketing majors), Old Dominion University, Fall 1997
- Services Marketing (elective course for undergraduate marketing majors), Old Dominion University, Fall 1996
- Principles of Marketing, Old Dominion University, Fall 1995; Spring 1997; Spring 1998
- (Student course comments available on request)

Dental

- Clinical Dental Hygiene (Senior Clinic), Old Dominion University, Spring 1994
- Postgraduate general dentistry
 - Responsible for general clinical education of dental General Practice Residents, 1976-1988
 - Responsible for specific supervision of dental General Practice Residents one day per week (advanced restorative dentistry clinic)

High School

- General Science, Chesterfield County Schools, Summer 1971
- Chemistry, Hopewell High School, 1970-71

9. International Experience:

German-American Seminar: The "Double Challenge" of European Integration and Globalization, March 7-15, 1998, sponsored by the Konrad Adenauer Foundation, Germany. Seminar consisted of lectures, discussions and meetings with business, labor and government representatives, and was held in Germany (Aachen, Bonn and Marl), The Netherlands (Amsterdam and Maastricht), and Belgium (Brussels)

10. Memberships in Other Organizations:

Psi Omega Dental Fraternity
 Thoroughgood Civic League
 Church of the Good Shepherd
 Norfolk Academy Alumni Association
 Hampden-Sydney Alumni Association
 Medical College of Virginia Alumni Association
 Old Dominion University Alumni Association

10. References

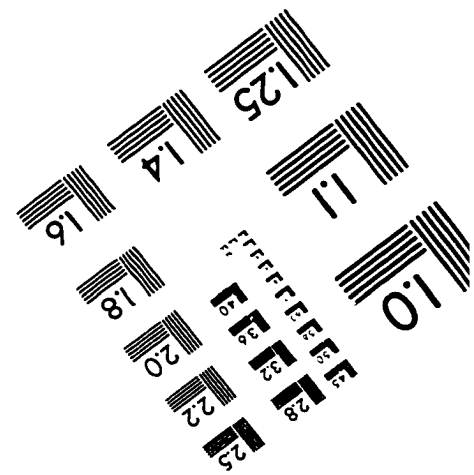
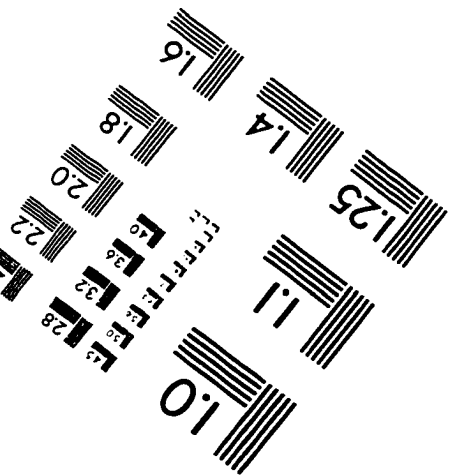
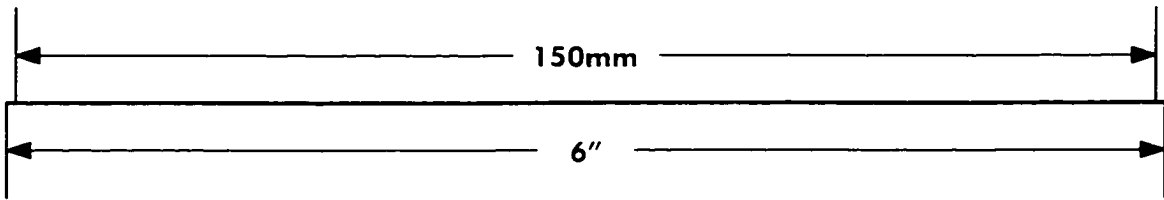
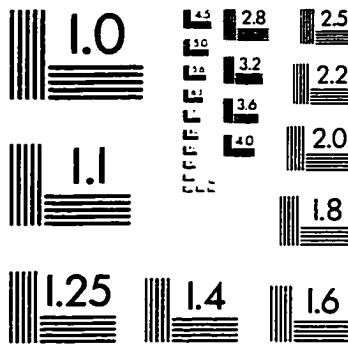
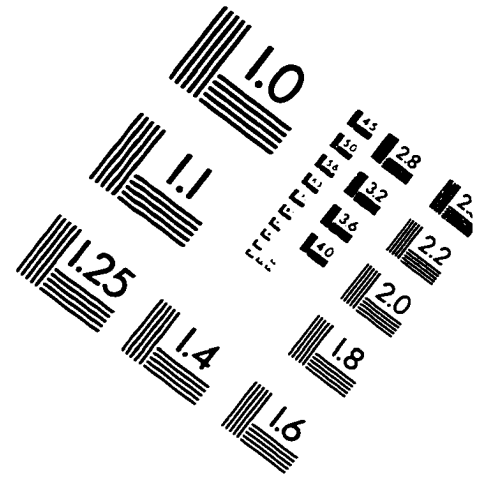
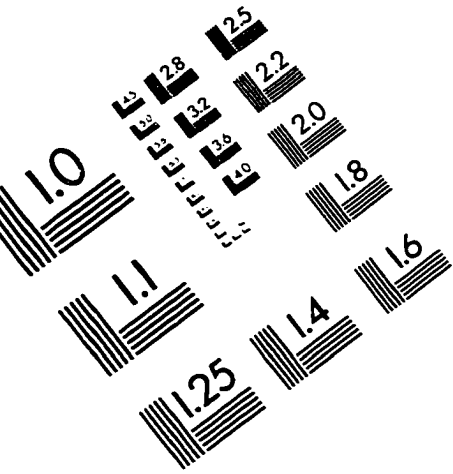
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