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The Physician-Patient Interaction in Real-Time: Applying Continuous Response Measurement to the Medical Visit

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The Physician-Patient Interaction in Real-Time: Applying Continuous Response Measurement to the Medical Visit

A Dissertation submitted in partial satisfaction
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Juliet B. Beni

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Dedication

Per la mia nonna, che mi manca molto. Ma c'è sempre.

ABSTRACT OF THE DISSERTATION

The Physician-Patient Interaction in Real-Time: Applying Continuous Response Measurement to the Medical Visit

by

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Dr. M. Robin DiMatteo, Chairperson

The following research involves the development and testing of a new system of physician-patient communication quality (Continuous Response Measurement, CRM), utilizing the instantaneous evaluation of the valence quality of communication. Raters were presented with a data-set of 204 video-recorded physician-patient interactions. The CRM system allows identification of specific physician behaviors correlating to changes in ratings of communication quality, as well as analysis of those behaviors comprising high- and low-quality communication among physicians and patients. This dissertation research develops and tests a method to enable researchers to identify specific behaviors in the physician-patient interaction that directly correlate with communication quality. Using the CRM method, raters instantaneously evaluated the valence quality of communication as they were presented with the interaction. The researcher was then able to identify salient time intervals in which raters' assessments of communication quality differed significantly from the rating average. These salient intervals were then compared to the time-intervals in which specific physician behaviors occurred. The results of the current research indicate that the occurrence of specific behaviors within the physician-patient interaction correlate with changes in ratings over time. The findings of the research contribute to changing the ways in which the physician-patient interaction is conceptualized by developing and applying a new system for researchers to identify specific behaviors as correlates of high- and low-quality communication.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

Health care provider-patient communication has been consistently identified as the primary means of health information exchange (Kaplan et al., 1996; Martin, Haskard-Zolnierek, & DiMatteo, 2010). Although research on the communication process of medical interactions has consistently identified the quality of health care provider communication to be a fundamental aspect of care, until recently, little empirical research existed to confirm the importance of the health professional-patient relationship (Romm, Mayo, & Hulka, 1976; Kenny et al., 2006). Physician-patient communication began to be analyzed in the late ‘70s by numerous researchers in health psychology, medical sociology and other fields; however the understanding gained is still limited due to the complexity of the interaction. The primary area of research that has pointed to the salience of such an interaction involves research that establishes the process-outcome correlation in care (Hall, Roter, & Katz, 1988). The process-outcome correlation refers to the relationship between the quality of health care provider’s communication, and various outcomes for the patient and the health professional themselves (Inui et al., 1982).

Numerous potential process-outcome correlates of positive doctor-patient interactions have been discovered, such as adherence to treatment, patient satisfaction, improved physical health, and positive psychological outcomes (Kaplan, Greenfield & Ware, 1989). However, the magnitude and direction of these correlates have not been supported unanimously (Wasserman & Inui, 1983), perhaps due to the numerous moderators that may influence the correlation. Understanding these outcomes, and the specific predictors of good physician-patient communication, remains critical to improving health care quality (Mallinger, Griggs, & Shields, 2006).

The most frequently cited of these patient outcomes are patient satisfaction and patient adherence; however, in recent literature, patient physical health outcome and patient psychological outcome have been increasingly investigated, along with outcomes for health care providers, such as job satisfaction (Hall et al., 1988). In studies identifying health communication as a predictor of patient satisfaction, researchers have found that both overall communication quality, and specific types of communication, predicts positive patient outcomes.

Communication and Patient Satisfaction

The link between patient satisfaction and physician-patient communication has been observed extensively; it is argued that physician-patient communication can enhance satisfaction through various mechanisms. Communication contributes to patients' understanding of their illness and the risks and benefits of treatment (DavidHizar & Giger, 1997). It has also been shown that support, empathy, and understanding (Deladisma et al., 2007), collaborative partnerships (Cant & Aroni, 2008) and patient-centered interviewing (Larson & Yao, 2005) require effective communication and, in such cases, they can enhance satisfaction. Physicians' humanism has been identified as a significant predictor of patient satisfaction by multiple researchers, most notably Fan, Burman, McDonell, and Fihn (2005) in their investigation of the communication processes of general practitioners. Moreover, poor communication predicts negative patient experiences with care, lower satisfaction, and a reduced likelihood to refer their physician to family or friends. Keating et al (2002) reported that there are three primary reasons for which patients remain unsatisfied with care: (1) the physician does not provide enough time to answer all of the questions the patient has, (2) the physician does not give comprehensible information when answering the patients' questions, and (3) the physician does not provide enough information. Keating et al's (2002) identification of these three common complaints that unsatisfied patients have, are supported by numerous researchers (Lawson, 2002; Comstock et al., 1982), and point to the potential for training physicians to communicate more effectively with their patients in a manner best promoting patient satisfaction with care. McLafferty, Williams, Lambert, and Dunnington (2006) conducted a study to determine what physician behaviors correlated with patient's failure to refer their physician to family and friends. The most common behavior discovered by McLafferty et al (2006) included the physician's failure to educate patients effectively, lack of explanation of medical conditions, treatments, and complications, failure to sit down during the interaction, lack of interest, failure to treat the patient with dignity, and failure to ask, invite, or answer the patient's questions. DiMatteo and Hays (1981) also assessed the process-outcome relationship in their study of physician-patient communication, and found that patient satisfaction was predicted by the communication quality of the interaction as perceived by the patient.

Several factors predict patients' liking of providers (Falvo, & Tippy, 1988; DavidHizar, & Giger, 1997; Roter, Frankel, & Hall, 2006). The most recognized of these predictors is the communication quality of the physician (Hall et al., 2002; Roter et al., 2006). Effective physician communication is currently studied, by health psychologists and researchers in public health, as a predominant element within the biopsychosocial model of care (Bensing & Dronkers, 1992). The expression of concern and empathy, according to the biopsychosocial model, mediates the relationship between physician communication and patient satisfaction (Bensing & Dronkers, 1992), decision-making and partnership (Mast, Hall, & Roter, 2007), transmission of information and effective questioning (Roter, Stewart, & Putnam, 1997), and linguistic and paralinguistic components of communication (Bensing & Dronkers, 1992). Physician-patient communication following the guidelines of the biopsychosocial model is known to improve ratings of patient satisfaction, even to the extent that health care providers, public health officials, and health psychologists have advocated the collaboration of patients with their providers, and have begun to teach patients to take an active role in their medical-decision making (Falvo, & Tippy, 1988).

The relationship between the qualities of physician communication, especially shared decision-making, and patient satisfaction is consistent and widely replicated (Ende, Kazis, & Moskowitz, 1990; Speedling & Rose, 1985). By contrast, the correlation between patient satisfaction and engagement in preferred decision-making has not been consistently replicated (Blanchard, Labrecque, Ruckdeschel, & Blanchard, 1988). Investigators have reported that patients who prefer for the physician to play an active role in decision-making report higher satisfaction compared to patients who choose more active roles in their care. This effect is small, but consistently found across physician-patient interactions (Baider, Ever-Hadani, & Kaplan De-Nour, 1995; Blanchard et al., 1988, Benbassat, Pilpel, & Tidhar, 1998). By contrast, other authors have found that the patients who prefer to not be involved in participatory decision-making are also often less satisfied with their physicians (Ende et al., 1990).

Findings in the literature on physician communication and patient satisfaction have not been as consistent as one may think at first glance. For example, Lawson (2002) found that there was no significant relationship between communication patterns and patient satisfaction; however, Lawson (2002) found differences between different health care providers in their communication patterns and patient satisfaction. Most notably, Lawson (2002) discovered doctors to be significantly more informative. Comstock, Hooper, Goodwin, and Goodwin (1982) analyzed the communication processes of internal medicine residents to determine correlations between their communication style and their patients' satisfaction with care. The authors found that communication quality (notably the amount information physicians gave) and satisfaction were strongly correlated; however, Comstock et al (1982) also noted that different kinds of communication correlated in different magnitudes and directions to patient satisfaction. For example, Comstock et al (1982) found that nonverbal behaviors (whole body movements, eye contact, and touch) did not significantly predict patient satisfaction. In order to tease apart the various moderators that may influence the correlation between physician communication and patient outcome, Hall et al (1988) performed a meta-analysis on the 41 studies then published on the process-outcome relationship. The authors found that satisfaction exhibited the most consistent relationship to communication quality of all patient outcomes.

Satisfaction has also been found to be a predictor of other patient outcomes. For example, Hall et al (1990) found that patients who are more satisfied with care also experience more positive health outcomes and reduced psychological distress. Patient satisfaction has also been implicated in predicting adherence to treatment regimens. In his investigation of correlates of communication, Bartlett et al (1984) found that the relationship between patient adherence and physician communication was completely mediated by patient satisfaction and patient recall. In the realization that patient satisfaction contributes to other patient outcomes, it is important to point out that the relationship between communication and satisfaction identified in these studies is entirely correlational. Thus, patient satisfaction could equally as likely cause good communication, as the other way around (DeVoe, Fryer, Hargraves, Phillips, & Green, 2002). Furthermore, a third variable (e.g., disease severity) could account for this relationship. Therefore, it is imperative for researchers to recognize that the process-outcome relationship is far from unidimensional, and causal conclusions cannot be drawn from these findings without interventional and experimental research.

Physician Communication and Patient Adherence

Research in health and behavior change has pointed to the importance of adherence as an outcome of communication. Patients may be satisfied with care, but unless they are given the resources and the motivation to change their behavior and to comply with a treatment regimen, the actual benefits of communication are limited (Speedling & Rose, 1985). Although two-thirds of medical visits result in a prescription, between 30-60% of patients do not comply with treatment regimens (Martin, Haskard-Zolnierek, & DiMatteo, 2010). Thus, nonadherence presents both a threat to patient health and a financial detriment to the health care system. Patients are not merely ‘compliant’ or ‘noncompliant’ with treatments, rather, many types of noncompliance exist. Patients may not understand their doctor, may feel as if they were not provided enough information with which to make a treatment decision, or seek a second opinion (Roter & Hall, 1992). Each of the many stages of the medical system, from the first symptoms a patient experiences, to the actual ingestion of medication, can be a cause for nonadherence; or a tool by which nonadherence can be improved (Martin et al., 2010). Close to one-third of patients who receive prescriptions take their medication incorrectly, in a way that poses a serious threat to their health. Thus, the process-outcome research focused on nonadherence is crucial in identifying physician behaviors that may contribute to patient's failure to comply with treatment regimens.

In the majority of situations, patient nonadherence can be linked to inadequate information provided during the medical encounter (Roter & Hall, 1992). Patients have been found to be more adherent to medication when physicians provide them with more information (Hall et al., 1988), speak more positively, less negatively, and ask more questions about adherence (but fewer questions in general). Question-asking has been found to be negatively related to information giving, which may explain why physicians who ask fewer general questions tend to have more adherent patients (Roter & Hall, 1992). More dominant physicians have been found to have more highly adherent patients; suggesting that the task-oriented side of communication may play a role in adherence to treatment (Romm, Hulka, & Mayo, 1976). Nonverbal communication has been identified as a significant predictor of patient adherence to treatment (Hall et al., 1988). Physicians who speak to their patients with a more hostile tone of voice tend to have fewer compliant patients; especially in the case of adherence to a lifestyle change intervention (Milmoe, Rosenthal, Blane, Chafetz, & Wolf, 1967). Physician's nonverbal sensitivity to patient's emotions was also found to correlate with patient behavior, and physicians who were more nonverbally sensitive had fewer cancelled appointments (DiMatteo, Hays, & Prince, 1986). Despite the importance of nonverbal communication, research has demonstrated no significant difference between information conveyed verbally and written information, provided that sufficient access to information is given (Orleans et al., 1985).

Despite the importance of life-style changes in the prevention and treatment of chronic illness, physicians are often unwilling to communicate advice on such issues. One study (Orleans, 1985) found that although all physicians recognize the negative effects of smoking, less than 1 in 4 is willing to counsel their patients to quit smoking on a regular basis. Physicians persist in their unwillingness to counsel patients, even when statistics show that patients who receive counseling by a health professional have 10 times the annual success rate of quitting (Freeman, 1987). Moreover, patient-centered behaviors have been found to promote lifestyle changes, and patients of physicians who communicate in a patient-centered manner have higher self-reported adherence to medication and pill counts.

Physician Communication and Patient Health

A similar set of communicative behaviors has been implicated in improvements in patient physical and psychological health. Although numerous studies have identified patient adherence or compliance to medical treatment to be related to physician patient communication (DiMatteo, Haskard & Williams, 2007), these findings do not specifically address the direct role of communication in predicting changes in patient health outcomes. Patients may be highly adherent to treatment regimens, but unless coupled with a mutual understanding of treatment decisions and high-quality communication involving patient choice, better health outcomes may not be more likely (Ong et al., 2000; Kaplan, Greenfield & Ware, 1989a). Numerous researchers (Kaplan et al., 1989; Hall, Roter, & Katz, 1988;

Schofield, 2010) have investigated the relationship between improved health and physician communication by conceptualizing health differently. Measures of health include more objective physiological markers (Viral cell count in HIV disease, blood pressure in heart disease, and so on), behavioral assessments (functional status), and subjective appraisals of health status or patient health related quality of life (Ong et al., 2000; Kaplan et al., 1989). One study (Kaplan et al., 1989), reported that higher levels of patient controlling behaviors (in the form of questions and interruptions) and lower levels of physician controlling behaviors, coupled with more information-giving by the physician, and higher levels of affect from both the patient and the physician correlated with improved health status.

Romm, Hulka, and Mayo (1976) identified process-outcome correlations in patients with congestive heart failure. The authors found that physician overall communication quality, physician awareness of distress, and patient access to therapeutic management, were related to patient outcome for patients who were minimally symptomatic. More severely ill patients may experience more challenges with care, and this may play a role in communication (DiMatteo, Haskard, & Williams, 2007). Illness severity has been found to be consistently negatively correlated with quality of communication (Hulka, Kupper, Cassel, & Mayo, 1975).

Despite a recent increase in the literature surrounding the psychosocial aspects of health, little research has attempted to empirically assess the relationship between physician communication quality and patient psychological outcomes (Leventhal, Nerenz, & Steele, 1984). The term 'psychological outcome' is used to refer to the interacting elements of patient wellbeing, including distress, trust, positive and negative mood, sub-clinical depression, broad-spectrum emotional health, and quality of life (Schofield et al., 2010). The significance of considering correlates of medical communication in the framework of psychosocial factors is vital, due to the intrinsic emotional and affecting nature of the medical setting (Fallowfield, 1993; Lind et al., 1989). Aggravated levels of emotional distress, fear, frustration, and anxiety are often caused by illness patients' experience of illness (Peteet, Abrams, Rose, & Stearns, 1991). Patient must frequently verbalize their psychological interpretation of illness in formalized settings where ambiguous verbal and nonverbal cues are present (Roberts et al., 1994). Substantial debate continues to surround the methods that providers, especially physicians, may utilize to alleviate the psychologically stressful elements of the medical environment (Schofield, 2010; Ptacek, & Ellison, 2000).

Health care providers communicate less effectively with patients of poor mental health (Shaw et al., 2009). Poorer communication quality is also implicated in a broad dimension of psychopathology in which no particular diagnostic criteria is met by the patient, *perceived psychological distress*, which is known to increase the risk of experiencing mental illness (Shaw et al., 2009). Nonadherence to medication is higher amongst patients of poor mental health, and this relationship may be moderated by physician-patient communication (Russell, & Kazantzis, 2008).

Some studies on medical communication quality patient involvement in decision-making, have pointed to a strong connection between communication of patient choices for treatment and consequent beneficial psychological effects, particularly within the framework of chronic illness management(Fallowfield, Hall, Maguire, & Baum, 1990). However, replications of these studies have not been conducted (Schofield et al., 2010), and most current studies have only measured the significance of a fraction of behaviors within the medical interaction (Fallowfield, 1993), and have often been constrained by methodological limitations (Roberts et al., 1994). Furthermore, little research on interventions to improve communication and predict beneficial psychological outcomes from physician communication training has yielded empirically-supported recommendations for clinicians (Schofield et al., 2010).

Good physician-patient communication is correlated with various patient outcomes (Jahng, Martin, Golin & DiMatteo, 2005). In fact, the formation of successful partnerships in the medical interaction is fundamental to outcomes of care including physical health, satisfaction, psychological distress, adherence, and recall (Hall, Roter, & Katz, 1988; Stewart, 1995; Ong, DeHaes, Hoos; 1995). Despite recent emphasis on quantifying the physician-patient relationship, research is still attempting to discover, and find ultimately solutions for, the many difficulties faced by both clinicians and patients (Fan, Burman, McDonell & Fihn, 2004).

The Goals of the Medical Partnership: Defining Effective Medical Communication

Despite numerous studies on the process-outcome relationship, researchers still question what ‘good communication’ really is. Ong, De Haes, Hoos, and Lammes (1995) identified three major purposes of communication: (1) to create, maintain, and support a good interpersonal relationship, (2) to exchange information, (3) to make treatment related decisions. Although it is recognized that patient autonomy plays a role in high quality communication, one area of discussion in health communication research that still remains unanswered is to what extent patients expect an autonomous relationship with their health care provider (Keating et al., 2002).

The movement of health psychology away from the biomedical model of the physician patient interaction and toward the biopsychosocial model supports the notion that patients are involved in their treatment decisions (Martin, DiMatteo, & Lepper, 2001). However, research findings concerning the process-outcome relationship when high levels of patient autonomy are present, have been inconsistent (Ong et al., 1995). Keating et al (2002) found that patients who were not sufficiently involved in their care were less trusting of their health care providers. Patients were especially unsatisfied when they were not included in treatment decisions, and did not have adequate access to information from medical procedures, tests, and referrals (Keating et al., 2002).

Blanchard, Labrecque, Ruckdeschel, and Blanchard (1988) conducted a study with cancer patients to assess their preferences in participatory decision-making. The authors found that although a great majority of patients wanted all of the information (>90%), not nearly as many wanted to participate in decision-making (~70%). Moreover, out of those patients who wanted all of the information, one fourth wanted the physician to make the majority of decisions.

More generally, physicians may contribute to their patient's desired roles in the medical setting by intentionally or unintentionally changing their behavior to account for sociodemographic differences or illness status (Roter & Hall, 1992). The idea that physicians could contribute to disparities in health care by treating patient differentially is so inconsistent with the Universalist ideal of the medical field, that it disrupts the fabric of the patient's trust and confidence in their health care provider (Cooper-Patrick et al., 1999). However, it should be pointed out that differences in the way physicians communicate with patients based on patient characteristics, infrequently occur through malice or stereotyped behavior (Roter & Hall, 1992). Rather, physicians may be attempting to aid patients to comprehend and interpret medical information by tailoring their communicative patterns to each patient (Benbassat et al., 1998).

In Blanchard et al's study (1988), patients who did not want to play a role in decision-making tended to be older, sicker males. This finding is consistent with Benbassat et al's (1998) findings, which found that patients who prefer nonactive roles tend to be male, elderly, sicker, of minority status, and less educated. However, Blanchard et al also discovered that the behaviors of those physicians did not explain their patient's preferences. In other words, the patient's experiences with communication did not appear to directly relate to their desire to participate in the medical decision-making process. Intuitively, it is possible that patient characteristics, such as sociodemographic status or illness status, could predict their patient's preferences. However, Benbassat et al's (1998) research found that only 25% of the variability in the preferences of patients to play a role in decision-making was explainable by sociodemographic factors. Thus, Blanchard et al (1988) and Benbassat et al., (1998) suggest that the best way for physicians to discover their patient's preferences is to ask directly. Therefore, although the assumption that patients prefer certain communicative styles may be made in the patient's best interest, research indicates that successful training programs should emphasize enabling physicians to ask their patients about their preferences in communication, and their preferred role in the medical relationship.

Methodology in Health Communication Research

Research in the field of dyadic communication has predominantly been conducted utilizing interactional analysis systems (Roter et al., 1997). Such systems rely on the categorization of frequencies (counts) or ratios of specific behaviors into mutually exclusive categories (Roter & Larson, 2002). Considerable research has been aimed at identifying the appropriate manner by which to categorize such behaviors, in order to best reflect the communication process (Kenny et al., 2010).

Sluzki and Beavin (1965) first proposed that communication occurs via four levels: (1) audible-linguistic, (2) audible-paralinguistic, (3) nonaudible-paralinguistic, and (4) contextual. Subsequent research has supported the categorization of communication at these four levels (O'Donnell-Trujioo, 1981), and common systems of interactional analysis have attempted to incorporate some aspect of each of these dimensions. However, as the complexity of the communicative process lies in the integration of all four sources of information, it is imperative for successful interactional analysis systems, and other measures attempting to accurately assess communication quality, to appropriately select the level(s) at which to study communication. In recent research, the communicative process has typically been studied at two levels, the verbal structure of communication and the contextual process of communication (Sluzki & Beavin, 1965). These two levels of communication analysis have been referred to as conversation and discourse analysis, respectively (Watzlawick, 1964).

Conversation analysts support the idea that communication can be characterized accurately by increasingly specific descriptors of the communicative process (Ware et al., 1980). Conversation analysis has been widely applied, notably to the study of aphasic patients (Perkins, Crisp, & Walshaw, 1999). Many researchers have attempted to formulate conversation analysis tools for the evaluation of verbal and nonverbal communication by characterizing the linguistic and paralinguistic communicative process of each of the interactants in the dyad, independent of their social context (O'Donnell-Trujioo, 1981).

Studies using discourse analysis typically evaluate the communicative process of long-lasting dyads (e.g., siblings, parents, or married couples), and are rooted in the symmetry/complementarity dynamic of social roles (Stiles, 1978). Symmetry and complementarity are considered key elements of the communication process in discourse analysis systems, as these two aspects of communication refer to the homeostatic pattern of social interaction inherent to the communicative process (Sluzki & Beavin, 1965). Symmetry and complementarity can be defined according to the respective structural similarity or dissimilarity of the communicative behaviors of each member of the interacting dyad (Stiles, 1978). Although original discourse analysis promotes the identification of communicative patterns within social roles to characterize communicative processes in long-interacting and previously acquainted dyads, the symmetry and complementarity typology of dyadic interactions can lend insight to the communicative qualities of less familiar dyads.

With this logic, the Stiles Verbal Response Mode (1978), a method of communication analysis typically used by researchers studying the physician-patient interaction, first advocated discourse analysis to characterize communication within the roles of the physician and the patient. Through use of symmetry/complementarity patterns, Stiles (1978) and others (Sondell, Söderfeldt, & Palmqvist, 1998; Meeuwesen, Schaap, Van der Staak, 1991) successfully promoted the use of discourse analysis systems to study physician-patient interactions.

Although Sluzki and Beavin's (1965) original division of communication into four levels of analysis has been recognized and supported by the literature, a surprising lack of research exists on the assessment tools aimed at evaluating nonverbal communication (Paasche-Orlow, & Roter, 2003). This is surprising, as nonverbal communication is highly associated with the support or denigration of dyadic relationships (DiMatteo, Hays, & Prince, 1986). Most communication analysis systems incorporate some form of nonverbal communication assessment into their coding or rating scheme (Street, 1992); however, few instruments are specifically tailored to evaluate the nonverbal characteristics of dyadic communication. The Profile of Nonverbal Sensitivity (PONS) a 220-item series of 2-second clips aimed at assessing the ability of individuals to decode nonverbal signals communicated via facial expressions, body movements and of voice tone, is a widely cited exception (Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979). Despite the lack of research on communication assessment instruments designed to evaluate nonverbal processes, researchers have identified specific audible and non-audible paralinguistic behaviors correlated with interactional outcomes (Sluzki & Beavin, 1965; DiMatteo, Hays, & Prince, 1986), for example, tone of voice (Boon & Stewart, 1998).

Rapport and interactional synchrony are related constructs evaluated in communication assessment instruments, and point to the importance of the dyadic interaction as a context in which the whole is more than the sum of the parts (Roter &

Larson, 2002); in other words, the interaction process itself, comprises the nature of the dyadic relationship, over and above the specific communicative characteristics of each of the interactants. Rapport refers to the overall quality of the interaction evaluated by the ability of each of the interactants to appropriately communicate informational content and paralinguistic cues so as to promote a positive dyadic relationship (Cannick et al., 2007). In research on medical communication, rapport has been found to predict patient outcomes; and lack of rapport has been tied to lowered satisfaction for both patients and physicians (Fallowfield & Jenkins, 1999).

Interactional synchrony refers to the degree to which individuals are willing to match each other on various linguistic and paralinguistic indicators (much akin to 'symmetry' in discourse analysis) (Natale, 1975). In his research on social behavior, Smith, Olekalns, and Weingart (2005) used Markov Chains to identify interactional synchrony as an indicator of the quality of communication and the fluidity of the interaction. Researchers have identified the synchronization of voice tone as an indicator of the power dynamic of the interaction. Gregory and Webster, (1996) studied talk show host "Larry King Live" to determine the relative dominance of Mr. King compared to his guests, by assessing the degree to which the interactants' vocal intensity converged. Gregory and Webter's (1996) rankings of the relative dominance of the guests on the show were consistent with third-party naïve raters' assessments of the social power of each of the guests compared to Mr. King.

Although currently applied to a wide variety of contexts, until recently, the great majority of dyadic communication instruments were used to evaluate therapist-client relationship (Kiesler, 1979). The research on dyadic communication quality assessment tools borrows much from this origin; however, one area of communication assessment promoted by researchers of the therapist-client relationship, is often left out of current communication analysis tools. Meta-communication, or the ability of the therapist to convey information to their client about their own communication process, is often supported indirectly by the literature, but not explicitly promoted in modern studies (Friedlander & Heatherington, 1989). Meta-communication was evaluated in therapist-client research by incorporating meta-communicative statements as categories in early interactional analysis systems (Kiesler, 1979). Subsequent analysis systems (e.g., the Roter Interactional Analysis System) incorporate meta-communicative elements into their coding schemes (e.g., the physician encourages the patient to communicate more); however, the detailed coding of meta-communicative processes such as those present in therapist-client assessment instruments, are not widely included in coding systems used in other domains (Carter, Inui, Kukull & Haigh, 1982). This could be due to a variety of reasons, most notably because of the rarity with which dyadic interactants overtly convey meta-communicative information outside of the therapist-client interaction. As a large number of interactional analysis systems are designed to assess the communication quality of health professionals, and meta-communicative processes, although encouraged, are seldom present, interactional analysis systems may simply combine such utterances with more generic categories (e.g., shows support).

The physician-patient interaction has been studied by numerous researchers in the field of medicine, health psychology, and the social sciences, as a specific case of dyadic communication (Hall, Roter, & Katz, 1988). A wealth of literature exists on the different interaction analysis coding schemes, and rating systems, used to characterize the communicative processes present in the medical encounter (Roter et al., 1995; Kalet, Earp, & Kowlowitz, 1992). Moreover, process-outcome researchers have pointed to the relative importance of good quality communication in predicting positive patient outcomes, such as increased satisfaction (Comstock et al., 1982), adherence to treatment regimens (Stewart, 1984), and improvements in health (Romm, Mayo, & Hulka, 1976) and psychological status (Zachariae et al., 2003). Debate still exists throughout the field as to the best method by which to evaluate the communicative process of physicians and patients, with some researchers promoting discourse analysis, others conversation analysis, and others rejecting coding schemes entirely (Kenny et al., 2010)

Instruments in Medical Communication Assessment

Attempts to evaluate the quality of physician-patient communication can be generally grouped into two overarching categories: coding systems and rating systems. Despite this common categorization, it is important not only to distinguish between the direct type of communication assessment methodology, but also in the original purpose for which the communication instrument was developed. Historically, physician-patient communication assessment instruments have been created for two purposes: (1) For medical education, in the evaluation of the socioemotional (McLafferty, Williams, Lambert, & Dunnington, 2006) and task-oriented (Baider, DeNour, Perry, Holland & Sison, 1995) skills of medical students, residents, and new physicians; and (2) For research purposes, to inform researchers in the field of health communication about the nature of the physician-patient relationship, in direct pursuit of a deeper understanding of the medical visit and the process-outcome relationship (Street, 1992). Table 1.0 presents a list of examples of physician-patient communication assessment instruments, and their appropriate categorization.

Table 1.0 Physician-Patient Communication Assessment Instruments

Medical Education	Research Development
Arizona Clinical Interview Rating (ACIR) (Stillman et al., 1977)	Bales Interactional Process Analysis (Bales, 1950)
Brown University Interpersonal Skill Evaluation (BUISE) (Burchard, & Rowland-Morin, 1990)	Bensing's General Consultation Judgment (Bensing, 1991)
Campbell's Assessment of Trainees (Campbell, Howie, & Murray, 1993)	Davis Observation Code (Robbins et al., 1993)
Daily Rating form of Student Clinical Performance (White, Tiberius, Talbot, Schiralli, & Rickett, 1991)	General Practice Interview Rating Scale (Verby, Holden, & Davis, 1979)
Hopkin's Interpersonal Skills Assessment (Grayson, Nugent, & Oken, 1977)	Kaplan's Measurement of Physician-Patient Communication (Kaplan, Greenfield, & Ware, 1989)
Interpersonal and Communication Skills Checklist (Choen, Colliver, Marcy, Fried, & Swartz, 1996)	Medical Communication Competence Scale (Cegala, Coleman, & Warisse, 1998)
Interpersonal Skills Rating Form (Schnabl, Hassard, & Kopelow, 1991)	Parents' Perceptions of Physicians' Communicative Behavior (Street, 1992)
Maastricht History Taking and Advice Checklist (Kraan, & Crijnen, 1987)	Profile of Nonverbal Sensitivity (Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979)
	Roter's Interactional Analysis System (Roter, & Larson, 2002)
	Stiles' Verbal Response Mode (Stiles, 1978)

Although less common, both educational and research instruments can be used for communication assessment by an observer in real-time over the course of the physician-patient interaction. White et al (1991) developed a 12-point scale to rate the behavior-specific communication of medical students throughout a standardized medical interaction. The Maastricht History Taking and Advice Checklist (Kraan & Crijnen, 1987), and the Medical Communication Behavior System use checklists so that specific behaviors or tasks can be rated during the interview. Other systems of communication assessment have had more rigorous assessments of the physician-patient interaction over time. For example, Davis Observation Code (Robbins et al., 1993) involves the coding of specific behaviors in the physician-patient interaction in consecutive 15-s intervals. Observers are prompted to observe and code behaviors by making codes on an audio-tape of a physician-patient interaction, with pre-recorded prompts indicating when to observe and record specific behaviors (Robbins et al., 1993).

In an effort to best replicate and systematically vary the interactive properties of the physician-patient relationship, a number of physician-patient communication assessment instruments have been designed specifically for interactions with standardized patients. For example, the Interpersonal and Communication Skills Checklist and the Interpersonal Skills Rating Form (Boon & Stewart, 1998), are both used with standardized patients. The use of standardized patients is particularly beneficial to educational and research methodology because the standardized patients may vary systematically in specific communicative characteristics important to the educational premise of the interaction, or the research question of the investigator (Street, 1992).

Physician-patient interaction assessment also varies in the extent to which the interaction being observed contains all of the visual and auditory stimuli of the original interaction. Many communication assessment instruments have been developed specifically for use with video- or audio-taped physician-patient interactions. This is particularly true for interactional analysis systems involving a complex series of codes (e.g., the Roter Interactional Analysis System), as well as for any system designed to account for temporal continuity in codes of the physician-patient interaction (e.g., the Maastricht History Taking and Advice Checklist). Communication instruments that involve ratings following a videotaped physician-patient interaction include the Brown University Interpersonal Skill Evaluation (Burchard & Rowland-Morin, 1990), the Campbell et al's Assessment of Trainees (Campbell, Howie & Murray, 1993), and the Bensing's General Consultation Judgment (Bensing, 1991). Other instruments use coding checklists and presence/absences scores over the course of recorded interactions.

Some systems of analysis rely on an entirely different approach. For example, the Profile of Nonverbal Sensitivity (PONS) (Rosenthal et al., 1979) uses a 45-minute video tape to measure an individual's (e.g., a medical professional's) ability to understand the emotion conveyed by another individual through nonverbal signals, including facial expressions, body movements, and tone of voice.

Although the majority of communication assessment instruments are designed for use with videotaped physician-patient interactions, many can be adapted for use with audiotaped interactions. Audiotaped data are often more convenient and less expensive for the researcher to collect; however, the audio recording loses a significant amount of the nonverbal cues communicated in the interaction (Street, 1992).

Although third party assessments, such as interactional analysis systems and end-of-interaction ratings, comprise an ample proportion of communication assessment techniques within the realm of health communication, the predominant research instrument for assessing medical communication remains the self-report. Perhaps due to the ease of use and relatively low cost, self-report from either the patient and/or the physician are very common in studies of health communication. For example, the Measure of Patient-Centered Care evaluates the physician's perception of his/her own communication with the previous 10 patients s/he interacted with (Boon & Stewart, 1998); whereas, the Patient-Centered Questionnaire asks the patient to assess the perceptions of the patient about their relationship with the physician (Boon & Stewart, 1998). Other self-report measures assess both the physician's and the patient's attitudes toward the relationship. For example, the Doctor-Patient Orientation Scale assesses the attitudes toward patient-centeredness of both members of the dyad (Street, 1992).

The number of measures to assess the physician-patient interaction has grown over the last few decades; however, no one system of analysis is without flaws and disadvantages. Instruments permitting the observation and analysis of communicative behaviors continuously over time, especially when used in conjunction with video-recording technologies, have several advantages over traditional systems.

Continuous Response Measurement

The current investigation challenges the method by which verbal and nonverbal communication quality is defined and assessed. Although the study of the ability of health care practitioners to communicate well with patients is most often through structured rating and coding systems, each of these systems currently in practice possesses a number of flaws (Frankel, 2004; Cannick et al., 2007; Kalet, Earp & Kolowitz, 1992). Quantitative systems of analysis, called interactional analysis systems, are a commonly used procedure to evaluate the communication skills of physicians and other health care providers. These systems rely on frequencies (counts) or ratios to characterize specific components of communication, both at the level of the individual interactants, and at the level of the dyadic relationship (Inui, Carter, Kukull, & Haigh, 1982; Stiles, 1978). Such systems have been widely used throughout the literature on communication, and are often considered superior to more subjective systems of assessment (Roter et al., 1995; Bales, 1950). Methods of analysis in which elements of communication are evaluated by 3rd party raters for more abstract interactive characteristics, have been criticized by researchers advocating the use of interactional analysis coding (Krupat, Frankel, Stein, & Irish, 2006).

In response to the wealth of literature on the importance of physician-patient communication within a biopsychosocial model of care, interactional analysis (IA) systems put less emphasis on technically based skills (e.g., clinical competence) and more emphasis on socioemotional aspects of communication (Martin et al., 2010). The challenge of IA systems is to characterize the empathic process of care using frequencies and ratios of specific verbal and nonverbal behaviors (Wasserman & Inui, 1983). Some researchers have argued that although the attempt of IA systems to quantify such socioemotional aspects of communication, via quantification of specific actions of the interactants, is commendable; the empirical literature does not fully support the use of such systems, and in assessing physician-patient communication, it can be disadvantageous to use such systems for numerous reasons (Lichtenberg, 1985; Sandvick et al., 2002). Thus, although coding schemes offer certain advantages, there are notable deficiencies in such systems and they may lack empirical usefulness (Inui et al., 1982). The proposed research advocates a paradigm shift away from the conceptualization of communication as a series of frequencies or ratios of behaviors as indicative of high- or low-quality communication through correlations of such frequencies and ratios with patient outcome, and toward an understanding of communication as evaluated by rating the interaction on multiple dimensions. The following research additionally provides a significant improvement over traditional methods of rating the quality of physician-patient communication, as it no longer requires a method in which ratings are made at the end of the interaction. Thus, the proposed research offers a novel method by which dyadic communication assessment can be improved and shifts the field toward a model in which communication should be evaluated continuously over time.

Although research in medical communication has many overlaps with communication research in many diverse fields, one useful application from marketing and consumer research has thus far not been applied. For decades, marketing researchers have analyzed consumers' real-time responses to products, using, e.g., instantaneous responses to video and audiotapes (Biocca, David & West, 1994). Rating perceptions to stimuli in real-time has been used as a mechanism of judging audience reactions since the 1940s. Peterman (1940) proposed the program analyzer to continuously assess valence (along a one-dimensional liking-disliking scale) of radio programs. Recently, real-time reactions to live performances, as well as to audio and video prerecorded material, have been applied to the political area (e.g., Maier, Maurer, Reinemann, & Faas, 2007; Weaver, Huck, & Brosius, 2009).

Although real-time physiological measures (such as heart rate, pupil dilation, and galvanic skin response) are used extensively in psychological and behavioral research (Ong et al., 1995), real-time conscious ratings of communication have not been utilized. Continuous Response Measurement (CRM) systems enable the researcher to gauge viewers' reaction to a stimulus simultaneously with its presentation. Through enhancements in recent technology, several cost-effective systems have now been developed. The technology used by the CRM can, in most cases, be easily replicated and used to rate any prerecorded audio or video interaction in many different contexts.

The central advantage to using CRM technology is in providing instant feedback from raters on the perceived quality of communication (West & Biocca, 1996). Through the use of any of several types of input devices (dial, joystick, software button, etc.) CRM records data in real time, which, in a typical embodiment, produces a graph showing the evaluation by the rater during the time of the observation. The graph provides a visual representation of the times when the communication was found to be positive or high quality and of when the rater found the communication to be negative or of poor quality. After averaging the graphs for many independent raters, the researcher would then be able to correlate objectively the rated quality of the interaction with the specific action represented in the prerecorded material. Upon viewing the interaction again, the researcher would be able to point to the exact behaviors (controlling for reaction time delay) that resulted in the highest ratings of good quality communication.

Improvements to Continuous Response Measurement

Commercialized CRM systems are increasing in popularity amongst researchers in marketing and in applications to political polling; however, these commercialized systems also have several disadvantages. The great majority of CRM systems utilize dials to obtain ratings over time from audiences of multiple raters. As first suggested by Biocca and colleagues (1994), dials are disadvantageous to continuous ratings as they measure absolute intensity and do not take into account the relative fluctuations in scores. By design, dials require raters to record multiple values before they reach their final rating. This system negates the presence of a decay curve, and assumes that raters maintain the same rating over time (Jaimes, Nagamine, Liu, Omura, & Sebe, 2005). Because the CRM systems that are currently available tend to poll a large number of individual raters in order to obtain instantaneous feedback on audience reactions (e.g., in the case of presidential debates), the program must combine the feedback from each of the raters instantaneously as the ratings are being made. This is problematic, as the most frequently used method of combining the graphs is via standardization through z-scores. As the calculation for z-scores require the population mean and population standard deviation, this prohibits the accurate instantaneous calculation of standardized scores. These potential disadvantages of CRM systems can be overcome by adapting the methodology used by commercial systems to enable a more scientifically rigorous analysis of affective response (e.g., Jaimes et al., 2005); however they are important to keep in mind when designing a

CRM system to accurately represent raters' assessments of interaction quality.

Across both traditional rating systems and CRM systems, human affective response has been historically measured in three dimensions: arousal, control, and valence (Jaimes et al., 2005). The dimensions are typically plotted in three-dimensional space in order to characterize raters' perceptions of a segment of human interaction (Hanjalic, 2004). Arousal represents the intensity of emotion and is representative of a continuous scale of affective states (Jaimes et al., 2005). Control describes the dominance-skew of the interaction. Valence embodies the type of emotion present in the affective response. Valence is usually scored on a continuous scale ranging from "positive" (liking) to "negative" (disliking). Of the three, valence has typically been characterized as the most fundamental rating of the interaction characteristics.

Thus, in light of the recent literature on CRM analysis of affective response, it is proposed that a simple discrete-entry system in which valence is measured on a continuous scale would best characterize raters' perceptions of the dyadic interactions. This system could be used to rate the quality of physician-patient interactions in order to determine the salient intervals in which rater appraisals of the valence of the interaction is significantly higher or lower than the average interval. The ability of CRM to measure affective response in combination with semantic and perceptual judgments within the context of a system establishing temporality of behaviors provides a distinct advantage over traditional rating systems and interactional analysis systems (Biocca et al., 1994).

Continuous Response Measurement systems have been widely used in mass media communication analysis and marketing applications; however, such systems have never been used in evaluating dyadic communication in the medical context. The research project methodology detailed below proposes to develop a CRM system specific to the analysis of communication quality in physician-patient interactions.

Overview

The relationship between the quality of health professionals' communication and patient outcomes has been well established. Statistically, this is an extremely important correlation explaining, on average, about 10% of the variance in patient outcome. The most frequently cited outcomes are patient satisfaction and patient adherence; recent literature also examines patient physical and psychological health outcomes, and health care providers' job satisfaction (Hall et al., 1988). In short, better provider communication is significantly correlated with greater satisfaction, better adherence and health outcomes, and higher provider job satisfaction (Martin, Haskard-Zolnierek, & DiMatteo, 2010), The implementation of training systems to improve providers' communication with their patients requires identification of specific behaviors that constitute high- and low-quality communication; this identification has not yet been established empirically.

Improving communication quality is a crucial step toward eliminating disparities in medical care. Disadvantaged populations are marginalized in the health care system due to poor communication with their health care providers (Phelan, Link, & Tehranifar, 2010). Women, patients of low socio-economic status, limited educational opportunities, elderly patients, and patients of ethnic minority status, all face unique challenges in the health care system (van Ryn, & Burke, 2000). Unfortunately, the correlation between these variables and quality of care is even more pronounced for patients suffering from chronic illness. The United States stands out in international comparisons as having significantly pronounced differences in quality of patient care based on socio-economic status, especially in combination with other sociodemographic risk factors (Huynh, Schoen, Osborn, & Holmgren, 2006). By investigating the processes of high-quality communication within an ethnically and economically-diverse sample and identifying sociodemographic variables as predictors within the analyses, the proposed research will further the field's focus toward breaking the link between social status and quality of health care.

Limitations in accurately assessing the quality of individual behaviors in the health care interaction have resulted from continued reliance on global measures of communication that use interactional analysis coding systems (e.g., the Roter Interactional Analysis System) and rating systems (e.g., Haskard, DiMatteo, & Heritage, 2009). These global measures, however, make it impossible to understand the specific aspects of the interactive process that relate to outcomes, and that would need to be elements in communication training.

The primary flaw in coding systems is the inferential leap required between observing a given behavior and an abstract characteristic of communication. Roter and Hall (1989) first indicated the methodological limitations of interactional analysis systems, noting that summary profiles developed from frequencies of behaviors actually reflect the process (and quality) of communication only to the extent that they are validated. Coding systems detail the number of times (or the relative frequency) of certain actions, but are valid measure of communication quality only to the extent that the behavioral counts are correlated with the predicted patient outcome. The flaw in current coding systems, however, lies in the inference that a given behavior is indicative of a more general descriptor of communication.

In rating systems, members of the medical interaction or naïve raters evaluate the process and content of communication by providing ratings on multi-dimensional scales. Currently, many studies obtain ratings of physician-patient communication after a medical interaction is completed, or at fixed intervals throughout the interaction (e.g., once during the first few minutes, once in the middle of the interaction, and once in the last minutes). Although these methods have been used for several decades, the subtleties of communication are lost when ratings are collected at the end of the interaction, or after fixed periods of time during the interaction. The longer the duration of the interaction examined for rating, the less reliable becomes the evaluation of the rater, as s/he must rely increasingly more on remembering what was presented (Stewart, 1995).

Currently, measures lack the ability to appraise the overall communication performance of the interactants and also identify specific behaviors that correlate with overall ratings of communication; such appraisal is essential to the development of communication training approaches for improving therapeutic interactions. Therefore, it is particularly important to discover new methods of measuring specific behaviors in communication so that general health care and mental health professionals can be trained to be better communicators, and contribute to better patient outcomes and improvements in health care services (Helitzer et al., 2011). Moreover, understanding the behaviors involved in high- and low-quality communication is particularly salient in the interaction of priority populations of patients with their physicians, especially those suffering from chronic illness (Heisler et al., 2002). Such research will benefit not only the understanding of the physician-patient interaction, but also how such a complex interaction can be tailored to targeting improvements in quality of care for disadvantaged populations.

Chapter 2: Continuous Response Measurement Applied to the Physician-Patient Interaction

The quality of physician-patient communication is known to correlate with multiple patient outcomes including satisfaction with care, health outcomes in chronic disease management, psychological well-being, treatment adherence, patient recall, and trust in the health care provider. Recent literature points to the importance of studying physician-patient communication as a means to diminish disparities in health care. Patients with limited educational opportunities, elderly patients, patients of ethnic minority status, and lower socioeconomic status, especially those suffering from chronic illness, experience consistently lower quality health care. This is in part due to the interaction with their health care providers. The current proposed research seeks not only to establish a new system of communication quality assessment, but also to do so in a context emphasizing the improvement of communication quality for such priority populations.

The literature on provider-patient communication points to two primary methods by which the quality of communication is evaluated: sequential analysis of frequencies of behaviors via coding systems (e.g., the Roter Interactional Analysis System), and ratings of the quality of communication made by parties involved in the medical interaction or by naive raters. It is via these systems that specific behaviors in the physician-patient interaction are considered representative of high- or low-quality communication. Although these systems of communication quality assessment are frequently used, they possess a fundamental flaw in that they disregard the inferential leap between observing a behavior and associating that given behavior with an abstract characteristic of communication. The research proposed here identifies and tests a method to enable researchers to identify specific behaviors in the medical interaction that directly correlate with communication quality. The results of the proposed research will change the way in which the physician-patient interaction is conceptualized by developing and applying a new system for researchers to identify specific behaviors as correlates of high- and low-quality communication. These findings will not only promote a more detailed theoretical understanding of physician communication, but also provide an opportunity for the improvement and specialization of training health care providers to become better communicators.

The proposed method applies a new system of analysis, rating the quality of dyadic communication continuously over time, to the study of physician-patient communication. Using this method, (known as Continuous Response Measurement, CRM) raters instantaneously evaluate the valence quality of communication as they are presented with the interaction. The researcher is then able to identify salient time intervals in which raters' assessments of communication quality differ significantly from their ratings of average intervals. These salient intervals are then compared to the time-intervals in which specific physician behaviors occur.

Specific Aims. Thus, the specific objectives of the proposed research are; (a) To obtain continuous ratings of dyadic communication quality from 204 videotaped physician-patient interactions and to identify salient-intervals within these interactions in which raters' assessments of communication quality significantly differed from the average interval; (b) To determine the correlation between salient time intervals identified via continuous ratings and the time intervals in which specific physician behaviors occurred; (c)To compare the specific behaviors occurring in time intervals across physicians and locations of medical facilities, to determine the effect of the higher-order characteristics of the medical visit.

The proposed research expects to find significant correlations between the presence of specific physician task-oriented and socio-emotional communicative behaviors and raters' assessments of communication as measured by the continuous response measure. Furthermore, the proposed research expects to find that sociodemographic indicators are strongly related to overall communication quality, as well as to the specific elements of the dyadic interaction identified as indicative of communication quality.

This research project will not only further the field by developing a new system by which individual behaviors within the medical interaction can be evaluated for the extent to which they contribute to perceptions of interaction quality, but it will also develop this new system in a context lending to the analysis of sociodemographic variables. Thus, findings of this research project will benefit both the training of physicians as better communicators and providers of care, and will do so in a manner specifically tailored to identify the communicative processes of those patients disadvantaged by sociodemographic risk factors.

Method

Participants

Data were collected as part of a larger research investigation, the "Communication and Satisfaction with Primary Care Teams" study. Videos of physician-patient interactions were recorded as part of a collaborative research project with Dr. M. Robin DiMatteo and Dr. John Heritage (Agency for Healthcare Research and Quality: Grant RO1-HS10922-03; Robinson & Heritage, 2005; Haskard et al., 2009).

Community primary care medical facilities were selected at random from three nonstaff-model health maintenance organizations within the greater Southern California metropolitan area. Physicians at potential sites were recruited by members of the research team (Haskard, 2009). In all, 34 practices agreed to participate in the study, and between one to five health care providers from each practice took part in the research. All patients and recruited health care providers at the selected facilities completed informed consent forms. All participating institutions approved the informed consent forms. Interactions with practice nursing staff and physicians were recorded. In order to participate in the study, patients had to be English speaking and meeting with their physician because of a new medical problem. Up to 10 patients were selected from each practice. A research assistant approached patients consecutively in the waiting room of each facility until the requisite number of patients agreed to participate in the study. Patients were provided with informed consent forms, agreeing to the videotaping of their medical interaction in the examination room. The informed consent form indicated that patients were able to stop the video recording at any time.

Patients filled out both pre- and post visit questionnaires. Pre-visit questionnaires were filled out in the waiting room, prior to the interaction with any nursing staff or physician. Post-visit questionnaires were completed upon the conclusion of the medical visit. The following study utilizes videotape data from a subset of 204 medical interactions of patients with their physicians. These patients were recorded with 56 physicians.

For the present research, four naïve raters analyzed 204 videotapes of the physician-patient interactions across 56 physicians and 32 sites (videos were unusable for 2 sites). Raters were undergraduate students at the University of California, Riverside. The raters had not previously worked with medical interactions, and were not familiar with any current coding or rating systems of physician-patient communication quality. All raters and coders received human subjects training and signed an informed consent form indicating their acknowledgment of the maintenance of the privacy of the identities of those present in the interaction, and the content of the interactions. Raters were required to spend 6-12 hours per week in the Health Communication Lab over the course of one academic term (March – June 2011). Each of the 204 interactions was coded by one trained coder, experienced in coding the occurrence of specific verbal and nonverbal behaviors in dyadic interactions. The coder was trained in two three-hour training sessions, in which she practiced identifying a series of 15 verbal behaviors (see Table 2.0). An additional coder also coded a subset (54) of the 204 interactions; this coder received the same series of training sessions as the original coder.

Materials

The Health Communication lab is in the Psychology Department at UCR and consists of a total of over 900 square feet of space, secure storage areas and file cabinets for data and audiovisual recordings (CD and DVD recordings), and six computer work stations for ratings, data organization, input, and analysis.

Eight complete desktop computers, seven running Windows Vista and one running Windows 7, all with SPSS 12 or IBM SPSS 19, were available to the researcher and research assistants. Any necessary literature consultation was facilitated by the Health Communication Lab's EndNote databases with electronic notations and identification of data on all aspects of health communication as well as access to the electronic library system of the entire University of California.

Raters and coders utilized HD 202 Senheiser over-ear headphones for observing and analyzing interactions. Video recordings of interactions were stored on a Western Digital WD Elements 2 TB USB 2.0 Desktop External Hard Drive in a secure locked file cabinet. In the continued use of the data, the maintenance of patient privacy with the videotapes was a primary concern, and all personnel were trained carefully to manage this issue. The data are all anonymous, and no patient names are used. The data are available only to the researchers, and strict control of the data continues to be maintained. Only ID number identifies the research data. Patient and physician questionnaires are identifiable only by assigned ID numbers. All identifying information was removed before the raters listened to or viewed the interactions. Video-editing to remove identifying information, and video format conversion (from .mp4 to .flv) was conducted using Final Cut Express 4.0.1 and iSkySoft Video Converter (2.0.1).

Measures

Survey Measures. At the time of video collection, multiple surveys were administered to the study participants. Descriptions of the original surveys used can be found in Haskard, Williams, DiMatteo, Heritage, and Rosenthal (2008). For the purposes of the present research, only physician and patient sociodemographic data were used in the data analysis. Patient sociodemographic data was collected as part of the *Patients' Pre-visit Questionnaire*, assessing sociodemographic qualities such as gender, age, education, income, race, and income. Physician gender and ethnicity were obtained from observational analysis from coders (method described in Haskard et al., 2008).

Coding. Coders were presented with videotapes of the interactions. Coders were instructed to watch the interaction using the Flash video application as part of the Continuous Response Measurement Software (see 'Continuous Response Software' below) and record the time (in seconds) at which they first observed the behavior begin, and the time (in seconds) at which the behavior ended. Fifteen verbal behaviors were coded (see Table 2.0). The fifteen behaviors were adapted from the original measures of physician communication developed by Robinson and Heritage (2005) as part of the "Communication with Primary Care Teams" study.

Continuous Response Measurement. Rating data were collected with communication assessment technique, newly developed for the purposes of this research (a Continuous Response Measurement system). A prototype of a new computer software data acquisition tool presents the interaction recording to the raters (Figure 2.0). Raters are instructed to make ratings, using a computer keyboard number pad, of valence on a 1-9 scale. In this way, a series of data are saved for each rater in which the rating [x] and the time (in milliseconds) at which the rating is made [t] is recorded [x, t]. The prototype has the capacity to present audio (no video), mute-video, and audio-video interaction.

Table 2.0 Physician and Patient Behaviors Coded

	Title	*Behavior*
b1	PtNarrative	Does the patient use a narrative format? 0=no, 1=yes
b2	PtSymptom	Does the patient give symptom descriptors? 0=no, 1=yes
b3	PtDuration	Does the patient give duration of this problem? 0=no, 1=yes
b4	PtSelfTrmt	Does the patient give self-treatment? 0=no, 1=yes
b5	PtMedHist	Does the patient give medical history relevant to this problem? 0=no, 1=yes
b6	PtCausal	Does the patient give or imply a causal theory for this problem? 0=no, 1=yes
b7	PtRulesOut	Does the patient rule out any cause/s for this problem? 0=no, 1=yes
b8	PtPsych	Does the patient give any psychosocial elaborations for this problem? 0=no, 1=yes
b9	PtDisrupt	Does the patient describe disruption of everyday activities? 0=no, 1=yes
b10	PtSensitive	Does the patient indicate verbally if this problem is delicate or sensitive? 0=no, 1=yes
b11	PtAdProb	Does the patient give any additional problems? 0=no, 1-yes
b12	MPAdProb	Does the MP[1] ask for any additional problems? 0=no, 1=yes
b13	HistOccur	Did history-taking occur? 0=no, 1=yes
b14	3rdConcern	Does the patient offer any 3rd party concerns? 0=no, 1=yes
b15	MPSensitive	Does the MP[1] ask if this problem is delicate/sensitive? 0=no, 1=yes

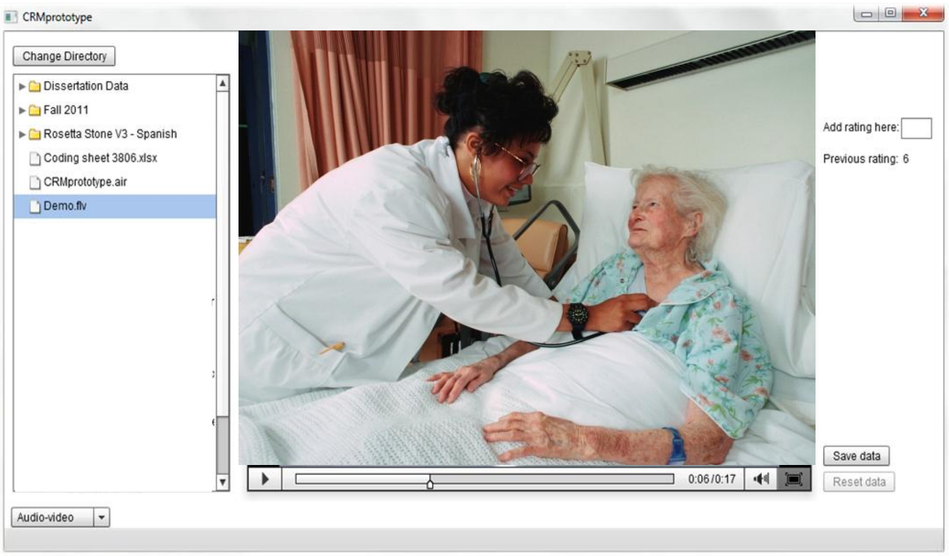
Note: [1]MP = Medical Professional

The Continuous Response System (CRM) includes a file browser, video player, and rater input field. The file browser hierarchically displays folders and files. When a user double-clicks a folder, the contents of that folder are shown. When a user single-clicks a video file, that video file loads in the video player but does not start playing until the user clicks the rater input field. When a user clicks a non-video file, no action occurs. The video player includes a play/pause button, a seek bar, and a volume control, and can also be used to view video-recordings without making ratings. The rater input field accepts keyboard input for only the numbers 1 through 9.

When a user presses a number 1 through 9 on the keyboard, that number is coupled with the time thus far in the video, which makes a rating. The ratings are stored in an Excel file. Clicking the “Save data” button can save the Excel file. CRM was implemented in ActionScript as an Adobe AIR3 application.

The currently supported video types compatible with the CRM prototype are limited to proprietary Flash video types, namely FLV and F4V; however, later versions of CRM will include more common video types, i.e. MPEG4 and AVI. Video format conversion software, such as iSkySoft for the Mac, allows for the rapid conversion of video files to-and-from the CRM prototype’s supported video files.

Figure 2.0. Continuous Response Measurement Software



Raters were instructed to rate the valence quality of the interaction. The communication quality of the interactive dyad was measured on a uni-dimensional scale of valence. Although often used in rating scales in combination with dimensions of arousal and dominance, valence has been identified as the most fundamental characteristic of quality of communication (Osgood, Suci, & Tannenbaum, 1957) and thus was chosen as the primary dependent measure for this first application of continuous response measurement to the medical interaction.

Procedure

Rating and Coding Interactions. Fifteen behaviors were dichotomously coded over time for each interaction (for each second, 0=behavior absent, 1= behavior present). Table 2.0 lists these behaviors. The coder was assessed for inter-coder reliability with another independent coder, who coded a subset of the 204 interactions. Dichotomously coding the presence of behaviors enables the identification of the presence or absence of a behavior for each second.

Independently, four independent naïve raters made ratings on the 204 interactions using the continuous response rating computer software. Raters assessed communication quality on a uni-dimensional scale of valence (1-9) from poor communication (1) to excellent communication (9). To reduce the impact of order effects, interaction order was randomized.

CRM Analysis. Once rating and coding data had been collected, the next series of steps were conducted to uncover the relationship between each of the specific behaviors coded and the raters' evaluations of interaction quality.

(1) For each interaction, each set of ratings was Z-scored separately for each rater. The Spearman up and down reliabilities for raters was calculated. Z-scoring the rating data adjusts for individual differences in baseline (the level considered neither good nor bad) rating and sensitivity (the amount of change in rating for the same observed effect) of raters, and allows direct comparison and combination of ratings

across raters. Using Z-scores sets the stage for the identification of the relative differences in ratings across the course of the interaction, adjusting for differences in the mean and standard deviation of ratings of each rater.

(2) For each interaction, ratings were standardized to be once per second as follows: If a rating was made less frequently than once per second, the last rating was continued until a change occurs (e.g., if a rating of 8 was made at second 210, and no other ratings were made until second 230, then rating 8 was repeated 19 times for 211, 212, …229). If ratings were made more than once per second, then the average of the ratings during that second was taken to be the rating. Standardizing rating data to be once per second adjusted for the different frequencies at which each rater actually rated. In this way, each rater was weighted equally regardless of how many times s/he rates. Also, this allowed direct comparison (second by second) of the rating data to the coding data.

(3) The z-scored ratings were then averaged across raters for each interaction. This summarized the ratings of the interaction over time for all four raters.

(4) A z-score value above (or below) which, rating data will be considered to be salient, was determined. The z-score cut-off for salient intervals was set to be z= X. To determine the z-score cut off X for saliency, the following steps were taken: find the cut-off such that the correlation between salient intervals (dichotomously coded 0=nonsalient, 1=salient) and coded intervals (dichotomously coded 0=no coded behaviors occur, 1= any coded behavior occurs) is maximum. For example, a z-score cut-off set at 1, would produce a certain correlation “R1”. A cut-off set at 2 would produce a correlation “R2”, and so on. If we proceed in this way, there will be a z-

score cut off beyond which the correlation will start decreasing. Thus, a value of the z-score cut-off for which the correlation is maximum can be chosen. This was so that the researcher could determine those intervals that are both salient and best correlated with the coded behaviors. In this way, no arbitrariness exists in the choice of the z-score cut-off.

(5) Going back to the salient intervals, not the dichotomized scores (as done for determining the most coded salient intervals), but the original z-scored values of the salient intervals (setting the values for the nonsalient intervals to zero) were now considered. In this way, the (most relevant) saliency profile for this interaction is obtained. The advantage of keeping the z-scored values instead of using dichotomous coding for the saliency profile is to adjust for the degree of saliency of the salient intervals.

(6) Z-scored salient intervals were correlated (Pearson r effect size) to coding data for each of the fifteen behaviors. A confidence interval for each r was obtained using a Bootstrap permutation test in *Mathematica 5.0*. The correlation between the z-scored salient interval rating data and each of the coded behaviors determined the degree to which the presence of a given behavior was correlated with a salient change in rater's appraisal of the interaction. The p value from the r determined the significance of the effect size. Although tests of significance are typically less informative than the exact effect size value, because number of data points was anticipated to be very high, a small effect size may still be significant and should not be undermined by the small value of the effect size (Rosenthal, Rosnow, & Rubin, 2000)

(7) Steps 1-6 were repeated for each of 204 physician-patient interactions. Results were anticipated to yield up to 204 correlation coefficient *r*s for each of the fifteen behaviors. Subsequent data-analysis on doctor- and location-level variables can then be conducted on the matrix of correlation coefficients obtained from this analysis.

Results

Relationships between codes and ratings communication. Four raters and one coder evaluated all 204 interactions. Each of the 15 behaviors varied on the number of times each appeared. Appendix A.1.0. presents a table of the correlations indicating the size of the effect between the rated salient intervals and the dichotomous codes of each behaviour. The low numerical values were found for each of the individual correlations; however, when taken across the 204 interactions, many of these correlations were significantly different from zero. Table 2.1 presents the descriptives and range for the 204 correlation coefficients for each behaviour.

As conducting a non-robust significance test of effect size would violate the independence assumption of the *t*-test, statistical significance of average effect sizes was computed using a bootstrap permutation test. Bootstrap analysis was performed with 1000 iterations. Table 2.2 presents the 99.9%, 99% and 95% Confidence Intervals obtained from the bootstrap analysis. [1] Confidence intervals corresponding to quantiles demonstrate significance level of each behavior.

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[1] {0.001, 0.999}, {0.01, 0.99}, and {0.05, 0.95} quantiles of the 15 behaviors. Bootstrap analysis values below are the results for the quantiles. Note that every time one runs the program the number are slightly different as this is a randomization program.

Table 2.1. *Descriptive Statistics of the Correlations over the 204 Physician-Patient Interactions*

		N	*Range*	*Min*	*Max*	*Mean*	*Std. Dev.*	*Variance*
PtNarrative	r1	67	0.20	-0.12	0.08	-0.0197	0.04038	0.002
PtSymptom	r2	200	0.17	-0.12	0.05	-0.0096	0.02418	0.001
PtDuration	r3	169	0.11	-0.08	0.03	-0.0030	0.00961	0.000
PtSelfTrmt	r4	108	0.08	-0.05	0.03	-0.0018	0.01134	0.000
PtMedHist	r5	125	0.15	-0.12	0.03	-0.0059	0.02004	0.000
PtCausal	r6	103	0.07	-0.05	0.02	-0.0028	0.01014	0.000
PtRulesOut	r7	14	0.03	-0.03	0.00	-0.0057	0.00852	0.000
PtPsych	r8	77	0.13	-0.04	0.09	0.0034	0.01854	0.000
PtDisrupt	r9	31	0.04	-0.02	0.02	0.0003	0.00875	0.000
PtSensitive	r10	1	0.00	0.00	0.00	0.0000	--[1]	--[1]
PtAdProb	r11	67	0.05	-0.02	0.03	0.0015	0.00702	0.000
MPAdProb	r12	42	0.02	-0.01	0.01	0.0007	0.00407	0.000
HistOccur	r13	133	0.17	-0.11	0.06	-0.0041	0.02161	0.000
3rdConcern	r14	26	0.10	-0.03	0.07	0.0015	0.01567	0.000
MPSensitive	r15	3	0.00	0.00	0.00	0.0000	0.00000	0.000

Note: [1]Standard deviation and variance could not be computed for r10 (Does the patient indicate verbally if this problem is delicate or sensitive?), as only one occurrence of the behaviour was observed. r1-r15 refer to the correlations between the saliency profile and the behavioural occurrence of behaviors b1-b15.

Table 2.2 *Quantiles from Bootstrap Analysis*[2]

		99.9% Quantile		99% Quantile		95% Quantile	
		Min	Max	Min	Max	Min	Max
PtNarrative	r1***	-0.0373	-0.0066	-0.0355	-0.0060	-0.0278	-0.0114
PtSymptom	r2***	-0.0153	-0.0050	-0.0151	-0.0053	-0.0128	-0.0073
PtDuration	r3***	-0.0055	-0.0008	-0.0052	-0.0010	-0.0043	-0.0018
PtSelfTrmt	r4*	-0.0052	0.0009	-0.0065	0.0017	-0.0035	-3.21×10^{-20}
PtMedHist	r5***	-0.0124	-0.0006	-0.0119	-0.0014	-0.0089	-0.0032
PtCausal	r6***	-0.0061	-0.0001	-0.0062	-0.0003	-0.0045	-0.0012
PtRulesOut	r7***	-0.0136	-0.0007	-0.0150	-0.0007	-0.0100	-0.0021
PtPsych	r8*	-0.0018	0.0105	-0.0028	0.0101	0.0001	0.0070
PtDisrupt	r9	-0.0042	0.0045	-0.0038	0.0052	-0.0022	0.0029
PtSensitive	r10	0	0	0	0	0	0
PtAdProb	r11*	-0.0012	0.0046	-0.0010	0.0040	0.0015	0.0029
MPAdProb	r12	-0.0012	0.0026	-0.0095	0.0026	-0.0002	0.0017
HistOccur	r13*	-0.0108	0.0018	-0.0101	0.0013	-0.0072	-0.0013
3rdConcern	r14	-0.0061	0.0127	-0.0054	0.0119	-0.0027	0.0073
MPSensitive	r15	0	0	0	0	0	0

Note. ***p<.001, **p<.01, *p<.05. Significance level determined by whether or not CI crossed zero.

A correlation matrix of saliency detection across the 15 behaviors was calculated. Results indicated a strong relationship between some behaviors. Table 2.3 presents a correlation matrix of the effect sizes. r1-r15 refer to the correlations between the saliency profile and the behavioural occurrence of behaviors b1-b15.

[2] It should be noted that 95% CIs from the Bootstrap analysis were very similar to (and more conservative than) the standard parametric calculation of a 95% CI. For example, using the formula the 95% CI for r1 was: Min (-0.0248) to Max (-0.0146).

Table 2.3 *Correlation Matrix of Coded Behaviors*

		r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15
PtNarrative	r1	1.00	0.66**	0.56**	0.50**	0.52**	0.43*	0.98**	0.59**	0.28	—	0.17	0.13	0.09	-0.25	—
PtSymptom	r2		1.00	0.44**	0.44**	0.30**	0.46**	0.13	0.29**	0.08	—	-0.01	0.06	0.32**	0.13	—
PtDuration	r3			1.00	0.26*	0.26**	0.15	0.36	0.15	0.49**	—	0.20	-0.27	0.05	0.28	—
PtSelfTrmt	r4				1.00	0.15	0.42**	-0.80	0.54**	0.26	—	0.00	0.09	0.34**	0.31	—
PtMedHist	r5					1.00	0.29*	0.00	-0.28*	0.32	—	0.13	-0.40*	-0.03	0.05	—
PtCausal	r6						1.00	0.33	0.13	-0.65*	—	0.02	0.30	0.15	-0.79**	—
PtRulesOut	r7							1.00	—	0.19	—	0.34	—	0.20	—	—
PtPsych	r8								1.00	0.02	—	0.20	-0.19	0.30*	0.31	—
PtDisrupt	r9									1.00	—	0.27	—	0.14	0.96**	—
PtSensitive	r10										—	—	—	—	—	—
PtAdProb	r11											1.00	0.11	0.02	0.00	—
MPAdProb	r12												1.00	0.14	—	—
HistOccur	r13													1.00	—	—
3rdConcern	r14														—	—
MPSensitive	r15															—

Note: ***p<.001, **p<.01, *p<.05.

Rater reliability was calculated using the Spearman Brown Up (R^{SB}) and Spearman Brown Down (r_{ii}) (Rosenthal, 2005). The average of the correlations between raters was relatively low, r_{ii} = 0.142. The R^{SB} was 0.398 (α = 0.395). Table 2.4 presents a correlation matrix of the raters' ratings of physician-patient communication using the CRM device. The difference between raters was significant[3]: $F(3,609)=283.2, p=4.73 \times 10^{-115}$

Table 2.4. *Correlations Between Raters of Physician-patient Communication Over Time*

	Rater 1	Rater 2	Rater 3	Rater 4
Rater 1	1.000	0.078	0.107	0.166
Rater 2		1.000	0.181	0.161
Rater 3			1.000	0.160
Rater 4				1.000

Note: correlations were calculated across seconds of the interactions (N=146,343)

A second coder received the same training and coded a random subset of 50 of the 204 interactions. Inter-coder reliability was moderate (α=0.67). The correlation between the coders was significant (r = 0.506)

Principal Components Analysis was run to determine whether the fifteen behaviors formed composite variables. Step-up varimax rotation on variables r1, r2, r3, r4, r5, r6, r8, r9, r11, r12, r13, and r14[4], was run to determine the most

[3] Residual degrees of freedom computed from $df = (n-1)(k-1)$, where k = 4 and n = 204
[4] r7, r10, and r15 had too few cases to be included in the principal components analysis

methodologically and substantively valuable categorization. Five factors were extracted. Results of the analysis are displayed in Table 2.5a and b.

Table 2.5.a *Principal Components Extraction: Unrotated*

Component Matrix(a)

		Component				
		1	2	3	4	5
PtNarrative	r1	0.695	-0.198	-0.002	-0.169	0.168
PtSymptom	r2	0.779	0.144	-0.094	0.011	-0.085
PtDuration	r3	0.663	-0.346	0.185	-0.140	-0.059
PtSelfTrmt	r4	0.512	0.357	-0.076	0.163	-0.149
PtMedHist	r5	0.444	-0.509	-0.321	0.220	-0.014
PtCausal	r6	0.471	0.318	-0.484	-0.055	0.037
PtPsych	r8	0.248	0.401	0.543	-0.471	-0.011
PtDisrupt	r9	0.203	-0.364	0.475	0.490	0.016
PtAdProb	r11	0.120	-0.157	0.297	-0.202	0.719
MPAdProb	r12	-0.001	0.380	-0.097	0.503	0.583
HistOccur	r13	0.290	0.488	0.257	0.260	-0.068
3rdConcern	r14	0.043	0.018	0.464	0.318	-0.293

Table 2.5.b. *Principal Components Extraction: Varimax Rotation with Kaiser Normalization*

Rotated Component Matrix

		Component				
		1	2	3	4	5
PtNarrative	r1	**.730**	.188	.028	-.074	.072
PtSymptom	r2	.524	**.606**	.021	-.028	-.027
PtDuration	r3	**.747**	.101	.043	.164	-.141
PtSelfTrmt	r4	.154	**.646**	.039	.040	.005
PtMedHist	r5	.518	.077	**-.575**	.028	-.049
PtCausal	r6	.193	**.569**	-.106	-.431	.057
PtPsych	r8	.172	.146	**.827**	.042	-.049
PtDisrupt	r9	.264	-.076	-.152	**.719**	.157
PtAdProb	r11	.386	-.354	.279	-.057	**.575**
MPAdProb	r12	-.226	.267	-.129	.013	**.779**
HistOccur	r13	-.067	**.532**	.260	.281	.158
3rdConcern	r14	-.067	.111	.106	**.603**	-.113

Note. Rotation converged in 16 iterations.

A correlation matrix was constructed to demonstrate the Intra- and Inter-composite differences. Table 2.6 A. reports this correlation matrix. Table 2.6 B. displays the Intra-Intermatrix.

Table 2.6A. *Correlation Matrix Grouped by Factors*

The Correlation Matrix													
		Composite I			Composite II				Composite III	Composite IV		Composite V	
Composites		R1	R3	R5	R2	R4	R6	R13	R8	R9	R14	R11	R12
I	R1	**1**	**0.56**	**0.524**	0.661	0.503	0.432	0.089	0.595	0.282	-0.254	0.17	0.13
	R3		**1**	**0.259**	0.443	0.263	0.153	0.053	0.15	0.495	0.277	0.2	-0.27
	R5			**1**	0.302	0.152	0.289	-0.033	-0.28	0.318	0.054	0.13	-0.4
II	R2				**1**	**0.435**	**0.463**	**0.32**	0.294	0.083	0.127	-0.01	0.06
	R4					**1**	**0.421**	**0.344**	0.088	0.26	0.309	0	0.09
	R6						**1**	**0.146**	0.126	-0.649	-0.79	0.02	0.3
	R13							**1**	0.304	0.142	0.141	0.02	0.18
III	R8								**1**	0.017	0.312	-0.19	0.3
IV	R9									**1**	**0.963**	0.27	--
	R14										**1**	0	--
V	R11											**1**	**0.12**
	R12												**1**

Table 2.6B. *The Intra-Inter Matrix*

		Composite				
		I	II	III	IV	V
Composite	I	0.446	0.276	0.156	0.195	-0.008
	II		0.355	0.203	-0.047	0.082
	III			1.000	0.164	0.057
	IV				0.963	0.135
	V					0.115

Note: r8 was included in the principal components analysis as a solo variable, and thus the r value of 1.00 is included in the intra-inter matrix. The average intra-composite coefficient (r=0.576) was higher than the average inter-composite coefficient (r=0.121).

Doctor Effects.

A One-way Random Effects Analysis of Variance (ANOVA) to determine the main effect of doctors in predicting the size of the effect. The results of the ANOVA showed a significant difference across doctors $F(55,456)=3.074$, $p=5.11\times10^{-11}$. Table 2.7 displays the results of the ANOVA. An Intra-Class Correlation indicated a significant effect of physicians: $r = 0.671$, $p=8.76\times10^{-9}$.

Table 2.7

Analysis of Variance for the Effect of Doctors

Model	*St. Dev.*	*Std. Error*	*95% CI for Mean* Lower Bound	Upper Bound	*Between Component Variance*
Fixed	0.0155	0.0007	-0.0052	-0.0025	5.42×10^{-5}
Random		0.0012	-0.0063	-0.0014	

	Sum of Squares	*d f* [5]	*Mean Square*	*F*	*Sig.*
Between Groups	0.040	55	7.3×10^{-4}	3.074	5.11×10^{-11}
Within Groups	0.110	456	2.4×10^{-4}		
Total	0.150	511	2.9×10^{-4}		

Note: Analyses conducted on the average correlation of behavior across patients of each physician.

[5] Degrees of Freedom calculation: 56 physicians x 15 behaviors = 840 correlations; 329 missing data points, i.e. 329 instances in which behaviors did not occur across all patients for the same physician; 840-329 = 511; 511 – 55 = 465

Site Effects

A One-way Random Effects Analysis of Variance (ANOVA) was conducted to determine the main effect of site on predicting the size of the effect. The results of the ANOVA showed a significant difference across sites $F(31,316)=2.416$, $p=7.16\times10^{-5}$. Table 2.9 displays the results of the ANOVA. An Intra-Class Correlation indicated a significant effect of site: $r = 0.585$, $p=0.0003$.

Table 2.8

Analysis of Variance for the Effect of Sites

Model	*St. Dev.*	*Std. Error*	*95% CI for Mean* Lower Bound	Upper Bound	*Between Component Variance*
Fixed	0.0141	0.0007	-0.0048	-0.0019	2.57×10^{-5}
Random		0.0012	-0.0058	-0.0097	

	Sum of Squares	*d f* [6]	*Mean Square*	*F*	*Sig.*
Between Groups	0.015	31	4.8×10^{-4}	2.416	7.16×10^{-5}
Within Groups	0.063	316	1.99×10^{-4}		
Total	0.077	347	0.0005		

Note: Analyses conducted on the average correlation of behavior across patients of each physician

[6] Degrees of Freedom calculation: 32 sites x 15 behaviors = 480 correlations; 133 missing data points, i.e. 133 instances in which behaviors did not occur across all dyads for the same site; 480-133 = 347; 347 – 31 = 316

Censoring & Cox Regression

A Cox Regression model was run to determine the effect of patient and physician characteristics on the occurrence of behaviors within the physician-patient interaction. One covariate was selected for each analysis: physician gender (1=Female, 2=Male), patient gender (1=Female, 2=Male). Covariates were centered.

Table 2.9 *Doctor gender as a predictor of behavior occurrence*

		β	*SE*	*Wald*	*Df*	*Sig.*	e^{β}	*95% CI for* e^{β} Lower	Upper
PtNarrative	r1	-0.203	0.49	0.172	1	0.678	0.816	0.312	2.133
PtSymptom	r2	--	--	--	--	--	--	--	--
PtDuration	r3	-0.481	1.238	0.151	1	0.697	0.618	0.055	6.995
PtSelfTrmt	r4	0.565	0.74	0.584	1	0.445	1.76	0.413	7.51
PtMedHist	r5	-0.209	0.754	0.077	1	0.782	0.812	0.185	3.556
PtCausal	r6	0.245	0.703	0.122	1	0.727	1.277	0.322	5.062
PtRulesOut	r7	-0.201	0.418	0.232	1	0.63	0.818	0.361	1.854
PtPsych	r8	-0.021	0.563	0.001	1	0.97	0.979	0.324	2.954
PtDisrupt	r9	0.207	0.406	0.261	1	0.609	1.23	0.556	2.725
PtSensitive	r10	-0.055	0.391	0.02	1	0.888	0.947	0.44	2.036
PtAdProb	r11	0.064	0.494	0.017	1	0.897	1.066	0.405	2.805
MPAdProb	r12	0.213	0.475	0.201	1	0.654	1.237	0.488	3.135
HistOccur	r13	1.826	1.108	2.716	1	0.099	6.212	0.708	54.514
3rdConcern	r14	0.098	0.407	0.057	1	0.811	1.102	0.496	2.45
MPSensitive	r15	-0.026	0.386	0.005	1	0.946	0.974	0.457	2.075

Note. Strata were assigned by site. Doctor gender was centered using effects coding. r2 was not included in the model because model requires estimates for baseline hazard functions at a minimum of two time points.

No behaviors were found to be significantly predicted by physician gender.

Table 2.10 *Patient Gender as a Predictor of Behavior Occurrence*

		β	*SE*	*Wald*	*Df*	*Sig.*	e^{β}	*95% CI for* e^{β} Lower	Upper
PtNarrative	r1	-0.051	0.304	0.028	1	0.867	0.95	0.523	1.726
PtSymptom	r2	--	--	--	--	--	--	--	--
PtDuration	r3	0.113	0.823	0.019	1	0.891	1.12	0.223	5.619
PtSelfTrmt	r4	0.274	0.351	0.609	1	0.435	1.316	0.661	2.62
PtMedHist	r5	-0.135	0.382	0.125	1	0.724	0.874	0.413	1.848
PtCausal	r6	-0.277	0.333	0.694	1	0.405	0.758	0.394	1.456
PtRulesOut	r7	-0.25	0.218	1.312	1	0.252	0.779	0.508	1.194
PtPsych	r8	-0.35	0.309	1.284	1	0.257	0.705	0.385	1.291
PtDisrupt	r9	-0.122	0.23	0.282	1	0.595	0.885	0.564	1.389
PtSensitive	r10	-0.214	0.21	1.047	1	0.306	0.807	0.535	1.217
PtAdProb	r11	-0.175	0.259	0.455	1	0.5	0.84	0.506	1.395
MPAdProb	r12	-0.318	0.231	1.892	1	0.169	0.728	0.463	1.145
HistOccur	r13	-1.032	0.458	5.065	1	0.024	0.356	0.145	0.875
3rdConcern	r14	-0.047	0.229	0.042	1	0.837	0.954	0.609	1.495
MPSensitive	r15	-0.177	0.211	0.704	1	0.402	0.838	0.553	1.267

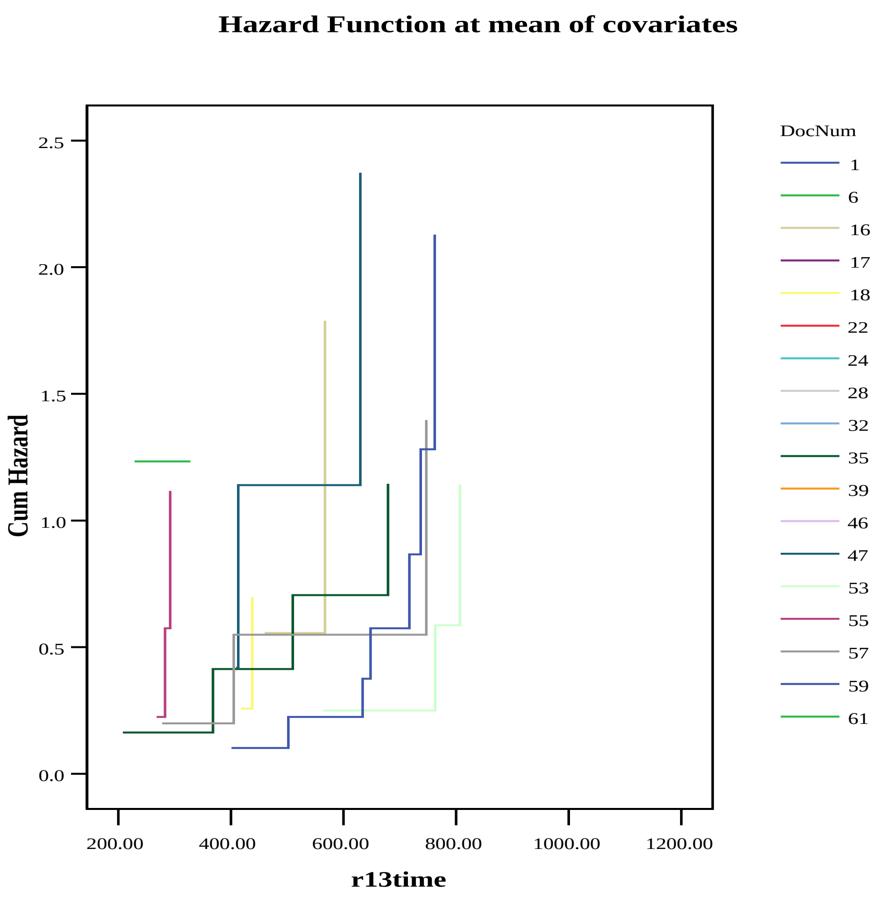
Note. Strata were assigned as by doctor. Patient gender was centered using effects coding. r2 not included in the model because model requires estimates for baseline hazard functions at a minimum of two time points.

One behavior was found to be significantly predicted by patient gender: behavior r13 (Did history-taking occur? 0=no, 1=yes). The raw beta coefficient (β=-1.032, p=.024), describes the effect of a one-unit difference in the associated predictor (i.e. female patients compared with male patients) on log hazard. In this manner, the model indicates that the log hazard function predicting the occurrence of history taking for male patients is -1.032 units lower than that for female patients. To calculate the effect of patient gender on the raw hazard, the algebraic antilog of the coefficient was obtained e^{β}=0.356. This value represents the hypothesized constant hazard ratio for a one-unit change in the predictor. The estimated hazard of receiving history-taking for female patients is 2.80 times that of male patients.

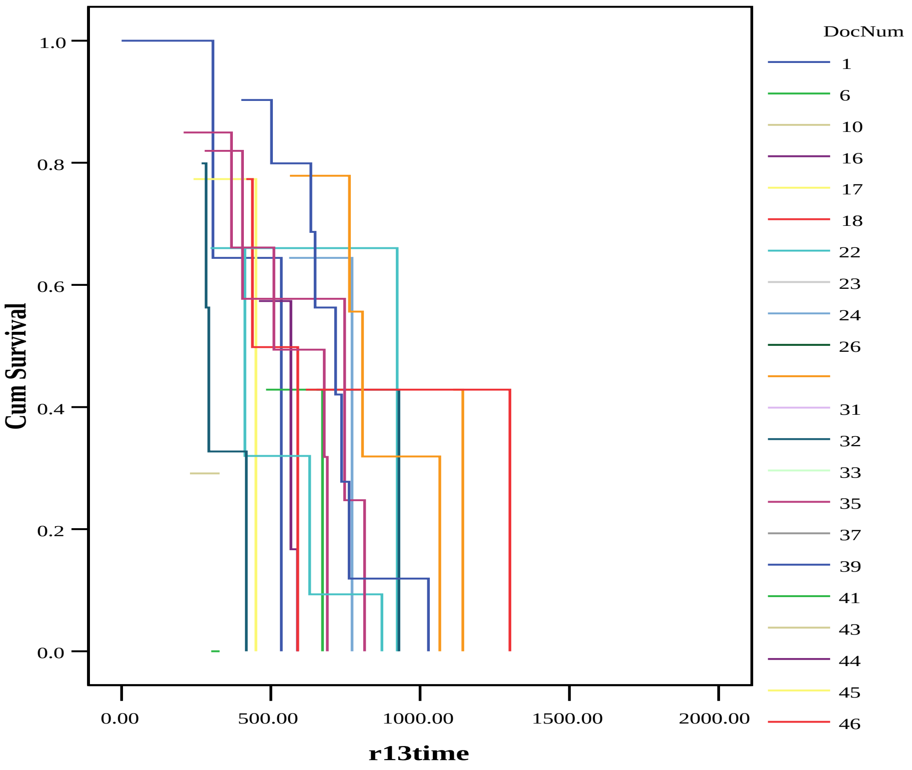
The survival function indicated that the number of seconds to history-taking (time to event) was higher for males than for females.

The survival function (Figure 2.3 A) and hazard function (Figure 2.3 B) are displayed in the following figures.

Figure 2.1 Survival and hazard functions at mean of covariates for r13 (“Did history-taking occur?”)



Survival Function at mean of covariates



The model was also run to determine the effect of physician-patient gender concordance. No significant effects were found.

Chapter 3: Discussion and Overall Extraction of Themes

An accumulating wealth of research points to the significance of the partnership of the physician and the patient in predicting outcomes of care. An understanding of this complex dyadic interaction is fundamental to elucidating the pathways by which medical care can be more beneficial to patients. The research presented here illuminates a new method by which the medical interaction can be quantitatively analyzed. The quality of the relationship of the physician and patient is a criterion by which the patient is able to evaluate the quality of health care they receive in other areas of preventive and acute care. The current work expands our understanding of the specific behaviors occurring in the medical interaction, and the manner by which these behaviors impact the patients' perceptions of their physician. The results of the present study dictate the importance of conceptualizing the physician-patient interaction by a unified method including both a quantitative appreciation of behavioral occurrence, and the humanistic evaluation by a rater.

The findings of this research are significant because no other study, to this point, has effectively conceptualized the relationship between the occurrence of specific behaviors, and ratings of physician-patient communication quality. Even more distinctively, the present research yields ratings of communication in real-time, allowing a more accurate appraisal of the qualities of the dyadic medical partnership.

This significant change from previous research is made with the hope that the field of health communication will realize the benefit of unifying two previously separated systems of interactional analysis.

Behaviors. Fifteen behaviors were evaluated using the Continuous Response Measurement (CRM) system. The occurrence of ten of these behaviors were independently significantly correlated with ratings of overall communication quality at the $p < 0.05$ level. Of these, six behaviors were significantly associated with changes in ratings of communication quality at $p < 0.001$: (b1) "Does the patient use a narrative format?"; (b2) "Does the patient give symptom descriptors?"; (b3) "Does the patient give duration of this problem?"; (b5) "Does the patient give medical history relevant to this problem?"; (b6) "Does the patient give or imply a causal theory for this problem?"; and (b7) Does the patient rule out any cause/s for this problem?"[7].

Some behaviors occurred much more frequently than others (See Appendix A.1.0.). For example, the behavior (b2) "Does the patient give symptom descriptors?" occurred in 200 of the 204 interactions, whereas behavior (b10) "Does the patient indicate verbally if this problem is delicate or sensitive?" only occurred once. This variation in the occurrence of behaviors is supported by previous research. For example, the occurrence of patient question-asking is known to be much less frequent than physician question-asking (Roter, 1984). With regard to the low frequency of b10, it is known that shame is an important correlate of patient participation in the medical interaction (Harris & Darby, 2009). As the physician typically has more

[7] Note that b1-15 refer to the coded behaviors, r1-15 refer to the correlations between the occurrence of each corresponding behavior (b1-15) with rater evaluations of the interaction.

social control over the interaction, patients who feel ashamed about a specific topic (if the topic is delicate/sensitive) are unlikely to bring this concern to their physician (Harris & Darby, 2009). This perhaps explains why a verbal statement recognizing the sensitivity of an issue was rarely found.

As is displayed in Table 2.1 and Appendix A.1.0., the numerical values of the correlation coefficients for each behavior were small. However, when taken across all 204 interactions, the correlations were found to be highly significant. Numerically small correlation coefficients have been demonstrated to be very influential (Rosenthal et al., 2000), and may even be larger than in medical literature where seemingly inconsequential effects have been demonstrated to be important (e.g., aspirin and the prevention of heart attacks, $r=.03$) (Rosenthal & DiMatteo, 2001). As the CRM device collects data over real-time, there is more of an opportunity for numerically small effect sizes to reach significance, compared to traditional studies of communication analysis, in which one rating, and/or series of codes, are made at the end of the interaction. However, it should be noted that each second of the interaction does not necessarily add independent degrees of freedom that increase power. This is due to the inherent temporal dependency of continuous rating data.

Principal components analysis yielded five behavioural composites. These composites are depicted in Table 2.6(a), and the intra-inter matrix is shown in Table 2.6(b). These five composites yielded a readily interpretable categorization of physician and patient behaviors. The first composite included three behaviors: (b1) “Does the patient use a narrative format?”, (b3) “Does the patient give duration of this problem?”, and (b5) “Does the patient give medical history relevant to this problem?”.

Theoretically, these three behaviors are representative of the patient's narrative of the medical problem. The second composite included four behaviors: (b2) "Does the patient give symptom descriptors?", (b4) "Does the patient give self-treatment?", (b6) "Does the patient give or imply a causal theory for this problem?", and (b13) "Did history-taking occur?". These behaviors describe the patient's experience of, and reaction to, the medical problem. The third composite contained the solo variable (b8) "Does the patient give any psychosocial elaborations for this problem?". This behavior was the only behavior that was associated with a positive change in ratings of communication. This behavioral composite represents the patient's psychological and social interpretation of the medical problem. The fourth composite contained behaviors (b9) "Does the patient describe a disruption of daily activities?", and (b14) "Does the patient offer any 3rd party concerns?". This composite represents the degree to which the patient's perceived functional status and appraisal of dependency is communicated. The fifth composite included two behaviors (b11) "Does the patient give any additional problems?", and (b12) "Does the MP ask for any additional problems?". This final composite represents the degree to which the patient and the medical professional are able to communicate further concerns.

This five-factor model is solely exploratory, but does implicate the categorization of behaviors into different composites as an effective means by which to describe behaviors within the physician-patient relationship, and the degree to which those behaviors impact ratings of communication.

Raters/Coders. Four raters and one coder evaluated each of the 204 interactions. Relatively low correlations were found between the four raters (See

Table 2.4). Previous research on experimenter effects has shown that global judgments and ratings of communication have lower reliability, but higher validity than coded measures (Rosenthal 1966, 2005). The findings of the current research demonstrate that although the global ratings of the valence of the dyadic interaction had low reliability, the values of the effect sizes measuring the relationship between ratings and coded behaviors are quite robust and significant. Other studies using this dataset, have demonstrated similar results (Haskard, Williams, DiMatteo, Heritage & Rosenthal, 2008), finding higher levels of validity than rater reliability. Empirically, Guilford's equation of validity (1954), quantifies the relationship between reliability and validity, and demonstrates that the reliability of a measure is not the upper bound of its validity (Rosenthal, 2005). In fact, the aspect of most Guilford's equation that is most influential on the value of validity is not the agreement of the raters with one another, but rather, the number of raters included in the study (Haskard et al., 2008). Raters may have differed in their appraisal of the valence of the interaction quality due to a focused perception of different aspects of the medical interaction. As the evaluation of the medical interaction by the raters is meant to symbolize the ratings of the interactions given by patients, it is possible that patients differ in many of the same ways that raters differ (perception of voice tone, relative importance of specific behaviors etc.). In this way, limitations in agreement between raters may simply mirror variability in concurrence among patients as well.

Coder reliability was moderate, and comparable to coding reliability levels in other investigations of physician-patient communication quality (Kemp-White, 2001; Collins et al., 2011). Differences between coders may have occurred primarily due to variation in prior experience with coding dyadic interactions. Moreover, gender differences between coders may have exacerbated the difference in coding the occurrence of behaviors, as male and female coders have been found to code communication differently (Davidson et al., 1996)

Doctors. Intra-class correlation indicated that there was an effect of physicians on the correlation between behavioral occurrence and shifts in ratings of interaction valence. Physicians are known to differ on their overall quality of communication (DiMatteo, 2004), as well as their tendency to engage in specific behaviors within the medical interaction (Roter & Hall, 1992).

This finding was expected, as physicians are known to differ significantly in their ability to communicate with patients, and the use of patient-centered approaches to care, as well as subsequent scores on measures of patient satisfaction (Ong et al, 2000). In order to further examine the degree to which physician characteristics contribute differentially to behaviors within the medical visit, a longitudinal model of behavioural occurrence was conducted. Physician gender was not found to be a significant predictor of the occurrence of any of the fifteen behaviors. However, patient gender was a significant predictor of one behavior. Behavior 13 (Did history-taking occur?) was 2.8 times more likely to occur in interactions with female patients, compared to interactions with male patients. None of the behaviors were significantly predicted by physician-patient gender concordance.

This result is, in some respects, similar to the findings of Bertakis (2009), who examined differences in patient-centered communication (PCC) across gender dyads. Bertakis (2009) found that there were no significant differences in measures of PCC between female or male physicians (or gender-concordant dyads). However, female patients had more interaction characterized by higher PCC, compared to male patients (Bertakis, 2009).

The finding that the occurrence of history-taking is significantly predicted by patient gender was unexpected, but can perhaps be explained by the literature on gender differences in medical communication. Quality of communication during the history-taking segment of the physician-patient interaction is known to independently correlate with patient health outcomes (Stewart, 1995). Roter, Lipkin, and Korsgaard (1991) found that physician gender was strongly associated with communication quality, and that differences between genders were especially salient during the history-taking segment of the interaction. Roter et al (1991) found that female physicians talked 40% more than male physicians, and patients of female physicians talked 58% more than patients of male physicians. However, other research has found that alcohol-dependent male patients are more likely to have had alcohol abuse history taken in the past 12-months compared to alcohol-dependent female patients (Amodei et al., 1996). Other research (Redondo-Sendino et al., 2006) has found that women are more likely to utilize medical care in general, as well as specific services within care.

Sites. Intra-class correlation indicated that there was an effect of site on the correlation between behavioral occurrence and shifts in ratings of interaction valence. Although the difference in the relationship between the occurrence of specific behaviors and overall ratings of communication differed by site, the conclusions that can be drawn are limited, as no site-level characteristics were recorded at the time of original data collection. Physician communication quality is known to vary by practice location and by type of medical facility (Jessee, Nagy & Downs, 2001).

Strengths of the Research

Direct comparison of coding and rating systems. The methodology of the present research offers a substantive improvement over traditional measures of physician-patient communication quality. The Continuous Response Measurement system primarily offers two advantages. First, CRM allows for a direct comparison of coding and rating systems. In other words, the researcher is able to point to each of specific set of behaviors and quantitatively reach a definitive conclusion about whether the occurrence of that specific behavior has a positive or negative correlation with physician-patient communication quality. In the present research, fifteen behaviors were evaluated to determine the degree to which their occurrence predicted changes in physician communication quality. Only one behavior was positively related to changes in communication quality (in other words, the occurrence of behavior was associated with an *increase* in global ratings of communication): "The patient gives psychosocial elaborations for this problem". All other behaviors were negatively related to changes in communication quality (in other words, the occurrence of the behavior was associated with a *decrease* in global ratings of communication).

There are numerous reasons why this behavior may have had a positive association with global ratings of communication quality. Patients who engage in psychosocial communication are more likely to be satisfied with the physician-patient interaction (Ong et al., 1995), and the perception of the patient's satisfaction may have contributed to improved ratings in physician communication quality. Also, patients who feel comfortable enough with their physician to engage in psychosocial communication may themselves be better at communicating compared with patients who are not as comfortable. Alternatively, raters may interpret expression of psychosocial issues as indicative of high quality communication.

The negative relationship between all other behaviors and global ratings of communication quality may have multiple explanations. Although the traditional model of Activity-Passivity has been refuted since the 1950s (Szasz & Hollender, 1956), and awareness of training physicians to be effective communicators has become much more widespread (Ong et al, 1995). Despite this, patients still exhibit a high rate of distrust in physicians in general, and in the health care system as whole, with less than a third of patients rating their trust as ‘very high’ (DiMatteo, 1998). Other research has found that although physicians receive the highest ratings on ethical conduct and cooperation with other health care providers, they receive the lowest scores on communication with patients and considering the cost of treatment to the patient (Shugars, O’Neil, & Bader, 1991).

It is also possible, that the way in which the behavior was carried out contributed to negative ratings of communication. For example, Beckman and Frankel (1984) focused solely on the first 90 seconds of the medical visit, and found that a patient’s response to the physician’s opening question was completed in less than a quarter (23%) of medical visits. In 69% of interactions, after only 15 seconds, the physician interrupted the patient (Beckman & Frankel, 1984). The current study only examined the occurrence of a specific set of behaviors (and the correlation to changes in valence ratings), but did not consider the quality of the behavior or the manner in which the behavior was carried out. Negative perceptions of the way in which a behavior was performed perhaps explain the negative relationship between the occurrence of many of the behaviors coded for, and ratings of the valence quality of the interaction.

Communication in Time.

In addition to fostering a more complete understanding of the physician-patient relationship via the integration of rating and coding systems, the CRM system offers another distinct advantage: the appreciation of the medical visit in real-time. By making ratings of the communication quality of the interaction as it occurs, the raters are able to report with significantly more detail, their perceptions of the interaction. While forming a gestalt of the whole interaction is useful to understanding the communicative style of physicians and patients, the immediate response of the rater to specific verbal and nonverbal behaviors is more similar to the experience of the patient.

As a consumer of health care, the patient is faced with a series of instantaneous decisions, in which s/he must decide whether and how to act and react to the communication of the medical professional. The moment-by-moment reaction of the patient is different from the holistic interpretation of the visit after it is completed. Understanding these immediate, continuous ratings of dyadic communication contributes a novel interpretation of the medical visit.

Limitations

The present research is limited in the conclusions that can be drawn from this preliminary investigation. First, although this research hopes to draw connections between specific interactive behaviors and ratings of communication quality, in no manner can a causal inference be made. It is just as possible that the occurrence of a specific behavior predicts a change in ratings of communication, as it is that communication quality predicts the occurrence of specific behaviors. Alternatively, a third, or series, of unmeasured variables may cause changes in either behavioral occurrence or ratings of communication.

The application of the Continuous Response Measurement system to the medical interaction is a first exploratory investigation. As such, there are many methodological refinements that can be made in future studies to draw more definitive conclusions. As rater reliability was low, having more raters could help to understand how global ratings of communication quality differ across individuals. Coder reliability was moderate, but could be improved by hiring trained professionals, instead of undergraduate students to identify communicative behaviors[8]. Including more coders in the analysis, perhaps even to the point of defining a criterion coder could help to eliminate any variation in interpretation of the objective occurrence of behaviors.

[8] The effective cost of including more highly trained raters and coders can be estimated using the equation for the effective cost of judges (Li et al, 1996). Findings from research on the effective cost of judges have tended toward supporting the use of many lower-cost (i.e. less trained) judges. The similarity between untrained raters and patients may actually be considered favorable in the context of this research.

There are also methodological limitations to collecting ratings in real-time. One such limitation is that there might be a time lag between when a behavior occurs, and when a rater begins to change their ratings of communication. As the number of coded behaviors is increased, a more accurate understanding of the relationship between changes in behaviors and subsequent changes in ratings can be established. It is also possible that the time to response in ratings differs across raters. The present study only examined fifteen verbal behaviors. Although raters may have made assessments of communication quality taking into account both verbal and nonverbal cues, the coder simply coded verbal behaviors. These behaviors were selected for the present research because they were coded for occurrence in the larger "Communication in Primary Care Teams" study. Subsequent research should analyze a much larger set of communicative behaviors, and include both verbal and nonverbal characteristics of communication.

It is also possible that raters preferred communication styles in which the physician engaged in paternalistic behaviors, and thus gave lower quality ratings of communication to behaviors that were indicative of the formation of a collaborative partnership. This however, is unlikely, as the sole positive behavior involved the patient giving a psychosocial elaboration of the problem, a behavior that is more akin to the biopsychosocial and mutual participation models of care.

Future Research

Many of the limitations of the present research are due to the exploratory nature of the analysis. The present research seeks to present a new mechanism by which the medical partnership can be understood; there are numerous applications to future research. First, it is imperative that the present study be repeated with a greater number of coders, raters, and behaviors. Coders trained in dyadic communication assessment can be hired to code each of the interactive behaviors. By having more raters make ratings on each of the interactions, inter-rater differences can be examined. Differences in rater sociodemographic characteristics may contribute to differences in perceived communication quality. Moreover, obtaining ratings from medical professionals may point to the perception of the physician of the medical visit. The results of the research could also be compared to end-of-interaction ratings of physician-patient communication quality.

The Continuous Response Measurement system has many new applications for future research. Although developed specifically for the context of physician-patient communication assessment, it is by no means limited to this application. The CRM software and subsequent method of statistical analysis can be applied to a wide variety of dyadic and multi-person interactions. The Continuous Response Measurement system is also equipped with the capacity to present audio-video, audio-only, and video-only interactions. A comparison of these three pathways would lend to an understanding of visual and auditory channels of communication within dyadic interactions.

Future research application could also involve using the CRM software and ratings of communication as a criterion for automating analysis of the physician-patient interaction. Computer vision software and audio-analysis can be used to fully automate ratings of communication quality, and then compared empirically to raters' ratings of communication quality. Moreover, such software systems can be used to explore the accuracy of identification of behavioral occurrence.

Chapter 4: Clinical and Training Implications

The ability to communicate effectively comprises a crucial aspect of the medical routine and is essential for the formation and maintenance of the medical partnership. Communication skills are a critical field within medical professionalism that a physician can develop an understanding of throughout his or her training and professional career. Communication skills remains one of the key factors by which patients decide upon a physician, and continue to exceed perceptions of medical competency in its importance to patients (Rothoff et al., 2010).

Medical training seldom emphasizes effective communication as a necessary aspect of a physician’s abilities. Although medical training does incorporate specialized training, applicable in specific contexts of patient care (e.g., stop-smoking advice), it very rarely teaches students general communication skills (Deveugele et al., 2005). In some curricula, communication skills are developed more extensively, though this is not a widespread standard; and students are primarily expected to gain communication skills during their clerkship and residency years in outpatient and primary care facilities (Benbassat & Baumel, 2002). When medical training does incorporate communication skills training, the primary means by which students learn communication skills is through simulated patients (Benbassat & Baumel, 2002). Simulated, or standardized, patients are trained actors who interact with medical professionals-in-training to elicit mock scenarios of patient care. Training with simulated patients has been identified as an effective means by which to improve scores on standardized assessments of communication skills (Lane & Rollnick, 2007).

In both continuing medical training and formative training, physicians must learn to communicate effectively with patients, as well as other members of the health-care team. The Continuous Response Measurement system, as well as the methods of statistical analysis utilized in the present research can be applied to clinical training scenarios in several different ways. Because of the versatile nature of the CRM system, continuous ratings of communicative behaviors can be made in the context of medical training. These continuous ratings, and the degree to which they correlate with specific communicative behaviors, can be used to identify areas of good and poor communication of physicians receiving communication skills training. Moreover, the CRM system can be used to train new physicians to communicate with other members of the medical staff, by identifying specific behaviors that are correlated with positive or negative ratings of communication quality.

The CRM system can also be applied to specialized clinical training scenarios, in which medical professionals-in-training can learn which behaviors are appropriate in different clinical contexts. As the results of this study demonstrate a significant difference across ‘sites’, or locations of medical practice, it is possible that specific behaviors are considered to be positive only in certain circumstances. For example, a psychosocial elaboration of a medical problem may be more indicative of high-quality communication in a preventive care setting compared to an acute care scenario.

The development of a new system by which the medical interaction is conceptualized in real-time will change the way in which researchers understand communication in health care. Although the complexities of the medical interaction continue to puzzle many in the field of health communication, the capacity of improving communication quality, and subsequent patient outcomes, continues to elicit much interest in educating physicians to become effective communicators and providers of care. The results of the present research, along with others already in the literature, show that specific behaviors in the medical interaction are significantly correlated with the formation and maintenance of the most important relationship in medical care, that of the physician and the patient.

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Appendix A

Table A.1.0.

Correlation coefficients representing the relationship between ratings of salient intervals and dichotomous codes of behaviors for b1-b15.[9]

Case Summaries

	Dr #	Interaction Length (sec)	Site #	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	r15
1	1.00	335.00	10.00	--	.00	--	.00	--	--	--	--	--	--	--	--	.00	--	--
2	1.00	535.00	10.00	--	-.02	--	-.01	--	.00	--	.01	--	--	--	--	--	--	--
3	1.00	306.00	10.00	-.03	-.02	-.03	--	-.01	--	--	--	--	--	--	--	--	--	--
4	2.00	563.00	10.00	--	.00	--	.00	--	.00	--	.00	.00	--	.00	--	-.03	.00	--
5	2.00	619.00	10.00	-.01	-.01	.00	-.01	--	-.01	--	--	--	--	--	--	.00	--	--
6	3.00	945.00	11.00	.01	.02	.00	.01	.01	.00	--	--	--	--	.01	--	.01	.00	--
7	3.00	628.00	11.00	--	-.01	-.01	-.01	--	--	--	--	.01	--	--	--	.00	--	--
8	3.00	770.00	11.00	--	-.03	.00	.02	-.01	.00	--	--	--	--	--	.00	.01	--	--
9	4.00	418.00	11.00	--	-.01	-.01	--	--	-.02	--	.00	--	--	.00	.00	.00	--	--
10	6.00	724.00	12.00	--	-.01	.00	--	.00	--	--	.00	--	--	--	--	-.04	--	--
11	6.00	701.00	12.00	--	.00	--	.00	--	--	--	--	--	--	--	--	-.02	--	--
12	6.00	673.00	12.00	--	-.03	.00	.00	-.01	.00	--	--	--	--	--	--	--	--	--
13	6.00	484.00	12.00	-.12	-.07	-.01	--	-.02	--	--	--	--	--	--	--	--	--	--
14	7.00	447.00	12.00	--	-.02	.00	.00	-.01	.00	--	.00	--	--	.00	--	.00	--	--
15	8.00	463.00	14.00	--	-.03	.00	-.01	--	-.02	--	--	--	--	--	--	-.02	--	--
16	8.00	979.00	14.00	--	.00	.00	--	--	-.03	--	.00	--	--	.00	.00	.00	--	--
17	8.00	518.00	14.00	--	-.02	.00	.00	--	.00	--	--	.00	--	--	--	.00	--	--
18	9.00	2227.00	14.00	--	.00	.00	.00	-.01	.00	--	--	--	--	.00	--	-.02	--	.00
19	10.00	1224.00	14.00	-.11	-.05	.00	-.03	-.01	.00	--	--	--	--	--	--	--	--	--
20	11.00	1108.00	14.00	--	-.02	.00	--	-.01	--	--	.00	--	--	.00	.00	-.03	--	--
21	11.00	754.00	14.00	--	-.03	-.01	--	-.01	.00	--	--	--	--	--	.00	.00	--	--
22	14.00	1136.00	16.00	-.01	-.01	.00	.00	.00	.00	--	--	--	--	.00	--	-.05	--	--

[9] Blanks (--) indicate that the behavior did not occur in the interaction. This is by contrast to r=.00, which indicates that the behavior did occur, but no correlation was found between the behavioral occurrence and rating of communication.

23	14.00	829.00	16.00	--	.01	-.01	--	-.05	.01	--	--	--	--	--	.00	.00	--	--
24	15.00	1170.00	17.00	--	-.04	.00	--	.01	-.01	--	-.01	--	--	.00	.00	-.11	.00	--
25	15.00	367.00	17.00	--	--	.00	--	--	--	--	.02	--	--	--	--	.01	.07	--
26	15.00	789.00	17.00	.00	.00	.00	--	.00	--	--	--	--	--	--	--	-.09	--	--
27	15.00	652.00	17.00	-.01	-.02	--	--	-.01	--	--	--	--	--	--	--	-.03	--	--
28	15.00	1500.00	17.00	--	.00	.00	.00	.00	.00	--	.00	--	--	--	.00	-.02	--	--
29	15.00	1370.00	17.00	--	.00	.00	--	-.01	.00	--	.00	--	--	.00	--	.00	--	--
30	16.00	469.00	19.00	--	.00	.00	--	.00	--	--	-.01	--	--	.00	--	.00	.00	--
31	16.00	460.00	19.00	--	.00	.00	--	.00	--	--	--	--	--	--	.00	--	.00	--
32	16.00	671.00	19.00	--	.00	--	--	.00	--	--	--	--	--	.00	--	-.04	--	--
33	16.00	457.00	19.00	.01	-.04	.00	-.03	.00	-.02	--	--	--	--	--	--	-.01	--	--
34	16.00	550.00	19.00	-.02	.00	.00	.00	--	--	--	.00	--	--	.00	.00	.00	--	--
35	16.00	567.00	19.00	-.08	.00	-.01	--	-.03	--	--	--	.00	--	.02	--	--	--	--
36	16.00	589.00	19.00	.01	.01	.01	--	--	--	--	--	--	--	--	--	--	--	--
37	17.00	539.00	20.00	--	.01	.00	--	.00	--	--	.00	.00	--	.00	--	.00	--	--
38	17.00	187.00	20.00	--	--	--	--	--	--	--	--	--	--	--	--	.03	--	--
39	17.00	241.00	20.00	--	-.01	--	.00	-.01	--	--	--	-.01	--	--	--	--	--	--
40	17.00	450.00	20.00	--	.02	.00	.00	.02	.01	--	.01	--	--	--	--	--	--	--
41	18.00	436.00	21.00	--	-.01	--	-.03	--	--	--	--	-.01	--	--	--	-.02	--	--
42	18.00	590.00	20.00	--	.00	--	.02	-.01	.01	--	--	--	--	--	--	--	--	--
43	18.00	418.00	20.00	--	.00	.00	--	--	--	--	--	--	--	--	--	--	--	--
44	18.00	438.00	20.00	--	.03	.01	--	--	--	--	--	--	--	--	--	--	--	--
45	19.00	648.00	21.00	--	.00	--	.01	.01	.00	--	.02	--	--	--	--	.02	.00	--
46	19.00	884.00	21.00	--	-.03	--	.00	--	.00	--	.00	--	--	.00	.00	-.02	--	--
47	19.00	612.00	21.00	--	-.01	.00	-.01	--	--	--	--	.00	--	--	--	-.02	--	--
48	19.00	1218.00	21.00	--	.01	.00	.00	.00	--	--	.01	--	--	.00	.00	.00	--	--
49	19.00	494.00	21.00	--	-.01	.00	--	--	--	--	--	--	--	--	--	.01	--	--
50	20.00	1069.00	21.00	-.05	-.02	-.01	-.02	.00	.00	--	-.03	.00	--	.00	--	-.01	.00	--
51	20.00	726.00	21.00	--	-.03	-.01	.00	--	.00	--	-.01	--	--	--	--	-.02	--	--
52	20.00	961.00	21.00	--	-.07	.00	.00	.00	.00	--	.00	--	--	.00	--	.00	--	--
53	21.00	550.00	22.00	--	-.03	-.02	.00	.00	--	--	--	.00	--	--	--	-.04	--	--
54	21.00	816.00	22.00	--	-.03	.00	--	.00	--	--	--	--	--	--	--	-.01	--	--
55	21.00	616.00	22.00	--	-.02	-.01	--	-.12	-.01	--	.05	--	--	--	--	.00	--	--

56	21.00	803.00	22.00	--	-.05	-.01	--	-.02	--	--	--	.00	--	.00	--	.01	--	--
57	22.00	1132.00	22.00	--	-.04	.00	--	-.02	--	-.01	--	--	--	--	--	-.03	--	--
58	22.00	468.00	22.00	-.04	-.02	.00	--	-.01	-.01	--	.00	--	--	--	--	.00	--	--
59	22.00	923.00	22.00	--	-.04	.00	--	.00	-.01	--	-.04	--	--	.00	.00	--	--	--
60	22.00	298.00	22.00	--	-.01	--	--	--	-.02	--	--	--	--	--	--	--	--	--
61	23.00	584.00	23.00	--	.00	-.01	--	--	.00	--	--	--	--	.00	--	-.01	--	--
62	23.00	1372.00	23.00	.00	.00	--	--	.00	--	--	--	--	--	.00	--	-.01	--	--
63	23.00	2241.00	23.00	--	.00	.00	--	.00	.00	--	.04	.00	--	.00	.00	.00	--	--
64	23.00	1286.00	23.00	-.01	-.02	-.02	--	.00	--	--	-.01	.00	--	--	--	--	--	--
65	24.00	1090.00	24.00	--	.01	.00	.01	.01	--	--	--	--	--	.00	--	.01	.00	.00
66	24.00	772.00	24.00	--	.04	.00	.02	.00	.02	--	.01	.00	--	.00	--	--	.00	--
67	24.00	930.00	24.00	--	.05	.01	--	.00	--	-.01	--	.01	--	--	.00	.03	--	--
68	24.00	561.00	24.00	--	.01	.00	--	.02	.00	--	--	--	--	--	--	--	--	--
69	25.00	650.00	24.00	--	-.03	-.01	--	--	--	--	--	--	--	--	.00	.00	--	--
70	26.00	607.00	25.00	--	-.03	-.01	.02	.00	-.01	--	--	--	--	--	.00	-.01	--	--
71	26.00	380.00	25.00	--	.03	.00	--	--	.01	--	--	--	--	--	--	.00	--	--
72	26.00	439.00	25.00	--	.02	.01	.00	.00	--	--	--	--	--	--	--	.00	--	--
73	26.00	901.00	25.00	--	.03	.00	.01	.00	.00	--	--	--	--	--	.00	.03	--	--
74	26.00	570.00	25.00	-.02	.00	.00	--	--	.00	--	--	--	--	.00	--	--	--	--
75	27.00	689.00	26.00	-.01	-.01	.00	-.01	.00	.00	--	--	--	--	--	--	-.01	--	--
76	27.00	2063.00	26.00	--	.01	.00	.01	.00	--	--	.03	--	--	.00	--	.00	--	--
77	27.00	1545.00	26.00	--	-.01	-.01	.00	-.01	.00	--	--	--	--	--	--	.00	--	--
78	27.00	1625.00	26.00	--	--	--	-.01	.00	.00	--	--	--	--	.00	--	--	--	--
79	28.00	593.00	27.00	-.01	-.01	.00	.00	--	.00	--	.00	.00	--	--	--	.00	--	--
80	28.00	906.00	27.00	--	-.01	.00	-.01	.00	--	--	--	--	--	--	--	.00	--	--
81	28.00	1143.00	27.00	--	.00	.00	.00	-.01	.00	--	.00	--	--	--	--	--	--	--
82	28.00	1111.00	27.00	--	-.02	.00	--	.00	-.01	.00	--	--	--	--	--	--	--	--
83	30.00	325.00	28.00	--	.03	.02	--	.02	--	--	--	--	--	--	--	.01	--	--
84	31.00	395.00	28.00	--	.03	.00	--	--	.01	--	--	--	--	--	--	.02	--	--
85	31.00	703.00	28.00	.02	.01	.00	.00	.00	--	--	--	.00	--	--	--	--	--	--
86	32.00	653.00	29.00	-.04	-.01	--	.00	--	--	--	--	--	--	--	.00	--	.00	--
87	32.00	1110.00	29.00	--	.00	.00	.00	--	--	--	--	--	--	--	.01	.00	--	--
88	32.00	724.00	29.00	-.01	--	--	--	--	--	--	--	--	--	--	.01	.04	--	--
89	32.00	945.00	29.00	--	.01	.00	--	--	.00	--	--	.00	--	.01	--	.05	--	--
90	32.00	929.00	29.00	--	-.01	.00	.00	.02	--	--	.00	--	--	.00	.00	--	--	--
91	33.00	991.00	30.00	--	.00	.00	--	.00	--	--	--	.00	--	.00	--	.00	--	--
92	33.00	703.00	30.00	.01	.00	.00	--	.01	.00	--	--	--	--	.02	--	--	--	--

93	34.00	738.00	30.00	--	.03	.00	--	.01	.00	--	--	--	--	.01	.00	.00	--	--
94	34.00	693.00	30.00	--	-.03	-.01	.00	--	--	--	--	--	--	--	--	.00	--	--
95	34.00	256.00	30.00	--	.00	.00	.00	--	--	--	--	--	--	--	--	.00	--	--
96	34.00	994.00	30.00	.08	.03	.03	.01	-.01	.00	--	.01	.02	--	.01	.00	.01	--	--
97	34.00	1759.00	30.00	--	.00	.00	--	.00	.00	--	.00	--	--	.00	--	.01	--	--
98	34.00	1369.00	30.00	--	.01	.00	.00	.02	.00	--	.04	--	--	.00	--	.01	--	--
99	35.00	510.00	31.00	-.01	-.01	--	--	-.01	--	--	--	--	--	.00	--	--	-.03	--
100	35.00	615.00	31.00	--	-.03	-.02	.00	-.06	--	--	--	-.02	--	--	--	.00	-.01	--
101	35.00	813.00	31.00	--	-.01	-.01	-.01	--	.00	--	--	--	--	.00	-.01	.00	--	--
102	35.00	378.00	31.00	--	-.02	-.01	--	--	--	--	--	--	--	--	--	.00	--	--
103	35.00	689.00	31.00	-.06	.00	-.01	--	.00	--	-.01	--	-.02	--	.00	.00	--	--	--
104	35.00	368.00	31.00	.07	.00	.00	--	.00	--	--	.05	--	--	.00	--	--	--	--
105	35.00	679.00	31.00	-.09	-.02	.00	.00	-.04	-.02	--	--	--	--	--	--	--	--	--
106	35.00	208.00	31.00	--	-.06	-.01	-.01	--	--	--	--	--	--	--	--	--	--	--
107	37.00	434.00	32.00	--	-.01	-.01	--	-.02	--	--	.00	--	--	--	--	--	-.01	--
108	37.00	1168.00	32.00	--	.00	.00	--	--	.00	--	--	.00	--	--	--	-.02	--	--
109	37.00	539.00	32.00	.01	.01	.00	--	--	.00	.00	--	--	--	--	--	.00	--	--
110	37.00	629.00	32.00	-.01	.00	.00	--	-.01	-.01	--	--	--	--	--	--	.00	--	--
111	37.00	924.00	32.00	--	.00	.00	--	-.04	--	--	.09	--	--	--	--	.02	--	--
112	38.00	467.00	32.00	--	-.03	-.01	--	--	--	-.03	--	--	--	--	--	-.02	--	--
113	38.00	1280.00	32.00	--	-.02	-.01	--	-.01	.00	--	--	--	--	--	--	-.01	--	--
114	38.00	1240.00	32.00	-.02	-.02	.00	.00	-.01	--	--	--	--	--	.00	--	.00	--	--
115	39.00	809.00	33.00	--	-.01	.00	-.02	.00	--	--	--	--	--	--	--	-.07	.00	--
116	39.00	458.00	33.00	-.07	-.03	-.01	--	-.01	-.01	-.01	--	--	--	--	--	-.04	--	--
117	39.00	740.00	33.00	--	-.02	.00	--	--	--	--	--	--	--	--	.00	-.02	--	--
118	39.00	1280.00	33.00	--	-.01	.00	.00	--	.00	--	--	--	--	--	--	-.01	--	--
119	39.00	705.00	33.00	-.02	-.04	.00	.00	.00	.01	--	--	--	--	--	.00	.00	--	--
120	39.00	985.00	33.00	--	.00	--	.00	.00	.00	--	--	--	--	.00	--	.00	--	--
121	39.00	801.00	33.00	.00	.04	.01	--	.00	.00	--	--	--	--	.00	--	.06	--	--
122	39.00	604.00	33.00	.00	.00	.00	.01	--	.00	.00	--	--	--	--	--	--	--	--
123	40.00	317.00	34.00	-.08	-.08	-.01	-.01	-.02	-.04	--	--	.02	--	--	--	-.01	--	--
124	40.00	536.00	34.00	--	-.12	-.01	-.02	.00	--	--	--	--	--	--	.00	.00	--	--
125	40.00	748.00	34.00	--	-.01	-.01	-.05	--	-.01	--	--	--	--	--	--	.00	--	--

126	40.00	354.00	34.00	-.10	-.03	-.08	--	.00	-.01	--	-.01	--	--	--	--	.02	--	--
127	41.00	1773.00	34.00	--	.00	.00	.00	-.02	.01	--	.01	.00	--	.00	.00	--	.00	--
128	43.00	824.00	35.00	--	.00	--	.01	.00	.00	--	.00	--	--	.00	--	.00	.00	--
129	43.00	999.00	35.00	.02	.02	.00	--	.01	--	--	.01	.00	--	.00	--	--	.00	--
130	43.00	496.00	35.00	-.07	-.03	.00	--	-.08	-.03	--	--	--	--	--	--	.00	.01	--
131	43.00	626.00	35.00	--	-.01	.00	.00	.00	--	--	.00	--	--	--	--	-.03	--	--
132	43.00	346.00	35.00	.00	.00	.00	.01	--	.00	--	--	--	--	--	--	.00	--	--
133	43.00	807.00	35.00	--	.00	.00	--	.00	--	--	--	--	--	--	--	.00	--	--
134	44.00	564.00	35.00	--	-.02	-.01	-.01	-.01	--	--	-.01	--	--	.00	--	--	--	--
135	45.00	480.00	36.00	--	.00	.00	.00	.00	--	.00	.00	--	--	.00	--	.01	.00	--
136	45.00	616.00	36.00	--	-.02	.00	--	.00	.00	--	-.02	--	--	--	--	-.02	--	--
137	45.00	505.00	36.00	-.01	-.01	.00	--	-.02	--	--	-.02	--	--	--	--	.00	--	--
138	45.00	451.00	36.00	--	.02	.01	.03	--	.00	-.01	--	--	--	--	--	.01	--	--
139	45.00	499.00	36.00	--	.02	.01	.01	.03	--	--	-.01	.01	--	--	--	--	--	--
140	46.00	1084.00	36.00	--	.00	--	.00	.01	.00	--	.00	--	--	--	--	.00	--	--
141	46.00	1301.00	36.00	.02	-.01	.00	.00	--	.00	--	.02	--	--	.00	--	--	--	--
142	46.00	617.00	36.00	--	.00	.00	.00	.03	.00	--	.00	--	--	--	--	--	--	--
143	47.00	872.00	37.00	--	.03	--	--	.00	--	--	.02	--	--	--	--	--	.00	--
144	47.00	413.00	37.00	--	.02	-.01	.00	-.01	.02	--	--	--	--	--	.01	--	--	--
145	47.00	630.00	37.00	.00	.04	.00	.00	--	.00	.00	--	--	--	.00	--	--	--	--
146	47.00	409.00	37.00	--	-.02	.00	--	--	.00	--	--	--	--	--	--	--	--	--
147	48.00	1009.00	37.00	--	-.01	.00	.00	--	.00	--	.00	--	--	.00	.00	--	--	.00
148	48.00	384.00	37.00	--	.00	--	.00	.00	-.01	--	-.01	--	--	--	--	.00	--	--
149	48.00	283.00	37.00	--	-.02	--	.00	.00	.00	--	.00	--	--	--	--	.00	--	--
150	49.00	485.00	38.00	--	.00	.00	--	.00	--	--	--	--	--	--	--	-.01	--	--
151	49.00	712.00	38.00	--	.01	.01	--	.03	--	--	--	--	--	--	-.01	.00	--	--
152	49.00	931.00	38.00	.00	.01	--	.01	.00	--	--	.02	--	--	.00	.00	.00	--	--
153	49.00	738.00	38.00	--	.03	.01	--	--	--	--	.01	--	--	.01	.00	.00	--	--
154	49.00	425.00	38.00	--	.00	.00	.00	--	.00	--	--	--	--	.00	--	.00	--	--
155	49.00	515.00	38.00	.00	.01	.00	--	--	--	--	-.01	--	--	--	.01	.01	--	--
156	49.00	583.00	38.00	--	.01	.00	--	--	--	--	--	--	--	--	--	.02	--	--
157	49.00	552.00	38.00	--	.02	.00	.00	.00	--	--	--	--	--	--	--	--	--	--
158	50.00	1054.00	39.00	--	.00	.00	--	--	.00	--	.01	--	--	--	--	.00	.00	--
159	50.00	1110.00	39.00	.01	.00	.00	.00	--	--	--	--	--	--	--	--	.02	.00	--
160	50.00	407.00	39.00	-.02	-.02	-.02	--	.00	-.01	--	--	--	--	--	--	-.02	--	--
161	50.00	803.00	39.00	--	-.02	--	.00	--	.01	--	--	--	.00	--	--	-	--	--

																.01		
162	50.00	336.00	39.00	-.02	-.04	-.01	--	--	-.02	--	--	--	--	--	--	.00	--	--
163	51.00	880.00	39.00	--	-.03	--	-.01	-.02	.00	--	-.01	--	--	-.02	--	.00	.00	--
164	51.00	431.00	39.00	.02	-.01	.00	--	--	.00	.00	.02	.00	--	.01	--	.04	--	--
165	52.00	906.00	39.00	--	.01	.00	.02	.01	--	--	--	.01	--	.00	--	--	.01	--
166	53.00	1066.00	40.00	.01	-.01	.00	.01	.01	--	--	.02	--	--	.01	.00	--	.00	--
167	53.00	380.00	40.00	-.07	-.09	--	-.01	--	--	--	--	--	--	--	.00	-.01	--	--
168	53.00	1748.00	40.00	-.01	-.01	.00	.00	.00	.00	--	-.01	--	--	.00	.00	.00	--	--
169	53.00	564.00	40.00	-.08	-.03	-.03	--	-.06	.00	--	-.01	--	--	-.01	--	--	--	--
170	53.00	763.00	40.00	--	-.01	.00	-.01	.01	.00	--	-.01	--	--	--	--	--	--	--
171	53.00	807.00	40.00	.01	.01	.00	.01	--	--	--	-.01	--	--	--	--	--	--	--
172	54.00	1032.00	40.00	--	-.03	.00	.00	-.02	--	--	--	--	--	--	--	.00	--	--
173	54.00	418.00	40.00	.01	.00	.00	.00	--	--	--	--	--	--	--	--	--	--	--
174	55.00	283.00	41.00	--	-.02	-.03	.00	--	--	--	--	--	--	--	.01	--	--	--
175	55.00	292.00	41.00	--	.00	.00	-.01	--	.00	--	.00	--	--	-.02	--	--	--	--
176	55.00	268.00	41.00	-.07	-.04	-.01	--	-.07	--	--	--	--	--	--	--	--	--	--
177	55.00	418.00	41.00	-.08	-.09	-.02	.00	--	--	--	--	--	--	--	--	--	--	--
178	56.00	609.00	41.00	-.01	.00	.00	-.01	--	.00	--	-.03	--	--	--	--	-.01	--	--
179	56.00	480.00	41.00	--	.00	.00	--	.02	--	--	--	--	--	.00	--	.01	--	--
180	56.00	796.00	41.00	--	.01	.00	.00	.02	.00	--	.00	--	--	--	--	.02	--	--
181	56.00	521.00	41.00	.01	.01	.00	--	--	--	--	.00	--	--	--	--	--	--	--
182	57.00	484.00	42.00	--	-.02	--	-.01	-.01	--	--	--	--	--	--	--	-.01	--	--
183	57.00	391.00	42.00	--	.00	--	.00	--	--	--	--	--	--	--	--	.00	--	--
184	57.00	954.00	42.00	--	.02	.00	--	-.01	.00	--	.00	--	--	--	--	.01	--	--
185	57.00	747.00	42.00	--	-.02	.00	--	--	--	--	--	.00	--	--	--	--	--	--
186	57.00	814.00	42.00	-.02	-.02	-.01	--	--	--	--	.00	--	--	--	--	--	--	--
187	57.00	405.00	42.00	--	-.04	--	.00	--	.00	--	--	--	--	--	--	--	--	--
188	57.00	278.00	42.00	--	-.01	.00	--	-.03	--	--	--	--	--	--	--	--	--	--
189	58.00	1055.00	42.00	--	.00	.00	--	.00	--	--	.00	-.01	--	.00	--	--	--	--
190	59.00	737.00	43.00	-.02	.00	.00	-.01	--	.00	--	--	--	--	.00	--	--	--	--
191	59.00	648.00	43.00	--	-.02	-.01	--	-.01	.00	--	.00	--	--	--	--	--	--	--
192	59.00	762.00	43.00	-.01	.00	--	--	--	--	--	.00	--	--	--	--	--	--	--
193	59.00	401.00	43.00	--	.01	.00	.01	--	--	--	.02	--	--	--	--	--	--	--
194	59.00	502.00	43.00	--	-.04	--	-.03	--	-.05	--	--	--	--	--	--	--	--	--
195	59.00	717.00	43.00	-.09	-.02	-.01	--	-.02	-.01	--	--	--	--	--	--	--	--	--

196	59.00	1028.00	43.00	-.01	-.01	.00	.00	.00	.00	--	--	--	--	--	--	--	--	--	
197	59.00	634.00	43.00	--	-.05	-.01	--	--	--	--	--	--	--	--	--	--	--	--	
198	60.00	562.00	44.00	--	-.07	.00	-.02	-.01	.00	.00	--	--	--	.03	--	-.04	--	--	
199	60.00	412.00	44.00	--	.00	--	--	-.02	--	.00	--	--	--	--	--	-.02	--	--	
200	60.00	216.00	44.00	.06	-.01	--	--	.00	--	--	--	--	--	--	--	-.02	--	--	
201	60.00	1468.00	44.00	--	-.03	-.01	-.01	-.01	--	--	-.01	--	--	.01	--	.00	--	--	
202	60.00	300.00	44.00	-.03	-.04	-.01	--	--	--	--	--	--	--	--	--	--	--	--	
203	61.00	505.00	44.00	-.05	-.05	-.01	-.01	--	--	--	.00	--	--	--	.00	.00	--	--	
204	61.00	229.00	44.00	--	.00	.00	--	--	--	--	--	--	--	--	.00	--	--	--	
Total	N	204	204	204	67	200	169	108	125	103	14	77	31	1	67	42	133	26	3

Table A.1.1.

Total Variance Explained From Principal Components Analysis. Five factor model of behaviors.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.413	20.109	20.109	2.413	20.109	20.109	2.003
2	1.368	11.404	31.512	1.368	11.404	31.512	1.679
3	1.285	10.710	42.222	1.285	10.710	42.222	1.227
4	1.051	8.757	50.979	1.051	8.757	50.979	1.186
5	1.011	8.422	59.400	1.011	8.422	59.400	1.033
6	.940	7.832	67.232				
7	.901	7.508	74.740				
8	.849	7.076	81.816				
9	.640	5.335	87.152				
10	.599	4.991	92.143				
11	.502	4.185	96.328				
12	.441	3.672	100.000				