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ENHANCING PATIENT ADHERENCE
THROUGH PERSUASIVE MESSAGES

Muhammad F. Walji

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**Does the Message Matter?
Enhancing Patient Adherence through Persuasive Messages**

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December, 01 2006

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Does the Message Matter? Enhancing Patient Adherence through Persuasive Messages

A

DISSERTATION

Presented to the Faculty of
The University of Texas
Health Science Center at Houston
School of Health Information Sciences
in Partial Fulfillment
of the Requirements

for the Degree of

Doctor of Philosophy

by

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ABSTRACT

To improve health and reduce costs, we need to encourage patients to make better healthcare decisions. Many informatics interventions are aimed at improving health outcomes by influencing patient behavior. However, we know little about how the content of a message in these interventions can influence a health-related decision. In this research we formulate a conceptual model to help explain and guide the design of “persuasive messages”, those which can change and influence patient behavior. We apply the conceptual model to design persuasive appointment reminder messages using human-centered design principles. Finally, we empirically test our hypotheses in a randomized controlled trial in order to determine the effectiveness of persuasive appointment reminders to reduce the number of missed appointments in a sample of 1016 subjects in a community health center. The results of the study confirm that reminder messages are effective in reducing missed appointment compared with no reminders ($p=0.028$). Further, reminder messages that incorporate heuristic cues such as authority, commitment, liking, and scarcity are more effective than reminder messages without such cues ($p=0.006$). However, the addition of systematic arguments or reasons for attending appointments have no effect on appointment adherence ($p=0.646$). The results of this research suggest that the content of reminder messages may be an important factor in helping to reduce missed appointments.

ACKNOWLEDGEMENTS

Completing a dissertation is far from a solitary process. I am deeply indebted to my mentors, teachers, collaborators, friends, and family who provided me the encouragement and support critical to completing this research.

Special thanks to my primary mentor Jiajie Zhang for his brilliant insight, dedication, counsel, and support. I would also like to thank my superb committee members: Elmer Bernstam, Todd Johnson, Craig Johnson, and Kathy Johnson-Throop for their guidance and assistance. I was truly fortunate to have a committee of this caliber.

I was also very lucky to have interacted with many other faculty, staff and students at the The University of Texas School of Health Information Sciences. In particular I would like to thank Jack Smith, Randolph Scott, Debbie Todd and my fellow graduate students.

I am also very grateful to Jose Bayona, Mohamed Zare, and all the clinic staff and patients at Baytown Health Center for generously providing access to their clinical facilities that were integral to completing this research. Special thanks also to Mandeep Bajaj and Sarah Edmonson for their assistance and advice.

And finally, I am truly grateful to my family who have been unwavering in their support and encouragement. I owe a great debt to my parents, Latifa and Hasnain Walji, who have provided me with so much motivation and nurture. I am deeply grateful to my wife Aliya, for her undying optimism, endless love, and compassion. And of course, special thanks to our daughter Naadiya, for providing us with infinite joy and happiness.

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Chapter 1: Introduction and Motivation

Many informatics interventions are aimed at improving health outcomes by influencing patient behavior (Revere & Dunbar, 2001). These interventions share the need to appropriately deliver a message to influence decision making. For example, patients are alerted with prompts to take their medications, attend appointments, or schedule recommended screenings (Krueger, Felkey, & Berger, 2003). Currently, there is little understanding as to how the message of an intervention can play a role in influencing a decision. Specifically, little research exists to explain how patients process such messages in a healthcare context. A better understanding of message processing and an exploration of the factors that affect acceptance of such requests may help improve adherence of interventions aimed at patients.

In this research we focus on enhancing adherence to appointments. Appointment adherence is estimated to range from 8% to 94% (Macharia, Leon, Rowe, Stephenson, & Haynes, 1992). Although appointment reminders are widely used in practice to reduce missed appointments, there has been little research to determine if the content of a reminder message may influence appointment adherence. If this research shows that the content of the message is important, existing appointment reminder systems may be further improved.”

In this study we propose a conceptual model to help explain and guide the design of persuasive appointment reminders. A persuasive message is one that is intended to influence a patient in an intended direction. We use human-centered design principles to engineer persuasive appointment reminder messages. Our focus is on iteratively creating the message itself and not the underlying technology that drives the reminder system.

Human-centered design is the field in which end users and other stakeholders are intricately involved in the design of an information system. Such a design paradigm is thought to be effective in creating useable systems that actually meet the needs of users (Jiajie Zhang, In Press; J. Zhang, Patel, Johnson, Malin, & Smith, 2002). Finally, we empirically test our hypotheses in a randomized controlled trial to determine the effectiveness of persuasive appointment reminders in reducing the number of no-shows in a sample of 1016 patients.

Chapter 2: Appointment Adherence: A Review of the Literature

2.1 Need to Enhance Patient Adherence in Healthcare

Despite technological and knowledge advances in healthcare that have dramatically increased life expectancy and quality of life, there is much room for improvement. Patients frequently fail to take their medications and miss scheduled clinic appointments. In fact, it is estimated that in 2000 alone, the cost of medication non-adherence was \$13.2 billion (Cleemput, Kesteloot, & DeGeest, 2002). Patients who miss clinic visits, especially for chronic diseases such as diabetes have poorer outcomes (Karter et al., 2004). In this research we focus on appointment adherence. A review of the literature regarding missed appointments and the effectiveness of appointment reminders follows.

2.2 Effects of Missed Appointments

Non-attendance at scheduled appointments is financially costly, results in poorer patient outcomes, and prevents other patients from being seen on time (Karter et al., 2004). The rates of appointment adherence range from 8% to 94% and differ depending on patient demographics, health modality, individual providers, insurance status, location, and appointment time/day (Cohen, Kaplan, Kraus, Rubinshtein, & Vardy, 2006). The costs of non-attendance have been broken down as to either 1) social costs resulting in unused appointment slots and 2) financial costs due to loss of income (Bech, 2005).

2.3 Reasons for Missed Appointments

Forgetting about scheduled appointments is cited as a common reason why patients miss clinic appointments (Murdock, Rodgers, Lindsay, & Tham, 2002; Neal, Hussain-Gambles, Allgar, Lawlor, & Dempsey, 2005; Zailinawati, Ng, & Nik-Sherina, 2006). However, increasing evidence suggests other barriers to attending appointments. For example, in a study in a low income population consisting of 34 patients, it was discovered from interviews that patients missed appointments due to emotional reasons, perceived disrespect by the healthcare system, and lack of understanding of the scheduling system. Emotional reasons discovered during the interviews included negative anticipation of the upcoming visit and doctor, fear of hearing bad news, and self-resolving symptoms. Patients also felt a great disrespect from the healthcare staff regarding their time, opinions, and feelings mainly due to long waiting times and the referral process instituted by insurance carriers. Transportation problems and child care were also found as reasons for non-attendance for a small number of patients (Lacy, Paulman, Reuter, & Lovejoy, 2004). In a telephone interview with patients with chronic illness, it was discovered that in addition to forgetting the date, patients missed appointments when they were not feeling well, and because of work or family commitments (Zailinawati, Ng, & Nik-Sherina, 2006). Fear of seeing a junior doctor was also cited as a reason for missing appointments (Murdock, Rodgers, Lindsay, & Tham, 2002).

Reasons for patient non-attendance at clinic appointments are complex and include factors beyond patients simply forgetting or lacking transportation. Therefore,

opportunities exist to provide interventions that can address other reasons for appointment non-adherence.

2.4 Reminders and Type of Appointment

Research evaluating the usefulness of reminders for appointments has included both appointments that have been previously scheduled and reminders to prompt patients to schedule visits.

2.4.1 Reminders to schedule visits

Automated telephone reminders for well-child and immunization-related visits showed minor improvements (4%-7%) in a randomized controlled trial (Alto, Fury, Condo, Doran, & Aduddell, 1994). However, the effectiveness of such reminders may dissipate with time (Szilagyi et al., 2006). Similarly, reminders for repeat mammography screening have shown a high degree of adherence (Rakowski et al., 2003).

Reminding patients to make follow-up appointments is challenging. For example, an intervention that attempted to improve follow-up care for patients with acute asthma after an emergency department visit showed that making an appointment for a patient was more effective than reminding patients to make their own appointment (Baren et al., 2006).

2.4.2 Reminders for previously scheduled visits

Many studies have evaluated the effectiveness of reminding patients about previously scheduled visits. Such appointment reminders have been deemed effective in areas such

as pulmonary function laboratory visits (Haynes & Sweeney, 2006), orthodontic visits, and adolescent clinics (Sawyer, Zalan, & Bond, 2002) (O'Brien & Lazebnik, 1998).

However, in other research, receiving a reminder from an orthodontic clinic (Bos, Hoogstraten, & Prahl-Andersen, 2005), or a substance abuse clinic (Stasiewicz & Stalker, 1999), was not effective in improving appointment adherence.

2.5 Mode of delivery

Appointment reminders have been delivered over postal mail, telephone, text message (via cell phone), and email. There is little evidence to suggest the superiority of any particular delivery mode. For example, there was no effect in actual appointment attendance or cancellation rate for mail, telephone or text message reminders compared with a control group. Perhaps the ineffectiveness of the reminders was because the non-adherence rate at the orthodontic clinic in The Netherlands was already low (Bos, Hoogstraten, & Prahl-Anderson, 2005). Similarly, there was no difference among telephone or postcard reminders in a low income inner-city population (Maxwell et al., 2001).

Appointment reminders delivered to a cell phone via text messaging (or short messaging service) has been found to be effective. For example, only 9.8% of 20,488 patients who received a text message failed to attend their appointments. In comparison, 19.5% of patients in the historical control group failed to keep their appointments. Patients in the control group had a cell phone, but received no reminder message (Downer, Meara, Da Costa, & Sethuraman, 2006).

Patients who received a letter one month before the time of their next annual diabetic eye appointment and a personal phone call 10 days prior, were more likely to return for an appointment than those who received just the letter alone. However, it is difficult to ascertain if a combined reminder strategy or personal phone call was the reason for increased appointment returns (Anderson et al., 2003).

Therefore, there is little evidence in the literature to suggest the superiority of any particular mode of delivery for appointment reminders. The choice of delivery method may be based on access and patient preference. For example, email reminders may not be suitable for an elderly, low income population as they are unlikely to have access to the Internet (Fox, 2004). Perhaps allowing patients to choose the mode of delivery would be the most optimal solution. For example Bos, et al, discovered that patients in their population preferred receiving a reminder by mail (56.3%), telephone (26%) and text message (17.7%) (Bos, Hoogstraten, & Prah-Andersen, 2005). In contrast , in patients with chronic diseases, it was found the majority preferred telephone reminders (Zailinawati, Ng, & Nik-Sherina, 2006).

2.6 Reminder Message and Information Content

Few studies in the literature evaluating the effectiveness of appointment reminders describe the content or script of the reminder message. Of the limited studies that have provided such information, modifying the content has not been effective in enhancing appointment adherence. For example, a group of women who had previously kept a mammogram appointment were enrolled in a reminder study to determine the likelihood of scheduling and returning for another mammogram one year later. A simple reminder

letter was found to be as effective as providing a comprehensive tailored leaflet matched on their particular behavioral variables. All groups had repeat scheduling levels between 70% and 75%. No control group was used (Rakowski et al., 2003).

Similarly, a reminder letter that described the “content of an upcoming well-child visit” based on the Health Belief Model was no more effective than a postcard reminder that specified only the date and time of an appointment (Campbell, Szilagyi, Rodewald, Doane, & Roghmann, 1994). More work is necessary to determine if the content of a reminder message is an important variable in appointment adherence.

2.7 Source of message

The sender of a reminder message may be important in encouraging patients to attend visits. However, in a study conducted in Australia, it was found that there was no difference if a telephone reminder message was delivered from a general practitioner’s office or from a hospital. Both reminders were more effective than no reminder in improving adherence to hospital outpatient clinics (Reti, 2003).

When trying to encourage women to schedule mammograms it was found that a telephone call from a physician was no more effective than a call from a medical receptionist (Mohler, 1995). Similarly a recommendation letter from a woman’s primary care physician was no more effective than a letter from the program director in prompting women to get mammograms (Taplin, Anderman, Grothaus, Curry, & Montano, 1994).

2.8 Reminders over time

In their evaluation of the effect of reminders over time, Morse, et al . discovered that mailed reminders had a waning effect in their pediatric clinic. The institution had

previously found that mailed reminders were effective in reducing missed appointments. However, upon noticing that fewer patients were keeping appointments, they decided to study the effect of missed appointments if they removed the mailed reminder on 20% of their patient visits. They found no difference between patients who received a mailed reminder and those who did not. However, the study results and claims are hindered by the fact that the clinic also used telephone reminders for all their patients (Morse, Coulter, Nazarian, & Napodano, 1981). More studies are warranted to examine the effect of appointment reminders over time.

2.9 Other Important Variables and Appointment Reminders

2.9.1 Live call or answering machine for telephone reminders

Telephone reminder messages may either be directly communicated to a patient or relative or left on an answering machine for future retrieval. In a small study there was no difference in absentee rates for patients who received reminders via direct conversations and those who received an answering machine message (Haynes & Sweeney, 2006).

In a reminder system tested in a pediatric clinic there was no difference in attendance rate if the reminder was received by the patient, their parent/guardian, other family member, or answering machine (O'Brien & Lazebnik, 1998). Reminders that were addressed to parents (6.3%) were more likely to result in the administration of measles vaccinations than those addressed to the child (2.6%). However, the response rate in both cases was low (Harper & Madlon-Kay, 1994).

2.9.2 Reminder and response (or action)

Patients who were sent mailed appointment reminders for a hospital orthodontic appointment and returned a stamped, addressed envelope were more likely to keep their appointments than those patients who did not receive a reminder (Thomas, 2004).

Similarly, patients who received a reminder and returned a confirmation slip were more likely to come to their appointments than those who did not receive a reminder (Can, Macfarlane, & O'Brien, 2003).

There is also evidence to indicate that pre-assigning patients an appointment slot is more effective than sending a reminder asking patients to schedule an appointment. For example, it was found that sending a reminder letter with a fixed appointment date was more effective than an invitation to call in and schedule an appointment for mammography (Stead, Wallis, & Wheaton, 1998). Similarly, for health checkups, patients who received a confirmed appointment time adhered at a rate of 70% compared with 37% of patients given an open invitation (P. Norman et al., 1991). Therefore, asking patients to confirm appointments or making appointments on behalf of patients appear to be alternative approaches to enhance appointment adherence.

2.9.3 Number of reminders

There are few studies examining the optimal frequency of appointment reminders. Sending one or two mailed reminder messages to a group of high risk patients had no effect in increasing influenza immunizations (Moran, Nelson, Wofford, & Velez, 1992).

2.10 Summary

Patient appointment non-adherence is common. Appointment reminders have been effective in some populations and conditions. Reasons for patients failing to come to appointments are complex. It is not known whether the content of a reminder message affects appointment adherence.

Chapter 3: Persuasive Communication to Enhance Patient Adherence

In this chapter we review the literature with the aim of applying theories and strategies from other disciplines to design persuasive reminder message to enhance patient adherence. A persuasive message is defined as one that is intended to influence behavior in an intended direction.

3.1 Theoretical Frameworks for Persuasive Message Creation in Healthcare

In order to increase patient adherence a variety of approaches have been used most notably in public health-related fields. Various models exist to help understand individual behavior change such as the Health Belief Model, Stages of Change, Theory of Planned Behavior, and Social Cognitive Theory. Table 2 provides an overview of some of these strategies as reviewed by Revere (Revere & Dunbar, 2001). These models have been used as a basis to design various interventions. However, these behavior change models require substantial patient-related information in order to design an effective message. For example, in the Stages of Change Model, it is necessary to determine if a patient is in the pre-contemplation, contemplation, preparation, action, or maintenance stage. This is normally done by surveying patients and creating a tailored message. This approach may be beneficial for designing a smoking cessation program, but may be too burdensome for an appointment reminder intervention.

Health informaticians have also adopted many of these theories of behavior change in various technology-based initiatives. Much research attention has focused on computer-patient health interventions, where the computer acts as an extension of the

clinician. In a systematic review of 37 such studies, 89% reported beneficial outcomes, 60% of which were statistically significant (Revere & Dunbar, 2001). Health topics covered by computerized-health interventions included such subjects as medication adherence, diabetes, migraines, cancer, hypertension, mental health, physical exercise, smoking cessation, nutrition, and preventative health (Revere & Dunbar, 2001). The mode of delivery of the information also ranged widely and included mobile communications, computer systems, automated telephone systems, and print communications.

Delivering a message plays a key role in all these interventions be it a medication reminder via a pager (Facchinetti & Korman, 1998), a computerized telephone immunization reminder (Stehr-Green, Dini, Lindegren, & Patriarca, 1993), or a tailored newsletter designed to increase fruit and vegetable consumption(Lutz et al., 1999). Most research analyzing the message of such interventions has focused on personalization, targeting, or tailoring techniques. Personalized information has the patient's name on the message (Revere & Dunbar, 2001). A targeted message seeks to differentiate or segment groups of patients, for example, diabetics or women. Tailored messages are those that are designed specifically for the individual based on a variety of factors. Computer-tailoring is thought to be more effective than general counseling as it can provide the patient with relevant material that reduces redundancy and the cognitive load required to process information (Brug, Campbell, & van Assema, 1999). Computer-tailored interventions partly mimic patient-clinician counseling, where the knowledge of the clinician (or counselor) is captured and represented in the expert computer information system (Brug, Oenema, & Campbell, 2003). However, there is little existing research

beyond personalization, targeting, or tailoring an intervention. Potentially important aspects of a message, including content, time of delivery, and mechanism of delivery have not been adequately investigated.

Therefore, we next turn to the persuasion literature. Much work has been done in psychology and marketing in attempting to change attitudes or convince consumers to purchase products.

3.2 Dual Processing Model of Persuasion

The Heuristic-Systematic Processing Model has been proposed by Chaiken to explain how individuals process information, change their attitudes, and make decisions (Chaiken, 1980). Chaiken suggests that there are 2 primary ways for decision making or information processing. Individuals either use rules of thumb and shortcuts (heuristic approach); or they use more rational, careful, or effortful thinking (systematic approach) to make decisions.

In the systematic approach individuals rely on arguments such as facts, evidence, reasoning, and logic. Therefore this approach is more cognitively taxing and is thought to occur in situations where there is strong personal relevance to the issue at hand.

Persuasion or influence exerted that invites the individual to use the systematic approach is considered more lasting over time.

In contrast, when using the heuristic approach, individuals rely on peripheral cues such as expertise of the source, attractiveness, or friendliness. In this approach individuals think just enough to be aware of the situation. The heuristic approach is less cognitively taxing as it avoids critical thinking and relies on learned cognitive heuristics to make decisions.

Although people would like to base their decision or actions in a more controlled or rational way, the pace of life and information overload make heuristic reasoning attractive. Cialdini defines 6 types of persuasion people employ using heuristic shortcuts (Cialdini, 2001). Similar principles applied to healthcare are also reviewed by Redelmeier and Cialdini (Redelmeier & Cialdini, 2002). Table 1 provides a summary of these approaches.

3.2.1 Rule of reciprocity

Cialdini describes this phenomenon as the “Old Give and Take”. The rule of reciprocity is based on social etiquette which implies that we should repay, in kind, what another has provided or gifted to us. For example, if a friend lent us money to pay for an expensive medical operation, we would feel obligated to repay that debt. One of the more obvious examples to be found in healthcare is the reciprocal relationship between clinicians and medical product sales representatives. Clinicians are often provided with gifts (e.g., dinners, football tickets, or retreats) by specific drug manufacturers. In turn, these clinicians are often found to prescribe or purchase the manufacturer’s products. For example, physicians who were provided all-expense paid trips to attend symposia sponsored by a pharmaceutical company were more likely to prescribe their drugs (Orlowski & Wateska, 1992). Pharmaceutical companies and other medical vendors have found significant success in using rule of reciprocity to influence prescribing behavior.

However, this powerful social contract may also be useful in more ethically favorable ways. For example, a physician who treats a patient successfully may have

more influence in recommending favorable health practices. Or, patients who are provided small gifts may be less likely to miss future clinic appointments.

3.2.2 Commitment and consistency

This principle suggests that people who take a stand are more likely to be consistent with that commitment. Consistency is often associated with personal and intellectual strength.(Cialdini, 2001) This principle is used widely in healthcare to convince patients to cease smoking or to reduce dependency on alcohol and drugs. For example, written or spoken commitments by such patients in a public group or in front of an authority figure vowing to stop smoking may be effective in influencing behavior. In the sales domain, getting a commitment from a prospect (example: if we can give you the car for that price, will you buy it today?) is a highly effective technique in closing sales. In healthcare, seeking commitment from an individual and reminding them of the commitment may be a powerful technique to influence patients and clinicians toward more positive behaviors.

3.2.3 Social proof

Individuals often look at what others are doing or thinking in order to make decisions about what to do or think. For example, if a physician has a very busy practice, that fact may indicate to the patient that they are a better choice than one who has a less busy practice. Social proof is often used in times of uncertainty (Cialdini, 2001). When looking for a book using Amazon.com on an unfamiliar subject, a user may look at its relative popularity in making a purchasing decision. In healthcare, as in other areas, using the social proof heuristic can result in poor decisions. The previous example of the physician-

drug industry relationship is so embedded into the healthcare system that many physicians justify their acceptance of incentives because most of their peers are also involved (ALLMAN, 2003). However, the social proof heuristic may also be used to promote guideline compliance. For example, physicians sometimes receive “report cards” indicating how they compare to peers in prescribing certain medication or in conducting procedures. Patients may also be more motivated in adhering to recommended exercise regimes if they were aware that their peers were also regular exercisers.

3.2.4 Liking

As individuals, we generally respond more favorably to requests from people we like compared to requests from people we dislike. Cialdini describes various facets that make up liking. More physically attractive people are thought to have favorable traits associated with them such as talent, kindness, honesty, and intelligence. In fact, attractive people get hired more, get paid more, and get better legal treatment. We also react more favorably to people who are similar to us in age, religion, politics, dress, etc. People are also very amenable to compliments, flattery, and praise. And people are drawn to things that are familiar. (Cialdini, 2001)

In healthcare, patients who like their physicians report better health and greater visit satisfaction. Similarly, physicians who like their patients report better patient health and better physician satisfaction. Female physicians reported liking their patients more, and patients also reported liking female physicians more than male physicians (Hall, Horgan, Stein, & Roter, 2002). Therefore, having a likable individual deliver a message may be an effective strategy to influence behavior.

3.2.5 Authority

Clinical medicine is hierarchical. Usually the physicians are at the pinnacle with other clinicians below. Even within the physician ranks, a hierarchy exists. Specialists are preferred over generalists and, similarly, attending physicians over physicians in training. Deference to authority is thought to be responsible for nurses knowingly providing incorrect doses to patients on a physicians order (Redelmeier & Cialdini, 2002). As individuals we are frequently influenced by and accept requests from those perceived to be in more authoritative positions. The perception of authority appears to be as effective as actual authority. Therefore, if an individual or source looks authoritative (e.g., wears the right clothes), he may be perceived as such. Messages that have authoritative sources may be adhered to at a higher rate than those that omit such sources.

3.2.6 Scarcity

When a resource is in short supply, our desire for the item, service, or opportunity increases.(Cialdini, 2001) The fall 2004 flu vaccination shortage is hypothesized to have caused a rise in healthcare workers' compliance in receiving the flu vaccine (Larkin, 2004).

Therefore, people are more motivated by thoughts of losing something rather than by gaining something of equal value. The principle of scarcity is widely used in the marketing domain to drive sales through the use of deadlines, time limits, and high pressure sales tactics that demand decisions immediately to get the best deal.(Cialdini,

2001) In healthcare, for example, informing patients of the difficulty of getting another appointment may be an effective tactic in reducing the number of missed appointments.

Table 1: Persuasive heuristic techniques to influence and change behavior

Heuristic Technique	Definition
1. Commitment and consistency	People who take a stand are more likely to be consistent with that commitment
2. Liking	As individuals, we are more likely to respond favorably to requests from people we like than from those we dislike
3. Authority	As individuals, we are frequently influenced and accept requests by those perceived to be in more authoritative positions
4. Scarcity	When a resource is in short supply, our desire for the item, service, or opportunity increases

3.3 Use of persuasive messages in healthcare

Much research has been conducted in discovering how message framing influences patients. Message framing involves either presenting a gain-framed message providing the benefits of engaging in the behavior; or as a loss-frame discussing the costs of failing to engage in a particular behavior. Such types of persuasive techniques can be categorized as systematic in Chaiken's Dual Processing Model. A preponderance of the

evidence supports the notion that gain-framed messages should be presented when trying to convince a patient to engage in healthy behavior such as exercise while a loss-frame message is preferred when trying to convince patients to engage in a risk-detection behavior such as breast cancer screening (Finney & Iannotti, 2002) (Apanovitch, McCarthy, & Salovey, 2003) (McCaul, Johnson, & Rothman, 2002) (Farrell, Ferguson, James, & Lowe, 2001) (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999).

Health messages providing risk information as absolute numbers rather than relative numbers were also found to be more effective (Hembroff, Holmes-Rovner & Wills, 2004). Order of differently framed health messages may also matter (Prentice-Dunn, Floyd, & Flournoy, 2001). However, in one study it was found that mailed reminders with or without persuasive elements emphasizing personal risk had no impact on increasing mammography rates (McCaul & Wold, 2002).

Only a few researchers have explored persuasive messages beyond message framing. One study found that use of scientific jargon increased message persuasiveness for unproven medical treatments (Haard, Slater, & Long, 2004). Also, matching a message based on an individual's tendency to engage in effortful thinking (need for cognition) tends to be more effective than mismatched messages (Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2003).

Therefore, in healthcare most work in influence and persuasion has focused on how to present the costs or benefits of various target health behaviors. Less work has been done on the effectiveness of persuasive heuristics in decision-making by patients. Similarly, there is little research on persuasive technology in healthcare.

3.4 Technology-based Persuasion

Persuasive techniques described by Cialdini and others are mainly based on experimental observations and interactions between humans. Can such principles be extrapolated into the realm of technologies such as automated telephones, computers, mobile phones, or other technologies? In healthcare, can computers really mimic a human in providing compelling information to patients that will change behavior? Alternatively, can computerized physician order entry (CPOE) systems influence physicians' treatment decisions?

Fogg suggests that computers can be persuasive as either 1) tools, 2) media, or 3) social actors (Fogg, 2003). Fogg describes computers as tools that provide people with new or enhanced abilities. Therefore, they become effective in changing behavior as they may reduce barriers, change mental models, or increase self-efficacy. As a medium, computers may help users understand cause and effect and motivate through experience. Computers can also play the role of a social actor and adopt physical features, emotions, voice communications, and follow social rules such as greeting or apologizing. Therefore by mimicking human social behavior computers begin to foster relationships with users.

Increasing evidence suggests that technology can be manipulated to appear to be persuasive. For example, websites are deemed more credible by consumers if they are more attractively designed (Fogg et al., 2002). Rather than pay attention to content quality indicators such as references cited or currency of information, consumers equate a professional and attractive design with the quality of the information (Fogg et al., 2002).

Similarly, computer-based agents appear to be effective in building relationships with human users. Katagiri, et al, describe two types of social persuasion techniques used to enhance the relationship between computer agents and human users. Appearance-

based attraction involves the interpersonal attraction a user feels based on outward appearances such as figures or vocal qualities. Capability-based attraction is the personal attraction based on profits and benefits gained by interacting with the agent. The authors also demonstrated that persuasive principles of social proof (or conformity) and authority translated to the computer-interface realm (Katagiri, Takahashi, & Takeuchi, 2001).

Lee and Nass provide evidence that the liking principle also applies to persuasive technology. They modified a computer voice manifesting a personality similar and dissimilar to the subjects. Subjects felt stronger social presence when the computer voice was similar to their own personality. For example, extroverts preferred an extrovert voice (Lee & Nass, 2003).

In summary, individuals appear to apply similar social rules to computer-mediated experiences as they do to human interactions. It seems reasonable to hypothesize that systems that are engineered to include persuasive elements will have a stronger influence on health behaviors.

3.5 Ethics of persuasive messages in healthcare

The appropriateness of persuasive messages in healthcare will likely depend on the situation. In some cases a persuasive message may convince a patient to stop a risky health behavior. Hospitals may need to counter-persuade physicians indoctrinated by drug manufactures to follow medication-prescribing guidelines that lead to better treatment and reduces costs.

However, in some cases, persuasion is likely to be unethical. Worden and Flynn suggest that persuasive messages should be used when one course of action is clearly

preferred over another. Influencing a patient's treatment decision and advocating surgery while a non-invasive procedure may be equally beneficial is undoubtedly questionable. For a review of the ethics of persuasion see Fogg (Fogg, 2003). In this research we seek to explain and investigate how patients are affected by various persuasive messages. This research is significant in that it will help design better interventions when a persuasive message is desirable and ethical, and may also provide a framework to identify persuasive message elements which may be excluded when a neutral message is more appropriate.

Table 2: Summary of behavior change theories adapted from Revere (Revere & Dunbar, 2001))

CONCEPT	DEFINITION
Health Belief Model	
Perceived susceptibility	One's opinions of chances of getting a condition
Perceived severity	One's opinions of how serious a condition and its consequences are
Perceived benefits	One's opinion of the efficacy of the advised action to reduce risk or seriousness of impact
Perceived barriers	One's opinion of the tangible and psychological costs of the action
Cues to action	Strategies to activate readiness
Self-efficacy	
Stages of Change Model	
Pre-contemplation	Unaware of problem, hasn't thought about changes
Contemplation	Thinking about changes
Preparation	Making a plan to change
Action	Implementations of a specific action plan
Maintenance	Continuation of desirable actions, or repeating periodic recommended step(s)
Theory of Planned Behavior and Theory of Reason Action	
Behavioral intervention	Perceived likelihood of performing the behavior; prerequisites for action
Attitude	One's favorable or unfavorable evaluation of the behavior
Behavioral belief	Belief that the behavioral performance is associated with certain attributes or outcomes
Normative belief	Subjective belief regarding approval or disapproval of the behavior
Subjective norm	Influence of perceived social pressure weighted by one's motivation to comply with perceived expectations
Perceived behavioral control	One's perception of how easy or difficult it will be to act
Social Cognitive Theory	
Reciprocal determinism	Behavior change results from interaction between individuals and environment
Behavioral capability	Knowledge and skills to influence behavior
Expectations	Beliefs about likely results of action
Self-efficacy	Confidence in ability to take action and persist in action
Observational learning	Beliefs based on observing others
Reinforcement	Responses to a person's behavior that increase or decrease chances of recurrence

Chapter 4: Framework for Designing Persuasive Messages

In preliminary work we have proposed a categorization scheme for messages intended to influence in a specific way (Walji, Johnson-Throop, & Zhang, 2004). We refer to these communications as persuasive messages. In this chapter we propose and explain a conceptual model to help design persuasive messages such as appointment reminders. The persuasive messaging model is based on Norman's 7-Stages of Action (D. A. Norman, 1988). We also incorporate Chaiken's Heuristic-Systematic Processing theory to explain how individuals make decisions and evaluate messages (Chaiken, 1980).

4.1 Categorization of Pervasive Messages

In an effort to better understand and define the types of persuasive messages encountered in healthcare we have proposed the following categorizations (Walji, Johnson-Throop, & Zhang, 2004):

Warnings & Alerts are usually a sign or signal of something negative occurring, or of a notice to be careful. They are intended to make people aware of an impending danger or difficulty. For example, drug interaction warnings embedded into drug prescribing systems warn doctors and pharmacists about dangerous drug-drug interactions when prescribing or filling a prescription. These warnings are designed to alert the clinician to a potential adverse event. Although such warnings may be critical in preventing errors, it is found that in practice such warnings are often ignored or overridden (Wilson, 2003).

Warnings and alerts are often urgent and need to be handled quickly. Warnings and alerts may either have an explicit or implicit action associated with them. For

example, a drug interaction warning may explicitly indicate that there is a potential interaction with another drug and provide a list of suitable alternatives. An audible alert may be more implicit, simply indicating an abnormal state, without providing any explicit instructions or actions (e.g., IV not flowing).

Reminders cause an individual to remember or recall an event. Medication reminders assist patients in adhering and complying with their medication regimens (Bennett & Glasziou, 2003). Although the urgency or importance of reminders may vary, many will include an explicit associated action. For example, a medication reminder may announce the time, dose, and route for the drug.

Suggestions are ideas or proposals that are presented to individuals as options they might employ in their healthcare. Patients often receive suggestions and recommendations from their caregivers. For example, diabetics are urged to exercise more and eat healthier. Physicians may be informed that their patient may be eligible for a particular clinical trial. Pharmaceutical companies also engage in suggestive practices to prescribers when they promote their particular brand of medication. These suggestions can be from face-to-face encounters with a pharmaceutical sales representative or by passing out pens bearing the name of their product. Suggestions are unlikely to be of high urgency or importance. But effective suggestions may explicitly state associated actions that are recommended.

Notifications are usually described as the process of informing. Notifications are defined as the most generic type of message with the least degree of importance or urgency. A

notification may purely be informational in purpose with no explicit instruction for action. For example, a notice stating the availability of a patient’s lab results informs a physician that their requested order is ready. However, notifications may lead to actions implicitly without specific instructions. In the case of a lab test, for example, it may indicate that a particular patient needs an immediate surgical procedure.

Table 3: Types of Persuasive Messages and their Characteristics

Message Type	Definition	Examples	Importance / Urgency	Action
Warnings & Alerts	Intended to make people aware of an impending danger or difficulty.	Drug interaction warnings in drug prescribing systems	High	Implicit or Explicit
Reminders	Causes an individual to remember or recall an event.	Clinical decision support systems which remind physicians to conform with practice guidelines *	High-Low	Explicit
Suggestions	Ideas or proposals that are presented to individuals.	Preventative recommendations to patients	Medium – Low	Explicit
Notifications	A notification may be informational in purpose in order to inform and with no explicit instruction for action.	A pager notification stating the availability of a patient’s lab result	Low	Implicit

Focus on Appointment Reminders

In this research, we have focused our attention on reminders. A reminder is a type of message that causes an individual to recall an event. A telephone call the night before a clinic appointment reminds a patient that their annual physical has been scheduled at their doctor’s office. The event to be recalled is normally an action whose execution is agreed

upon historically. For example, the doctor's appointment may have been set months before. The telephone call serves as a reminder to execute the previously agreed upon action (attend appointment).

If an action has already been agreed upon, what is the need for a reminder? Reminders are often provided in a healthcare context to help patients who may have forgotten about the agreed upon event. An appointment set one year in advance is unlikely to be remembered by any but the most organized of individuals. The reminder also serves as an administrative tool for the clinic to determine if a patient will attend their appointment. If a patient cannot attend the appointment, the resources may be allocated elsewhere (to another patient). A review of the literature in Chapter 2 suggests that appointment reminders may also be used to educate and inform patients about the importance of attending visits in addition to reminding them of the date and time of their appointment.

4.2 Persuasive Message Processing Model

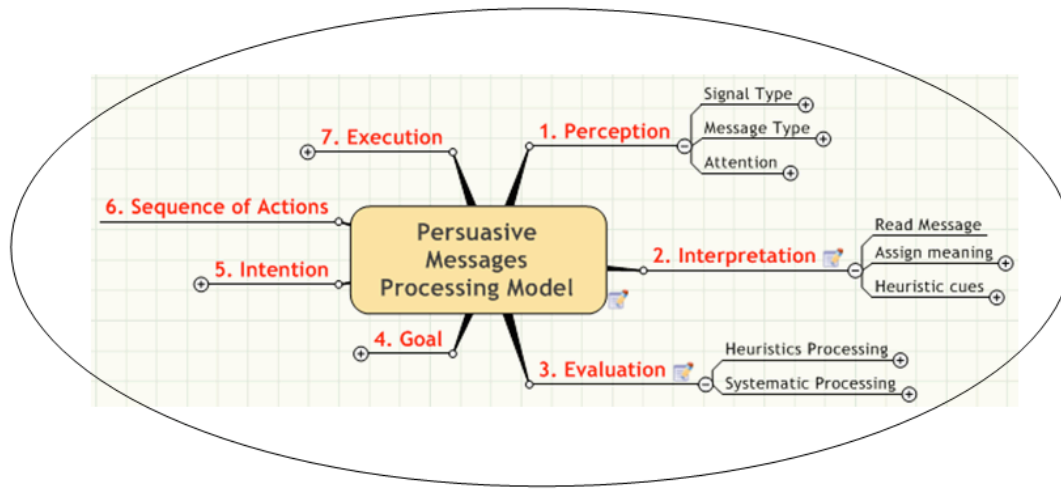


Figure 1: Persuasive Message Processing Model (Adapted from Norman’s 7-Stages of Action model)

The proposed model uses the 7 stages of action as defined by Norman in order to help explain at the individual action level the reason a message is accepted and acted upon (D. A. Norman, 1988). Norman’s model was proposed to explain how an individual undertakes an action. The original model considers forming the goal the first step. However, when considering a message presented to a user it is appropriate to begin with the perception stage. We discuss the various stages below.

4.3 Analysis of an Appointment Reminder using Norman’s 7-Stages of Action Model

Stage 1. Perception

When a patient is presented with a message, they must perceive the state of the world. The perception stage involves grabbing the attention of the patient and making them aware that their focus is being solicited. The signal of the message is critical in gaining

attention. A signal may be audible, visual, or tactile. The telephone ring, an email pop-up message, or cell phone vibration are examples of signals that may be perceived. In this stage the context of what the user is doing is critical. If the patient is involved in a highly important and cognitively burdensome task, a telephone appointment reminder may be particularly inappropriate.

Therefore, in this stage, it is not only important to select the correct reminder signal but also to determine the context in which the user will be receiving it. Another important part of the perception stage is to make certain the signal will be perceivable by the target individual. Directing the reminder to a personal cell phone or email address may increase the likelihood that the patient will receive and perceive the message.

Stage 2. Interpretation

Once an individual becomes aware of the reminder message, they need to assign meaning, make sense, and engage in interpretation. During this stage the user needs to read or listen to the message and assign some meaning in order to determine the nature and importance of the request. For example, after picking up the telephone, the patient hears a pre-recorded message from their doctor's office:

“Hello Mr Smith. This is Elizabeth from Dr. Doe's office reminding you of your appointment at 12 p.m. tomorrow...”

The patient can clearly determine the message source and the request of the message. The tone of the voice, the “pre-recorded” sound of the message, and the current situation of the individual will also influence the interpretation.

Stage 3. Evaluation

While an individual is interpreting the message they may be concurrently trying to determine the costs or benefits of various associated actions. For example, if the patient is involved in an important task, they may decide to hang upon the telephone reminder message. They may also decide to hang up if they have determined that they have received a pre-recorded message. Social rules may dictate that it may be rude to terminate a call with a live person, but it is all right if it's a pre-recorded call.

An appointment reminder normally conveys the date and time of the upcoming appointment. After hearing this information, the patient may recall they did indeed agree to keep this appointment when it was scheduled months ago.

However, for patients who may not be so sure about attending their appointment, further information may be important at this point. We suggest referring to Chaiken's dual processing model (Chaiken, 1980), described in an earlier section, individuals will use heuristic and/or systematic routes of information processing. Heuristic cues such as the authority or liking heuristic may help the individual ascertain value. For example, a message from Dr. Doe may have more weight than one from the receptionist. In systematic processing the individual may use various arguments embedded in the message to determine the costs of compliance or non-compliance. Therefore in this stage the individual assesses the message content to aid evaluation.

Stage 4. Goal

Based on the evaluation stage, the patient will form a goal. For example, the patient may make the goal that they will attend their appointment tomorrow. From the message designer perspective, there are desired goals and undesired goals. It would be very advantageous if the goal can be explicitly determined. For example, after, the patient hears the pre-recorded reminder message, they may be asked to “Press 1 to confirm this appointment, or Press 2 to speak to a representative if you are unable to attend.”

A desired goal is achieved if the patient presses 1. If the patient presses 2, that may be an undesirable goal. However, by explicitly knowing the patient’s goal, the customer representative may take steps to convince the patient to keep the appointment or, alternatively, reschedule the appointment for another time.

The ease of detecting goals varies depending on the mode of delivery. Email and telephone reminders may be more efficient in determining goals than postal reminders due to the immediacy of the technology.

Stage 5. Intention

Once a goal has been formed, the individual needs to form a specific intention to carry out the action. The intention may be to attend the appointment with Dr. Doe at 12 p.m.

Stage 6. Sequence of Actions

In this stage the individual decides and determines the sequence of actions that are required to carry out the intention. If the intention is to attend the appointment at 12pm,

the actions may be to gather all medications, find a baby sitter for the children, leave the house by 11:30, get gas for the car, withdraw money for co-payment, etc.

From the reminder designer perspective, it would be very important to have a sense of what sequence of actions need to occur in order for the action to be executed. Sequence of action may be split into directly relevant or indirectly relevant. Actions that are central to the task are considered directly relevant. For example, the patient needs to gather all his medications and have money for the co-payment. Indirectly relevant actions are items that are not central to attending the appointment but are still important for the individual to complete in order to attend. Finding a baby-sitter or putting gas in the car are examples of actions that need to occur.

By knowing the sequence of actions both directly and indirectly relevant, the reminder designer can provide assistance in bridging the gulf. For example, if it is discovered that a large number of patients need to withdraw money for co-payment, perhaps an ATM can be installed at the clinic.

Stage 7. Execution

In this final stage, the individual will physically execute the actions described in stage 6. An individual may skip particular steps or simply abandon them due to complexities in accomplishing the action (D. A. Norman, 1988). For example, if a patient accurately perceives, interprets, and evaluates the appointment reminder message and wishes to comply with the request, but finds that achieving it will be overly burdensome it is possible that it will be impossible to achieve the action. . We surmise that in order for a message to be optimal, all seven stages need to be easily accomplished.

Summary

Norman's 7-Stages of Action and Chaiken's Heuristic-Systematic Processing Model provide a useful conceptual model in the design of persuasive messages. The 7-stage Action Model, when initiated at the perception stage may help to explain how a user processes and acts on a persuasive message. The Heuristic-Systematic processing model provides a framework to understand how a user evaluates a message and forms a goal and intention to comply with the request.

Chapter 5: Creation of Persuasive Messages; a human-centered approach

5.1 Human-Centered Design

In this chapter we describe the use of human-centered design principles used in creating persuasive appointment reminder messages. Our focus is on iteratively creating the messages and is not on the underlying technology that drives a reminder system. A human-centered design of an information system takes into consideration end users and other stakeholders (J. Zhang, 2005a, , 2005b). Such a design paradigm is thought to be superior in creating useable systems that actually meet the needs of users. In the field of medical informatics, human-centered design is increasingly being used as part of creating software for clinicians. Large scale failures of clinical systems have also starkly highlighted the need for such a participatory approach (Han et al., 2005; Sittig, Ash, Zhang, Osheroff, & Shabot, 2006). Therefore, in the creation of human-centered reminder messages we demonstrate the use of a variety of techniques used to conceptualize, to build prototypes, to redesign, and finally, to evaluate their effectiveness in reducing missed appointments.

5.2 Project Lifecycle

Figure 2 shows the project lifecycle that guides all aspects of the design, implementation, and evaluation of the persuasive appointment reminder messages. A similar perspective was adopted by Rinkus, et al, in their evaluation of distributed knowledge management systems.(Rinkus et al., 2005) In stage 1, we are concerned with formulating the problem.

As part of problem formulation, we use existing theoretical frameworks to help understand the problem and suggest solutions. In stage 2 we use the theoretical framework to guide the design of an early prototype. The prototype is then tested using appropriate usability evaluation methodologies. Results from the user-centered design provide input to stage 3 where the prototype is modified. After modification of the prototype, numerous iterations occur between stage 2 and stage 3. The refined prototypes are then re-tested. Information from each stage may contribute to the redefining of the problem and its subsequent solution. Finally, once the prototype has been extensively tested, it will undergo a randomized controlled trial to test its effectiveness in a real patient population. In previous chapters we have reviewed the literature and explored the problem space. We have also proposed a theoretical framework to guide the design. In this chapter we focus on creating the prototype, user testing and prototype modification. The outputs of this process will be used in the randomized controlled study. The results of the empirical study are discussed in Chapter 6.

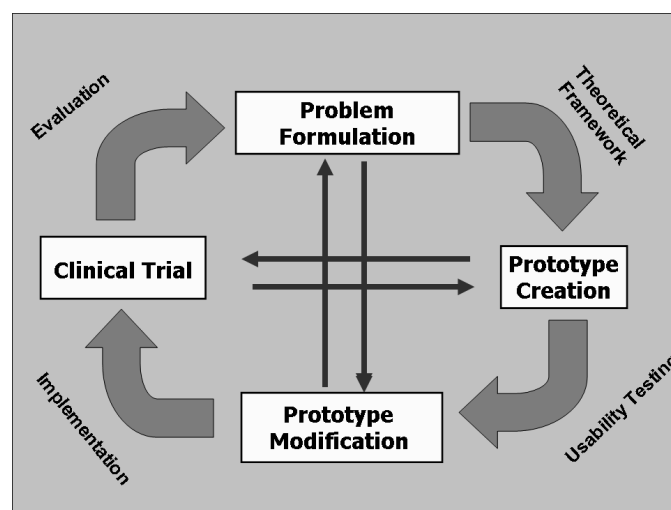


Figure 2: Project Design Lifecycle

5.3 Initial Message Creation

In this section we describe how we initially created and evaluated mockup persuasive appointment reminder messages. Guided by the conceptual framework and especially by Chaiken's Heuristic Systematic Processing Model, it was determined that an appointment reminder message should contain the following elements:

- 1. Necessary Information** to carry out the desired action (example: the date and time of the appointment)
- 2. Explanatory information** explaining why the desired action is beneficial (support systematic processing)
- 3. Peripheral information** to guide the adoption of the desired action (support heuristic processing)

Based on our research goals we created three persuasive reminder messages. (Appendix A shows mockups of the persuasive reminder messages.) The elements manipulated are also listed below:

1. Necessary Information:

Your next appointment with Dr. Smith is on Monday July 30, 2005, at 12:00 a.m.

If you have any questions, please call 409-123-4567

2. Peripheral Information (Heuristic Message)

Just a reminder that you have scheduled your next appointment with me on Monday July 30, 2005, at 10:00 a.m. [**Commitment Heuristic**]

I very much enjoyed your last visit, and look forward to seeing you on the date you scheduled above. [**Liking Heuristic**]

If you need to reschedule your appointment please let us know as soon as possible, as we are usually fully booked. [**Scarcity Heuristic**]

Sincerely

Jane Smith M.D., F.A.C.E. [**Authority Heuristic**]

Associate Professor,

Stark Diabetes Center

American Diabetes Association Certified Physician

3. Explanatory Information (Systematic Message)

Based on a literature review of appointment adherence for diabetes and general information about the condition the following statements were developed

As you know it is very important to keep your appointment.

People who fail to keep their appointments have:

- Poorer control of their diabetes
- More side effects and complications (such as going blind)

- Poorer quality of life (more reliance on others to carry out everyday tasks)

When you do not show up for your appointment at the clinic you also prevent doctors from seeing other patients who need attention. It also results in wasted resources.

5.4. Evaluation of Persuasive Messages (Iteration 1)

Paper prototyping is an inexpensive and highly effective technique to gather user feedback. Paper mockups are often used early in a products lifecycle. Paper prototyping was particularly suited to our tasks. In order to evaluate the initial message elements we created a paper mockup of an appointment reminder. Three types of messages were created. Message 1 was an email appointment reminder that used heuristic elements. Message 2 used systematic elements. Message 3 was a combination of both heuristic and systematic elements (mixed reminder). We also created a scenario and a set of questions to assess the degree to which subjects agreed to statements that related to heuristic and systematic processing. In order to help evaluate the perceived effectiveness of these messages subjects were randomly assigned to one of the following groups: 1) control (did not receive a reminder), 2) heuristic reminder, 3) systematic reminder, or 4) mixed reminder.

5.4.1 Methods

After random assignment, subjects received a paper packet that contained the following scenario:

- Forty-one year old technology worker, works very hard
- Diagnosed with Type 2 diabetes recently.
- Required to take meds, exercise frequently, and watch diet.
- Last clinic visit showed need to better control diabetes.
- Last visit to doctor was on April 12, 2005. Next visit is scheduled on July 30.
- Doctor's office is about a 25-minute drive in Houston traffic

After reading the scenario, all subjects apart from those assigned to the control group were told that a few days before the appointment they received an email message. All the emails were provided as a paper-based mockup. Each packet contained the appropriate reminder message. For example, subjects assigned to the heuristic group would receive the heuristic reminder. After reading the messages, subjects were asked a series of questions and asked to rate their agreement on a 5-point Likert scales. Subjects were provided the following statements relating to heuristic processing:

1. I should do what my doctor recommends as she is experienced and knowledgeable in treating diabetes.
2. I look forward to seeing my doctor.
3. I made the appointment; therefore, it is important for me to attend.
4. If I don't go to the appointment it will be difficult for me to make another appointment.

The last 4 statements related to systematic reasoning.

1. If I miss my appointment it will increase the likelihood that I will experience a side effect of diabetes such as vision loss.
2. If I miss my appointment it will make my health worse in the long run.
3. If I do not show up for my appointment it prevents other patients who need attention from being seen.
4. If I do not show up to my appointment it causes financial problems for the clinic.

In order to minimize any order effect, questions were presented in random order. Subjects were also asked to respond to the following question:

On the morning of July 30, you get a call from your office asking if you can meet with a prospective client. The client can only meet at 10:00 a.m., the same time as your clinic appointment. What do you do?

- 1) Confirm client meeting and miss doctors appointment.
- 2) Decline client meeting and go to doctors appointment.

Subjects were also asked to provide reasons for their decision. After completing the evaluation, subjects were asked to provide additional oral feedback regarding the messages.

Sample

A convenience sample of 38 staff and students at the University of Texas Health Science Center at Houston participated in this evaluation. This study was approved by the UT

Houston Institutional; Review Board (IRB). Each subject signed an informed consent form.

Statistical Analysis

Due to the small sample size, only descriptive statistics are provided. All analyses were performed using SPSS 14.0 statistical software (SPSS, Inc., Chicago, IL).

5.4.2 Results

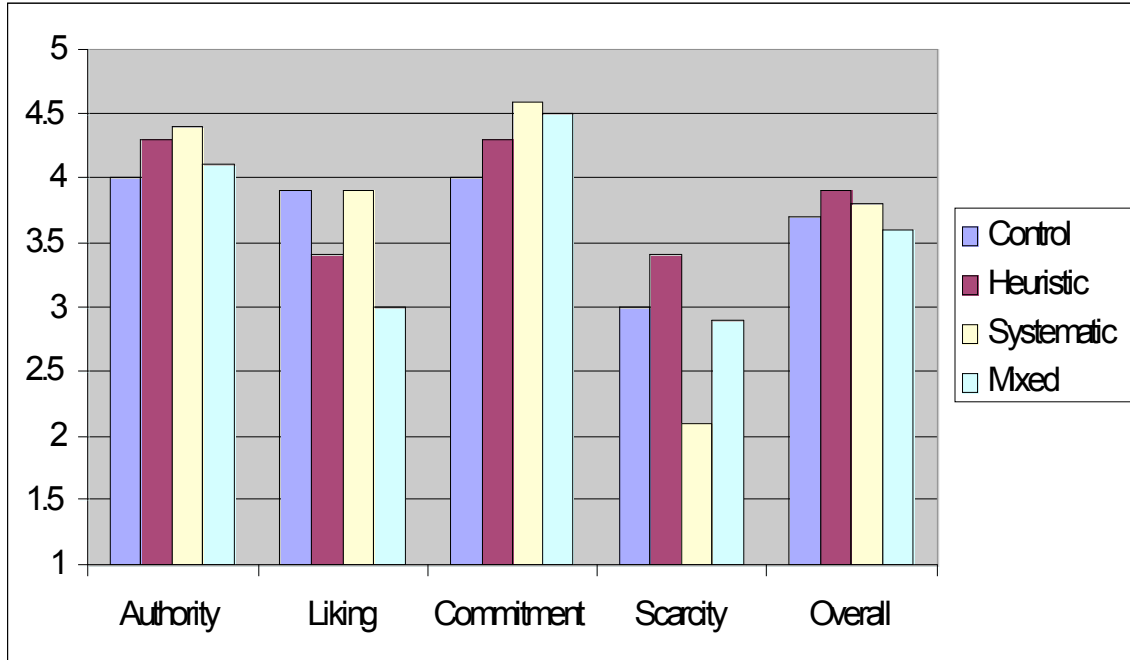


Figure 3: Subject responses to questions associated with heuristic reasoning

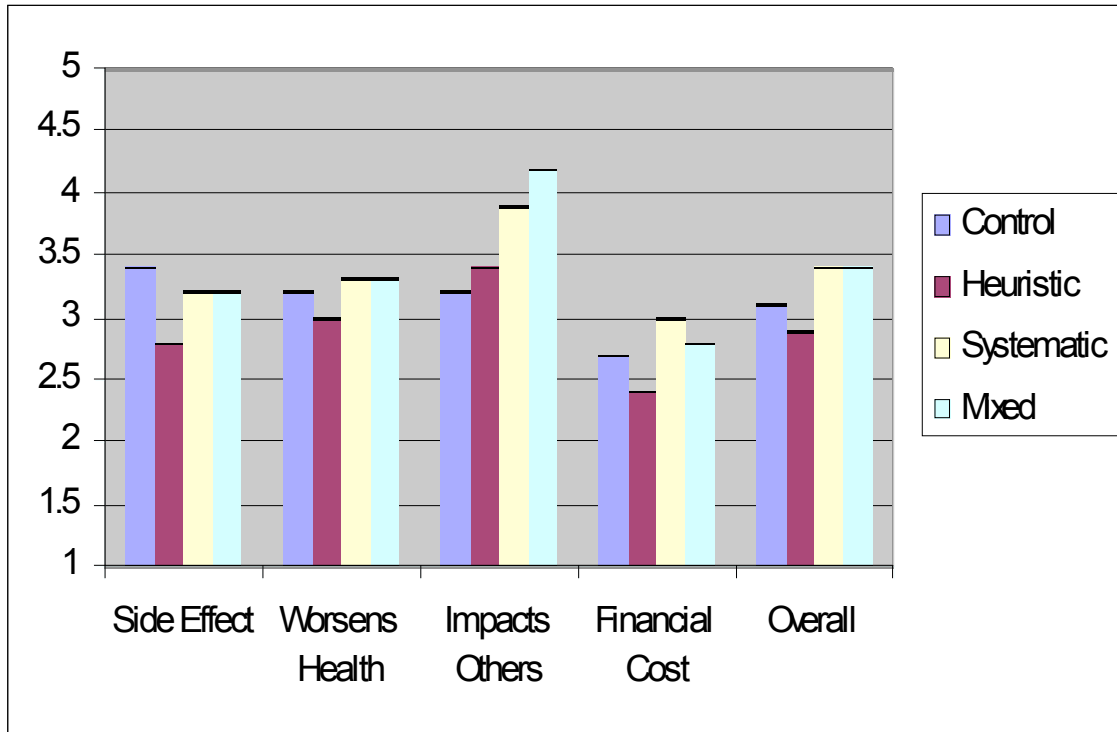


Figure 4: Subject responses to questions associated with systematic reasoning

Figure 3 shows subject responses to questions relating to heuristic processing. Figure 4 shows subject responses to systematic processing. The results suggest that regardless of the group, most subjects agreed to statements relating to authority, liking, and commitment heuristics, even when these elements were not specifically mentioned or manipulated. Similarly, most questions associated with systematic processing also had similar levels of agreement among the message groups. However, subjects in the heuristic group appeared to agree at a higher degree to the scarcity-related statement that “If I don’t go to the appointment it will be difficult for me to make another appointment.” Those subjects assigned to the systematic group also had higher agreement to the statement that “If I do not show up for my appointment it prevents other patients who need attention from being seen.”

Table 4 shows mean scores relating to intention to act on the conflict questions. Scores closer to 1 indicate tendency to go to the client meeting. Those closer to 2 have chosen to go to the doctor.

The results indicated a trend in which subjects who viewed the mixed reminder were more likely to go to the doctor's appointment. Conversely, those who received the heuristic reminder were more likely to go to their business meeting. It is important to note that the differences were not significant.

Table 4: Subject responses to intention to act

	Control	Heuristic	Systematic	Mixed
Intention to Act	1.5	1.4	1.6	1.7

1 = Confirm client meeting and miss doctors appointment

2 = Decline client meeting and go to doctors appointment

Reasons for Confirming Client Meeting

Subjects who elected to attend their client meeting provided the following reasons:

- Easy to reschedule doctor

- Diabetes is a long-term condition, missing one appointment probably not a big deal
- Job important, no job = no health insurance (cannot then go to doctor)
- Company depends on me
- New client important, especially in tech industry

Reasons for Attending Doctor's Appointment

Subjects who elected to attend the doctors' appointment provided the following reasons:

- Commitment to keeping appointments, keep promise
- Difficult to reschedule appointment with doctor
- Diabetes is a serious condition
- Take health seriously
- Health is first priority and more important than client.

Feedback from Subjects

The following is a summary of the comments provided by a small number of subjects who elected to provide further feedback:

- Heuristic Message
 - Sounds too “commercial”
 - Why did the doctor “enjoy” last visit
 - Sounds as if I am being lectured (*you, your...*)

- Get to the point!
- Systematic Message:
 - Personalize
 - Use language such as “You will...”
 - Provide patient specific reasons

5.4.3 Discussion

Due to the small sample size it was difficult to draw definitive conclusions from the subject survey responses. The preliminary results appeared to suggest that the heuristic reminder was least effective, and this observation seemed to be confirmed when receiving user feedback. However, the scarcity heuristic appeared to resonate with some of the subjects. Participants reported that they were generally satisfied with the systematic message. Suggestions to improve the message included trying to personalize the reasons given to an individual patient.

5.5 Paper Mockup 2: Clinician and Staff (Iteration 2)

Based on feedback from the initial evaluation, the appointment reminder messages were refined. Figures 5 and 6 reflect the improved messages. Much of the language that was perceived to be of a commercial nature in the heuristic message was removed. The messages were also shortened and changed based on user comments.

In the second stage of evaluation, we asked clinicians and staff who see patients to evaluate the appointment reminders.

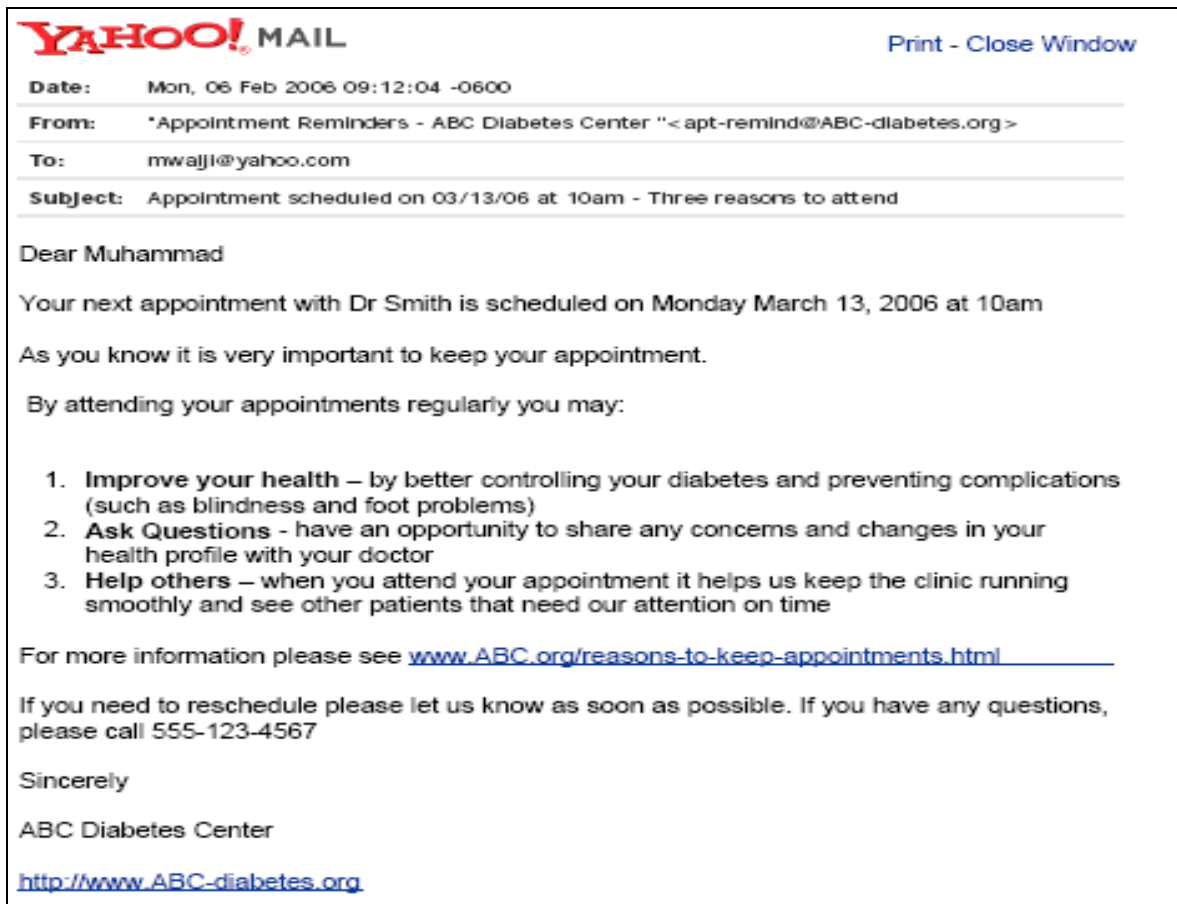


Figure 5: Systematic Reminder (Mockup)

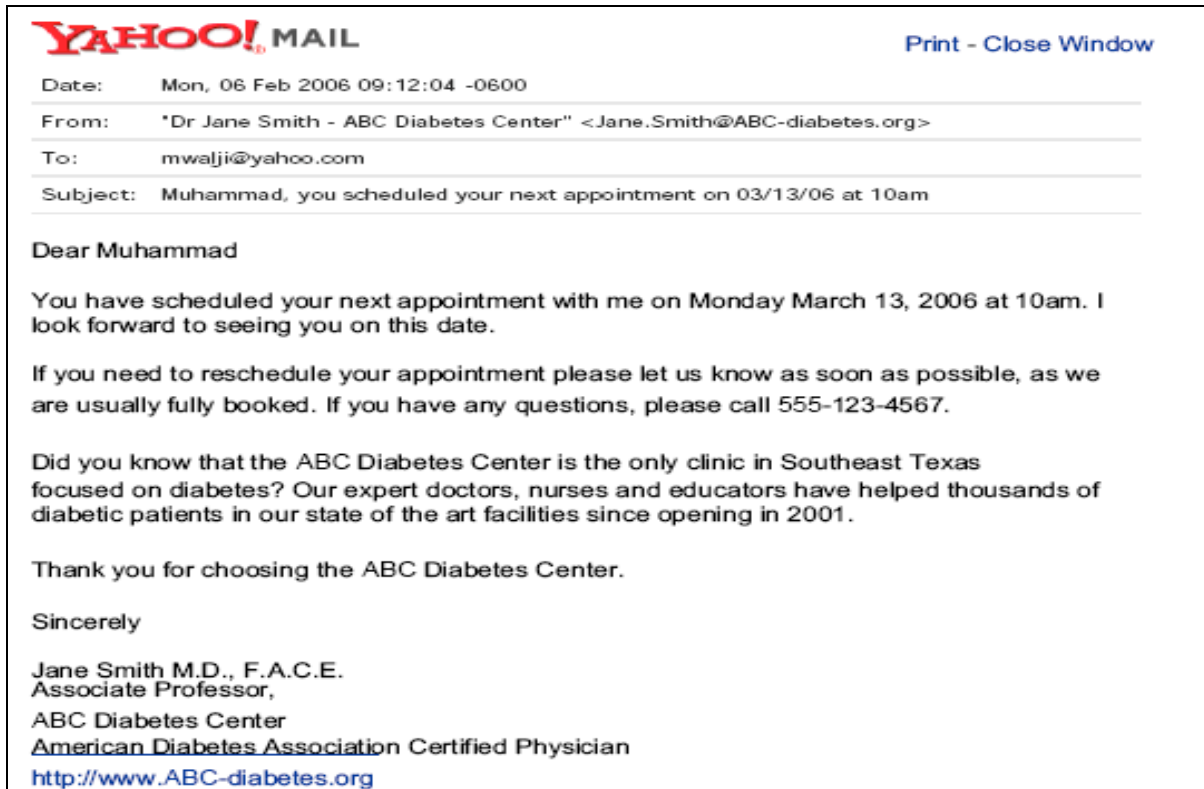


Figure 6: Heuristic Reminder (Mockup)

5.5.1 Methods

Subject recruitment and procedures

The study population consisted of clinic staff at a specialist diabetes clinic. Fourteen staff members were approached to participate in the study. One person declined. Two subjects agreed to participate but failed to complete the questionnaire and were excluded from the analysis. Therefore, 11 subjects were enrolled in the study. All subjects signed an informed consent form. The subjects included 5 physicians, a physician assistant, a nurse, a diabetes educator, a dietician, a social worker, and a scheduler.

Subjects were provided with a 7- page paper questionnaire that included the systematic and heuristic reminders. Subjects received either Form A or Form B of the

paper questionnaire.(See Appendix B). Both forms were identical with the exception of the ordering of the reminder messages. Subjects who received Form A were presented with the heuristic message first, followed by the systematic message. Subjects who received Form B were presented with the systematic message followed by the heuristic message. Subjects were randomly assigned to either Form A or Form B. An equal number of forms were prepared so both orders would be shown in approximately equal numbers. Of the 11 subjects, 6 participants received Form A, and 5 participants received Form B.

Subjects were asked about their current perception of appointment adherence at the clinic, and reasons why they thought patients missed appointments. Subsequently, subjects were asked to read both reminders. This was then followed by a set of questions relating to the accuracy, credibility, perceived effectiveness, and rationale of the reminder message. Subjects were also asked to rate the appropriateness of the sender field and informativeness of the email subject line. Each question was posed as a statement and subjects were instructed to rate their agreement on a 5-point Likert scale. The two extremes of the Likert scale were “strongly disagree” to “strongly agree”. Subjects were then asked to respond in free text format to aspects of the reminder they liked the most, aspects they liked the least, and how they felt the message might be improved.

Statistical Analysis

Paired sample T-Tests were used to detect differences among survey responses relating to subjects’ perceptions of the systematic and heuristic appointment reminders. Significance

was set at $p < 0.05$. All analyses were performed using SPSS 14.0 statistical software (SPSS, Inc., Chicago, IL).

5.5.2 Results

Result 1: Predictions of missed appointments at the clinic

Clinic staff predicted on average that 19% (± 11.3) of clinic appointments were missed (defined as no-shows or cancellations). Responses ranged from 50% missed appointments to only 7%. An analysis of data showed that over a one year period 24.9% of all appointments scheduled at the clinic were actually missed.

Result 2: Reasons for missed appointments

In total, 11 subjects suggested 56 reasons why patients' may miss appointments. These reasons were characterized into 9 themes (in descending order of frequency):

1. Patient has appointment conflict -10
2. Patient forgot - 9
3. Transportation problems- 8
4. No reminder to patient - 8
5. Lack of money – 7
6. Other patient characteristics – 7
7. Misunderstanding about appt - 4
8. Bad weather - 2
9. Doctor cancelled appointment - 1

(Numbers represent frequency of occurrence)

Result 2: Perceptions about the persuasive appointment reminders

Table 5: Mean scores (st dev) of agreements to statements. Scores were rated on a 5-point Likert scale. (1=low agreement, 5=high agreement).

	Systematic Reminder	Heuristic Reminder
Reminder is accurate	4.73 (0.47)	4.18 (0.98)
Reminder is credible	4.64 (0.50)	4.36 (0.67)
Reminder will help patients better attend appointments	3.73 (1.10)	3.82 (1.17)
Reminder provides good reasons to attend appointments	4.45 (0.52)	3.73 (1.49)
Sender address appropriate	4.20 (0.92)	4.4 (0.84)
Subject line informative	4.64 (0.50)	4.55 (0.69)

Table 5 shows subjects' perceptions about the systematic and heuristic appointment reminders. Both reminders were perceived to be highly accurate and credible. There was general agreement to the statement that the reminder may help patients better attend their appointment. The sender and subject lines of both messages were also highly rated by the subjects. There were no significant differences between the two reminders.

Result 3: Most liked and disliked aspects of the reminders

Table 6 summarizes the items liked and disliked by the subjects. The reasons provided in the systematic reminder why patients should attend the appointment was the most commonly liked item. Similarly the message sender (physician) in the heuristic message was the most liked item.

However, reason #3; patients should attend appointments as it may help others, was the most disliked item in the systematic reminder. Subjects commented that patients may feel that other people are more important than themselves. The paragraph describing the diabetes clinic was listed as the most disliked item of the heuristic reminder.

Table 6: Subject responses regarding most liked and disliked elements of the persuasive reminders

	Systematic	Heuristic
Most liked	<ul style="list-style-type: none"> -Reasons for attending -Appt time listed concisely -Easy to read 	<ul style="list-style-type: none"> -Message sender -Liking -2nd paragraph -Subject line -Date/Time of appt
Most Disliked	<ul style="list-style-type: none"> -Reason 3 -Reasons not general enough -Message sender -Paternalistic tone -Too formal 	<ul style="list-style-type: none"> -Paragraph describing clinic -Message sender -Too informal

Result 4: Suggestions for improvement

Subjects provided thoughtful suggestions as to how the reminders may be improved.

They recommended that both messages could be made more concise. In particular, subjects suggested removing the information about the clinic that was included in the third paragraph of the heuristic message. However, subjects suggested adding more patient-specific information to both reminders. For example, they felt it would be helpful

to state the nature of the appointment and to remind patients to bring their medicines and glucose meter.

5.5.3 Discussion

Clinic staff appeared to have a good idea of the number of missed visits at the clinic. About 1 in every 4 appointments is either missed or canceled. When queried, clinic staff, on average predicted that 1 in 5 appointments were missed or cancelled. In this study we defined missed appointments as no-shows or cancellations. Rescheduled appointments were not included. However, it should be noted that late rescheduled appointments may also have a detrimental impact on clinic operations.

Nine recurring themes were identified as to why a patient may miss an appointment. Ten of the eleven subjects suggested that a patient may not attend an appointment because they have conflicting activities such as work conflicts, unexpected schedule changes, emergencies, illness, or hospitalization. Subjects also noted that patients forgot, failed to receive a reminder, or had a misunderstanding about their appointment. These three themes suggest opportunities for improving how appointments are communicated. Subjects also identified very practical barriers to compliance including lack of transportation, lack of money, and bad weather. Patient characteristics were also suggested as important factors. For example, some subjects felt that patients were “not responsible enough to reschedule”, did not want to come, denied their disease state, or were simply “afraid that they will be fussed at for not caring for themselves appropriately”. These reasons for non-adherence suggest that reminders that attempt to persuade, rather than merely inform, may be beneficial.

After viewing the proposed reminder messages, subjects gave high ratings regarding the accuracy and credibility of the messages. The sender address and subject line of both reminder messages were also rated highly by the clinic staff. Email marketing professionals have suggested that sender address and the subject line of an email are critical elements for successful email campaigns ("DoubleClick's 2004 Consumer Email Study. Accessed March 15, 2005", 2004). These ratings suggest that staff were comfortable with most aspects of the messages.

Feedback from the subjects regarding the most liked and disliked aspects of the reminders were also constructive. Many staff liked the bulleted list of reasons why patients should attend appointments in the systematic reminder. In the heuristic message, three subjects liked the fact that the physician was the sender of the message. Therefore, the authority heuristic seemed to resonate with some of the subjects although one subject noted that the message sender was the least liked element.

We had purposefully created the systematic message to remain neutral in tone and present the reasons why it may be beneficial to attend. Some subjects suggested that this email sounded paternalistic and overly formal. Conversely, the heuristic message was designed to have a lighter tone. It seemed most subjects appreciated the lighter tone, although one noted that she usually addressed her patients as Mr. or Mrs. as opposed to using their first name. Therefore, a reminder that merges favorable qualities of both the systematic and heuristic message may optimal.

The reminders may also be improved by addressing the reasons for missed appointments. Although not all the issues can be solved through an email message, it may be useful to provide links to information about free and low cost transportation. We also

hope that patients who prioritize other commitments over and above their appointment may be persuaded otherwise by the reasons provided in the systematic reminder relating to the importance of attendance.

5.6 Focus Groups of Audio Reminder Messages (Iteration 3)

Based on results and feedback from clinicians and staff, the reminder messages were further refined. The messages were also converted into a script suitable for delivery as an audio message over the telephone. They were redesigned to serve as an appointment reminder for any other type of clinic visit as well. In addition, the messages were generalized so that a randomized controlled trial could be conducted in a general medicine clinic. See Appendix D for the refined messages. Two focus groups were conducted to gather feedback from 1) a convenience sample of students at University of Texas Houston and 2) clinicians at the Baytown Health Center, a smaller city near Houston where the clinical site where the refined reminders would be tested in a randomized controlled trial.

5.6.1 Focus Group of non-clinicians

Six individuals participated in a focus group to assess their opinions of pre-recorded audio messages. Focus groups are similar to individual interviews, but have multiple concurrent participants. Participants respond to questions from a facilitator. Focus groups are thought to generate a lot of information due to their interactive nature. Participants in this study were graduate students at the UT Houston School of Health Information Sciences. The focus group was conducted as part of the class lecture. The racial demographics of the participants were as follows: Caucasian – 3; Asian – 2, and African American – 1. The overall goal of the focus group was to receive feedback from them related to the pre-recorded audio messages.

Scenario and Context

Participants were provided with the following scenario:

- A clinic wants to improve the show rate of appointments
- They want to determine if a reminder system will help
- They want feedback on voice reminder messages

Then participants were told that missed appointments are detrimental to patients, the clinic, and other patients.

Past Experience with Appointment Visits

Participants were then asked what they liked about visiting their doctor's office.

Although the question asked about the positives, the first comment from a participant was that they would like it if their doctor had shorter waiting times. The participant expressed frustration at a recent clinic visit in which she had to wait for an unacceptable for a very long time to see the doctor. Another participant said that she liked it when her pediatrician's office called to remind her of an appointment. She also liked the fact that when she had a question, she would be promptly called back by a knowledgeable staff member, usually on the same day. The ability to read the latest magazines without paying for them was also mentioned as an advantage of attending an appointment visit.

When asked about negative aspects when keeping an appointment, waiting time was identified as the main problem by most participants. One participant who worked in a health clinic suggested that new electronic systems are responsible, in part, for clinic

problems “. . . especially when the clinician who installs and maintains the system is away from the office.”

Participants were then asked what solutions they might have to offer to reduce no-shows. A clinic requiring patients to call 24 hours before the appointment to cancel, or face a monetary fee was seen as one way to reduce failure to keep an appointment and not notifying the doctor’s office in advance. . A participant mentioned that they would pay the fee out of fear it would reflect on her credit report.

When asked why patients failed to keep appointments, the participants suggested that there may be other important issues or events to attend to. One participant said that perhaps the patient did not feel very sick that day, therefore feeling it was unnecessary to attend. Another reason provided was lack of money. One participant also said that by not attending appointments, he was “being lazy”. He also that he would delay a preventative care visit preferring to wait until he felt he had a medical need to attend. One participant mentioned that patients may simply forget to keep an appointment. A participant who worked in a health clinic noted that they had observed that on a nice day, few patients would attend; and that busiest days were those with bad weather.

Participants were then told that they would be presented with a series of audio reminder messages. They were told that after hearing each message, they would be asked their opinions.

Generic Reminder Message

The audio of the generic reminder message was played. (See Appendix C for script of generic message.)

After hearing the audio message, a participant noted that it sounded like a telemarketing call. Another mentioned that it was easy to forget the date/time of the appointment, particularly if it came at the beginning of the message; and that it should be repeated later. One participant mentioned that there was no information about name of the recipient (patient). Nor was there any mention about their particular doctor. Participants stated that they do not go to a clinic, but rather to see a particular doctor. Another participant asked if Health Insurance Portability and Accountability Act (HIPAA) laws were invoked, especially since he would not like a reminder message about a sensitive lab test delivered by this method.

Participants also noted that it was not a real person calling. She preferred a message from her doctor in the form of “Hi, this is Mary from Dr Smith’s office...”. This type of message would have less chance of being immediately deleted from an answering machine.

Heuristic Reminder Message

Participants were then asked to listen to the heuristic reminder message. (See Appendix C for script of heuristic message.)

After hearing the audio message, the first response was that this message was better than the previous message. When asked why, the participants responded that the doctor’s name was mentioned. (The message was phrased as if it was on behalf of the Medical Director, Dr Zare, rather than an appointment with a particular doctor on staff). Participants also felt that this message was more personal due to phrasing such as “You have an appointment...”. One participant mentioned that she did not like the phrase “We

look forward to” Another participant also pointed out that a call-back number needs to be added to the message, especially if left on an answering machine.

When asked about the language referring to the fact that clinic is normally full, one participant commented that they thought they were being sent on a guilt trip. The voice of the message was also seen to be monotonous. When asked what they considered the best time to call with a reminder, there was disagreement among the participants. One participant wanted to have the call one day before the appointment; another suggested a call 2 days in advance of the appointment in order to adequately prepare and change schedule if necessary. Another participants suggested being called twice, the first time a week before the appointment; the second on the morning of the appointment. Participants also disliked the option presented at the end of the message to “press 1 to confirm the appointment”. Instead they wanted the clinic to assume they would attend unless otherwise notified. The option to press 2 to speak with a customer representative was considered appropriate. However, one person suggested that the term “customer representative” sounded like a marketing call, and thought the word “receptionist” should be used instead.

Systematic Reminder Message

The participants were then asked to listen to the systematic message. The first response was that the message was too long. Another commented that it sounded as if they were being lectured, while another said that no machine has any idea about her health status. The latter comment sparked a discussion about how very impersonal message seemed to come across and that most of them felt that the message delivered this way was too cold.

Participants were further asked their opinions of the voice of the reminder messages, and whether there was a preference for a male or a female voice. (A similar message was recorded by a male actor and played back for the participants' comparison.) Opinions were inclusive although one participant suggested that she preferred the female voice as she expected that 90% of receptionists were female and another commented that she thought greater than 50% of telemarketers were male.

Participants were then asked to summarize and provide suggestions for improving the messages. The group consensus was to create short, concise messages with important information including the name of the message recipient as well as that of their treating doctor. The group also suggested minimal options at the culmination of the message. One participant suggested having a message that began with the voice of a receptionist which was personal to be followed by an automated voice which then states the time of the appointment and the doctor's name. . Another participant suggested that a sentence be added prompting patients to retrieve a paper and pencil in order to write down the important information. Lastly, a participant suggested that what they found appealing about the recorded male voice was the inflection, emphasis, and feeling. These elements should be incorporated into the voice of the reminder message whether it be delivered and/or recorded by either a male or a female.

5.6.2 Focus Group: Clinicians

Six medical doctors participated in the clinician focus group. The participants were the medical doctors whose patients would undergo the persuasive appointment reminder system intervention. Therefore, the focus group was used as an opportunity to introduce

the aims and goals of the study and allow them to participate in the design of the messages. The focus group was conducted during the lunch break at the clinic. All the participants were in one room; but due to various needs, the participants were often eating lunch, completing medical charts, or consulting on patient cases while they were providing their feedback. Although this was not the ideal setting in which to conduct such an evaluation, it was the optimum possible in this real world setting and it had been felt that it was very important to get feedback from the treating physicians.

After introducing the aims and goals of the study, participants were asked to listen to a reminder message and provide feedback. First, the generic message was played (see Appendix C).

Participants thought the message was appropriate. Participants were asked what they thought about the response options. Participants indicated that they “seemed ok”. When told that in a previous focus group, many participants felt that the response option to press 2 to confirm the appointment was unnecessary, the participants agreed with this sentiment.

Next the heuristic message was played (see Appendix C). One individual did not like the use of “Dr Zare, Medical Director”. She thought her patients might not recognize the name of the medical director as opposed to their own particular doctor. Another commented that the message was long. One participant also suggested adding personal language such as “. . . important to take care of your needs”.

Next, the systematic message was played (see Appendix C). Participants also thought that this message was long. One participant commented that she did not like the statement “. . . it helps us keep the clinic running smoothly and see other patients on

time”. They felt that this was too impersonal. A conversation arose among the participants about advising patients to come 30 minutes prior to their appointment which produced disagreement among the participants about this suggestion.

One participant also did not like the beginning of the message. It was suggested that “Baytown Health Center” be mentioned at the very beginning of the message.

Participants were also asked about how to deal with answering machines and language. The participants responded that the message should be left in English first, followed by Spanish.

Participants were then played the mixed message (see Appendix C). Due to participant time constraints, they were told that this message was a combination of the heuristic and systematic message. Participants indicated that the message was too long.

In summary, the participants liked the generic and systematic message. However, they thought all the messages, apart from the generic one, were too long. They suggested using the name of each treating physician instead of the medical director. They also suggested using more personal and encouraging language.

5.7 Creation of Final Refined Messages

Appendix D shows the final version of the reminder messages to be used in the randomized controlled trial. The human-centered design process was very valuable in eliciting feedback about the reminder messages. In iteration 1 we learned that the heuristic message was perceived as commercial in nature. This led to the development of more effective language. In iteration 2 we received feedback from clinicians as to why patients miss appointments. This suggested that persuasive reminders may help convince

some patients to attend. The focus groups were also very effective in receiving feedback regarding the voice and tone of the messages. For example, based on the focus group feedback, the following statement was removed from the systematic message: “Also when you attend your appointment it helps us keep the clinic running smoothly and see other patients on time.”

Chapter 6: A Randomized Controlled Study to Enhance Appointment Adherence

Based on the results and feedback received from user testing, surveys and focus groups a final set of persuasive appointment reminder messages were created (see Appendix D). We then sought to test the real world effectiveness of these messages in a community health clinic. Our overall research goal was to determine if the contents of a reminder message were important in reducing the number of no-shows. We were also interested in comparing a generic reminder message that contained only the date and time of the appointment with a persuasive reminder message that contained heuristic cues and/or systematic arguments. Further, we wanted to determine which type of persuasive message was most effective in reducing no-shows. The community health clinic that participated in this research reported that their no-show rate was between 30-40%. The clinic had also used nursing staff to call patients a day before an appointment in the past which appeared to reduce the number of no-shows. Clinic administrators were also interested in determining the overall effectiveness of reminders as well as the differences between automated and human-initiated reminders.

Therefore, a randomized controlled trial was designed to investigate the following hypotheses that had both theoretical and practical significance:

6.1 Study Hypotheses

Hypothesis 1: Patients who do not receive an appointment reminder are more likely to fail to keep their appointments (no-show) than patients who receive a reminder message.

Hypothesis 2: Reminder messages delivered by an automated system are as effective as messages delivered by a human (nurse-initiated reminder).

Hypothesis 3: Persuasive appointment reminder messages that contain heuristic and/or systematic elements are more effective than a reminder message that contains only the date and time of an upcoming appointment.

Hypothesis 4: A persuasive message that contains both heuristic and systematic persuasive elements (mixed message) is more effective than a message that contains heuristic cues, although one with **only** heuristic cues is more effective than a message that contains **only** systematic arguments. (Mixed > Heuristic > Systematic)

6.2 Methods

6.2.1 Institutional Regulatory Board (IRB) Approval

The study was approved by the University of Texas Health Science at Houston IRB and the Harris County Hospital District. A waiver of informed consent was granted by the IRB.

6.2.2 Setting

The study was conducted at Baytown Health Center, a community health clinic in Harris County, Texas. Baytown Health Center provides primary health care services for more than 50,000 patient visits a year. Services include regular adult and pediatric services,

ophthalmology, obstetrical/gynecology, podiatry, pharmacy, laboratory and radiology services, psychiatry and behavior counseling. ("Baytown Health Center. Accessed November 19, 2006 at <http://170.57.224.10/about/facilities/baytown.htm>")

6.2.3 Creation of Reminder Messages

Messages were designed using an extensive user-centered design process. The details of the design process are described in Chapter 5. Appendix D lists the scripts of each of the 4 automated reminder messages.

6.2.4 Implementation of Voice Reminder System

The manual staff reminder system consisted of bilingual nursing staff members at the clinic telephoning patients. The automated voice reminder system would automatically call telephone numbers associated with a patient with a voice message reminding patients of their upcoming appointment. The voice message would be given in both English and Spanish.

A commercial appointment reminder system called Housecalls, developed by Televox Inc, was used to send out the automated reminders. Televox Inc also recorded the messages using a voice actor based on scripts provided (see Appendix D). The messages were professionally translated into an equivalent Spanish version. All messages were recorded by the same female voice actor in both English and Spanish. If an answering machine was detected, the Housecalls system message was delivered in both English and Spanish.

6.2.5 Subject Selection

All patients with an upcoming physician appointment and valid telephone numbers were included in the study. Only subjects who had same-day appointments with another subject with the same telephone number were excluded in order to minimize multiple calls to the same household.

All patients with an appointment between Oct 25th and Nov 3rd were randomly assigned into the following groups.

- 1. Control** – patients in this group received no reminder

- 2. Manual Staff Reminder** - patients in this group received a reminder from a nursing staff member at the clinic.

- 3. Generic Automated Reminder** – patients in this group received an automated appointment reminder that stated the date and time of the appointment.

- 4. Heuristic Persuasive Automated Reminder** – patients in this group received an automated appointment reminder that stated the date and time of the appointment. In addition the message contained content based on heuristic processing.

- 5. Systematic Persuasive Automated Reminder** – patients in this group received an automated appointment reminder that stated the date and time of the appointment. In addition the message included benefits of attending the appointment.

6. Mixed Persuasive Automated Reminder – patients in this group received an automated appointment reminder that stated the date and time of the appointment. In addition the message included benefits of attending the appointment and contained content based on heuristic processing.

Patients in the reminder groups received an appointment reminder 2 days before their appointment.

6.2.6 Statistical Analysis

The primary dependent variable used to evaluate the effectiveness of each message group was whether or not the patient was a no-show (yes or no). Adherence to appointment was determined by querying the clinic scheduling system for each subject 3 days after the appointment visit date. At the clinic, adherence to appointment was classified as: 1) Attended, 2) Rescheduled, 3) Cancelled, or 4) No-Show. To facilitate analysis a dichotomous no-show variable was created. If the appointment status was a no-show then the variable would be coded as yes (or 1). If the variable was attended, rescheduled, or cancelled, the variable would be coded as no (or 0). As the dependent variable was categorical, Chi Square tests were used to determine statistically significant relationships between comparison groups as described in the hypotheses. A secondary dependent variable; ‘cancellation’ was also used to provide additional information about the effectiveness of the intervention. A dichotomous cancellation variable (yes/no) was also

created and coded 1 if cancelled, and 0 if the appointment was attended, rescheduled or a no-show.

In order to avoid type 1 error, only *a priori* hypotheses were tested. Prior to the data analysis, statistical significance was set at $p < 0.05$. Sample size calculations suggested that 1200 subjects were required to detect a difference among groups based on a small effect size (0.12) and 0.8 power at $\alpha = 0.05$ and degrees of freedom=5. Gpower was used to calculate sample size estimates.(Erdfelder, 1996) Therefore, approximately 200 subjects were required in each group.

6.3 Results

In total, 1194 subjects were enrolled in the study and were randomly assigned to one of the six study groups. Of the 1194 subjects, 1016 subjects (85%) were successfully contacted. Nurse-initiated reminders and automated reminders contacted patients 64% and 90% of the time respectively. A successful contact was defined as when a reminder message was delivered either to a person who listened to the message or when a message was left on an answering machine. Of the 178 subjects (15%) who were not successfully contacted, reasons included phone out of order, phone line busy, hung up, and invalid phone number. Only patients who were successfully contacted were included in further analysis.

Table 7: Demographic Characteristics of Subjects

Race	Frequency	Percent
Asian	14	1.4
Black	202	19.9
Hispanic	504	49.6
Other	14	1.4
White	282	27.8
Total	1016	100.0

Sex	Frequency	Percent
Female	682	67.1
Male	334	32.9
Total	1016	100.0

The mean age in years of the patients was 44.6 (SD: 16.6). Most of the subjects were female and half of the population was Hispanic (see Table 7).

Table 8 shows that the overall no-show rate was 27% for the 1016 subjects included in the study. The Generic Reminder and Control group had the highest no-show rates: 33% and 34% respectively. The human, heuristic, and mixed reminders had the lowest no-show rate at 18%, 22% and 23% respectively. The differences among the 6 groups were statistically significant ($X^2=17.0$, $df=5$, $p=.004$). However, there was no difference among the 6 groups in the number of cancellations ($X^2=5.34$, $df=5$, $p=.375$).

Table 8: No-show per randomization group. Values are counts (percentages).

Group	No-Show		Total
	No	Yes	
Control	134 (67)	67 (33)	201
Nurse	103 (82)	23 (18)	126
Generic	115 (67)	58 (34)	173
Heuristic	132 (78)	37 (22)	169
Systematic	121 (70)	51 (30)	172
Mixed	135 (77)	40 (23)	175
	740 (73)	276 (27)	1016

Hypothesis 1: Patients who do not receive an appointment reminder are more likely to fail to keep their appointments (no-show) than patients who receive a reminder message.

Table 9 shows that sending an appointment reminder reduced the no-show rate from 33% when no reminder is sent to 26% when a reminder is sent ($X^2=4.8$, $df=1$, $p=.028$).

Table 9: No-show rate and reminder received. Values are counts (percentages).

Reminder Received	No Show		Total
	No	Yes	
No	134 (67)	67 (33)	201
Yes	606 (74)	209 (26)	815
Total	740 (73)	276 (27)	1016

However, there was no statistically significant difference in the cancellation rate for subjects who received a reminder and those that did not ($X^2=0.91$, $df=1$, $p=.340$).

Hypothesis 2: Reminder messages delivered by an automated system are as effective in reducing the number of missed appointments as messages delivered by a human.

Subjects who received a human reminder had fewer no-shows (18%) compared to those who received automated reminders (27%) ($X^2=4.3$, $df=1$, $p=.039$). This data is inconsistent with the hypothesis that human and machine reminders are equally effective. However, when we compare nurse-initiated reminders with the most effective automated reminder (the heuristic reminder), there is no statistically significant difference between the human (18%) and a machine reminder (22%) ($X^2=0.59$, $df=1$, $p=.442$).

There was no statistically significant difference in the cancellation rate for subjects who received a human reminder compared with those that received a machine reminder ($X^2=2.24$, $df=1$, $p=.134$).

Hypothesis 3: Persuasive appointment reminder messages that contain heuristic and/or systematic elements are more effective than a reminder message that contains only the date and time of an upcoming appointment.

Table 10: No-show rate and generic versus persuasive reminder. Values are counts (percentages).

	No Show		Total
	No	Yes	
Generic	115 (67)	58 (34)	173
Persuasive	388 (75)	128 (25)	516
Total	503 (73)	186 (27)	689

The results in Table 10 suggest that for automated reminders, persuasive messages are 25% more effective in reducing the no-show rate than a message that contains no persuasive elements (34%) ($X^2=5.0$, $df=1$, $p=.025$). Therefore, these data suggest that the content of the message, and specifically the addition of persuasive elements, can affect the no-show rate.

There was no statistically significant difference in the cancellation rate for subjects who received a generic reminder compared with those that received a persuasive reminder ($X^2=0.292$, $df=1$, $p=.589$).

Hypothesis 4: A persuasive message that contains both heuristic and systematic persuasive elements (mixed message) is more effective than a message that contains only heuristic cues, although one with only heuristic cues is more effective than a message that contains only systematic arguments. (Mixed > Heuristic > Systematic)

When comparing the three persuasive message groups we find that the heuristic and mixed messages are most effective at 22% and 23% respectively compared to a 30% no-show rate for the systematic reminder (see Table 11). However, differences among the three persuasive message groups were not significant. ($X^2=3.29$, $df=2$, $p=.193$). The

frequency data is not consistent with the hypothesis that a mixed message (no-show = 23%) is more effective than a heuristic message (no-show =22%), which in turn is more effective than a systematic message (30%).

Table 11: No-show rate and persuasive message groups. Values are counts (percentages).

	No Show		Total
	No	Yes	
Heuristic	132 (78)	37 (22)	169
Systematic	121 (70)	51 (30)	172
Mixed	135 (77)	40 (23)	175
Total	388 (75)	128 (25)	516

Table 12: No-Show Rate and Presence or Absence of Heuristic Elements. Values are counts (percentages).

	No Show		Total
	No	Yes	
Heuristic Element Absent	236 (68)	109 (32)	345
Heuristic Element Present	267 (78)	77 (22)	344
Total	503 (73)	186 (27)	689

However, when the data is analyzed from the perspective of the presence or absence of heuristic (Table 12) or systematic elements (Table 13) among the four automated reminder groups, we find that when heuristic elements are present (i.e, in the heuristic and mixed groups), the no-show rate is 22% compared with 32% when heuristic elements are absent (generic and systematic group). Therefore, the presence of heuristic elements in a reminder message is associated with fewer no-shows than when heuristic elements are absent ($X^2=7.41$, $df=1$, $p=.006$).

Contrastingly, there is no significant relationship between the presence or absence of systematic elements in a reminder message and the number of no- shows ($X^2=0.211$, $df=1$, $p=.646$).

Table 13: No-Show Rate and Presence or Absence of Systematic Elements. Values are counts (percentages).

	No Show		Total
	No	Yes	
Systematic Element Absent	247 (72)	95(28)	342
Systematic Element Present	256 (74)	91 (26)	347
Total	503 (73)	186 (27)	689

There was no statistically significant difference in the cancellation rate for subjects who received the three different persuasive reminders ($X^2=1.55$, $df=2$, $p=.461$). Similarly, there was no statistically significant difference for subjects who received messages with the presence or absence of heuristic ($X^2=0.83$, $df=1$, $p=.361$) or systematic elements ($X^2=0.498$, $df=1$, $p=.481$).

Chapter 7: Discussion

7.1 Summary and Main Findings

The medical literature is rich with studies evaluating the effectiveness of appointment reminders in reducing the level of no-shows.(Bos, Hoogstraten, & Prahlandersen, 2005; Campbell, Szilagyi, Rodewald, Doane, & Roghmann, 1994; Can, Macfarlane, & O'Brien, 2003; Macharia, Leon, Rowe, Stephenson, & Haynes, 1992) Results from these studies suggest that in some instances appointment reminders are effective in reducing the number of missed appointments. However, there was little research to evaluate if the content of a reminder message may affect appointment non-adherence. To address this gap, we have proposed a conceptual framework to help design effective healthcare reminder messages. As part of the conceptual framework we provide a rationale as to why the content of a message may be an important factor in reducing appointment no-shows. We then apply a heuristic-systematic processing theory to develop persuasive reminder messages. We use a human-centered design approach to iteratively develop the reminder messages. The human-centered design approach provided valuable feedback in the development of the reminder messages. Paper mockups, surveys, and focus groups were also used as part of the evaluation process. The persuasive reminder messages were then tested in a randomized controlled trial.

The results from our empirical study confirmed that in our specific patient population, a telephone reminder system was effective in reducing the no-show rate from 33% to 25%. The reminder messages were also found to have no statistically significant effect on the number of cancellations at the clinic. We also determined that it was

possible to contact approximately 85% of the population via telephone. When we compared a nurse-oriented reminder against automated machine reminders, we discovered that, overall; nurses were more effective in reducing the number of no-shows. However, when we compared the human reminders versus the best automated reminder, we found there was no statistically significant difference. Therefore, the data suggests that an automated reminder can be as effective as a nurse initiated reminder if optimally designed. It is important to note that in this study we allowed the nurses to call patients without providing a script or guidance as to how to communicate with patients. We also did not investigate strategies the nurses used to contact the patient. However, the automated system was more successful in reaching a patient and delivering a reminder message. On average, nurses were able to contact patients 64% of the time. In contrast, automated reminders had a 90% success rate in contacting patients. The automated reminder system attempted to call back a phone number every 30 minutes if the line was busy or if there was no answer. Also, the automated reminder system could make calls after hours, while nurses made calls only during business hours. Therefore, the results suggest that an automated reminder message was as effective as a human reminder in reducing the number of no-shows, and that machine reminders were more effective in reaching patients.

Our results confirm the hypothesis that the content of a reminder message affects patient behavior as measured by the number of no-shows. First, we found that messages with persuasive elements were more effective than a message that contained only the date and time of the appointment. These data suggest that merely reminding a patient of an upcoming appointment does not reduce the no show rate. In fact, a generic reminder had

a similar no-show rate to patients who received no reminder. Additional message elements appear to matter when a patient makes a decision **not** to miss an appointment. On further analysis, we also discovered that providing arguments and a description of the benefits of appointment attendance were ineffective in reducing the number of no-shows. However, messages that contained heuristic cues were effective in reducing the no-show rate. Therefore, in this particular population, the use of heuristics such as authority, scarcity, commitment, and liking as manipulated in our design were effective in reducing the number of patients who failed to attend appointments without prior notice. However, we were unable to determine which individual heuristics or combination of heuristics were responsible for this effect. The results from our study do suggest cognitive heuristics in a reminder message are an effective persuasion mechanism in helping to reduce the number of no-shows.

7.2 Limitations

Although we have demonstrated that the content of a reminder message affects appointment non-adherence, it is unclear without further studies whether or not this effect can be duplicated in other populations. Also, our study was conducted over a 2-week period. Future studies over a longer period of time would be needed to ascertain the long-term viability of such interventions. Although we used a human-centered design process to design the reminders, the message designs may have been improved if we had incorporated actual patient feedback. Due to the difficulty in accessing the target patient population, convenience samples were often used to design the messages.

Although we have proposed a conceptual model to account for all stages of action when a persuasive message is received, we empirically tested only the evaluation stage. Therefore, further work is needed to validate the whole model.

7.3 Future Directions

In this research we have proposed a conceptual model to help design persuasive messages. In our empirical study we evaluated the effectiveness of persuasive reminders in a specific population. Future work should attempt to validate if the effect can be duplicated in similar and dissimilar populations.

We also proposed a classification scheme of different persuasive messages, but only empirically tested reminders. Determining the effectiveness of heuristic and systematic elements in other types of messages such as warnings and alerts, suggestions and notifications may help in designing more effective interventions.

This research provided a framework for improving existing appointment reminders and developing effective and intelligent appointment reminder systems. Although we only tested the evaluation stage of the conceptual model, other stages may also be optimized. For example, the perception of a reminder message may be improved if the message is sent at exactly the right time. Ideally, an appointment reminder system of the future would know the patient's exact location, their current and future tasks. Knowing a patient's affective state may also be helpful in enhancing the likelihood of a successful intervention. However, due to technical and privacy reasons such contextual information may be difficult to collect.

Interpretation and evaluation of the reminder messages may also be further enhanced by knowing the medical history of a patient and personalizing the heuristic cues and systematic arguments. For example, informing a diabetic patient that missing one more ophthalmology appointment will likely lead to a vision loss may be more persuasive than merely informing the patient they may experience a side effect.

More work needs to be done in understanding the types of goals and intentions a patient may form when evaluating reminder messages. Although the desired and undesired goals may be clear, patients may form intermediary goals. For example, the reminder message may also prompt the patient to schedule an ancillary service or to schedule an appointment for a family member. It may also remind the patient to refill a prescription that they have forgotten.

Very little is known about the actions needed for a patient to comply with a reminder message. Qualitative research methods such as ethnography or task analysis may be particularly valuable in ascertaining the sequence of actions. These are very important as it is likely that many patients fail to attend their appointments because the execution of these actions may be too burdensome. For example, an email appointment reminder in which the patient can change an appointment with one or two mouse clicks may be more effective than a reminder sent by telephone in which the patient has to navigate difficult voice response systems and long hold times.

Analysis of an appointment reminder in the context of the conceptual framework demonstrates that there are many opportunities for future research in an attempt to improve reminders and other health-related interventions.

Chapter 8: Conclusions

We proposed a conceptual model to help design persuasive messages to enhance appointment adherence in healthcare. We used a human-centered design process to design persuasive appointment reminders based on the heuristic-systematic processing model. We then evaluated the effectiveness of persuasive reminders in a randomized controlled trial and found that reminder messages were effective in reducing the number of missed appointments (no-shows). Further, persuasive reminders that included heuristic cues such as authority, scarcity, liking and commitment were more effective than messages that used systematic arguments in reducing the number of missed appointments. The results suggest that patients use heuristic processing to make decisions regarding appointments.

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Appendix A

Thank you for agreeing to participate in this short experiment. The experiment takes only 10-15 minutes. Please read the following:

You are a 41 year old technology worker at Really Good Software Corp. You have worked there for the last 5 years, and have led the development of the company's widely acclaimed websites. You work very hard, often as much as 60 hours a week.

You were diagnosed with Type 2 Diabetes recently. Because you have non-insulin dependent diabetes, you are required to exercise frequently and watch your diet. You also take medication orally when needed. Last time you went to the Doctor, your tests showed that you need to better control your diabetes.

Your last visit to Dr Smith was on April 12, 2005. Your next visit is scheduled on July 30.

Your Doctor is located about 12 miles away, or a 25 minute drive in Houston traffic

On July 27th, you receive an email. Please read the email carefully on the next page. Once you have read the email, you will be asked to answer some questions.

FROM: Appointment Reminders (apt-remind@stark-diabetes.org)
Sent July 27, 2005 : 12.31pm
SUBJECT 3 reasons to keep your appointment on 12/01/05 at 10am

Dear Jon

Your next appointment with Dr Smith is scheduled on Monday July 30, 2005 at 10am

As you know it is very important to keep your appointment.

By attending your appointments regularly you may:

1. **Improve your health** – by better controlling your diabetes and preventing complications (such as blindness and foot problems)
2. **Ask Questions** - have an opportunity to share any concerns and changes in your health profile with your doctor
3. **Help others** – when you attend your appointment it helps us keep the clinic running smoothly and see other patients that need our attention on time

For more information please see www.stark-diabetes.org/reasons-to-keep-appointments.html

If you need to reschedule please let us know as soon as possible. If you have any questions, please call 409-123-4567

Sincerely

Stark Diabetes Center

FROM: Dr Jane Smith (Jane.Smith@stark-diabetes.org)

Sent July 27, 2005 : 12.31pm

SUBJECT Jon, you scheduled your next appointment on Jan 30 at 10am

Dear Jon

Just a reminder that you have scheduled your next appointment with me on Monday July 30, 2005 at 10am. I look forward to seeing you on this date.

If you need to reschedule your appointment please let us know as soon as possible, as we are usually fully booked. If you have any questions, please call 409-123-4567

Thank you for choosing the UTMB Stark Diabetes Center.

Sincerely

Jane Smith M.D., F.A.C.E.
Associate Professor,
Stark Diabetes Center
American Diabetes Association Certified Physician

Interesting Fact

Did you know that the UTMB Stark Diabetes Center is the only clinic in Southeast Texas focused on diabetes? Our expert doctors, nurses and educators have helped thousands of diabetic patients in our state of the art facilities since opening in 2001.

FROM: Dr Jane Smith (Jane.Smith@stark-diabetes.org)
Sent July 27, 2005 : 12.31pm
SUBJECT 3 reasons to keep your appointment on 12/01/05 at 10am

Dear Jon

Just a reminder that you have scheduled your next appointment with me on Monday July 30, 2005 at 10am. I look forward to seeing you on this date.

By attending your appointments regularly you may:

1. **Improve your health** – by better controlling your diabetes and preventing complications (such as blindness and foot problems)
2. **Ask Questions** - have an opportunity to share any concerns and changes in your health profile with your doctor
3. **Help others** – when you attend your appointment it helps us keep the clinic running smoothly and see other patients that need our attention on time

For more information please see www.stark-diabetes.org/reasons-to-keep-appointments.html

If you need to reschedule your appointment please let us know as soon as possible, as we are usually fully booked. If you have any questions, please call 409-123-4567

Thank you for choosing the UTMB Stark Diabetes Center.

Sincerely

Jane Smith M.D., F.A.C.E.
Associate Professor,
Stark Diabetes Center
American Diabetes Association Certified Physician

Interesting Fact

Did you know that the UTMB Stark Diabetes Center is the only clinic in Southeast Texas focused on diabetes? Our expert doctors, nurses and educators have helped thousands of diabetic patients in our state of the art facilities since opening in 2001.

Please answer the following questions by circling the answer choice:

1. If I don't go to the appointment it will be difficult for me to make another appointment

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

2. If I miss my appointment it will increase the likelihood that I will experience a side effect of diabetes such as vision loss

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

3. I look forward to seeing my doctor

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

4. If I do not show up to my appointment it causes financial problems for the clinic

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

5. I should do what my doctor recommends as she is experienced and knowledgeable in treating diabetes

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

6. If I do not show up for my appointment it prevents other patients who need attention from being seen

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

7. I made the appointment, therefore it is important for me to attend

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

8. If I miss my appointment it will make my health worse

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

9. I need more information to decide if I should go to my appointment

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

10. On the morning of July 30, you get a call from your office asking if you can meet with a prospective client. The client can only meet at 10am, the same time as your clinic appointment. What do you do? (Please circle answer choice)

1) Confirm client meeting and miss doctors appointment

2) Decline client meeting and go to doctors appointment

Reason for answer:

This is the end of the experiment. Thank you for your time!

Appendix B

Thank you for agreeing to participate in this short experiment.

Please answer the following questions

A. What is your best estimate of the percentage of missed appointments (cancellations or no-shows) at the UTMB Stark Diabetes Center clinic?

_____ %

(for example if you answer 10%, that means that roughly 10% of all appointments are missed, while 90% are kept)



B. In your opinion, name 5 reasons a patient may miss his/her appointment at the UTMB Stark Diabetes Center?

1. _____
2. _____
3. _____
4. _____
5. _____



C. How helpful are the current mailed or telephone appointment reminders offered at the UTMB Stark Diabetes Center? (Please circle your answer choice)

Very Unhelpful 1 2 3 4 5 Very helpful

Please turn the page and view appointment reminder 1. This is a paper version of a reminder that can be sent via email. Once you have read through the reminder you will be asked a series of short questions.

Please answer the following questions by circling the answer choice:

1. The information presented in the appointment reminder is accurate

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

2. The information presented in the appointment reminder is credible

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

3. The appointment reminder will help a diabetic patient better attend his/her appointment

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

4. The appointment reminder provides good reasons why a patient should attend his/her appointment

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

5. The name of the sender (From line) listed on the appointment reminder is appropriate

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

6. The subject line of the appointment reminder is informative

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

7. What part(s) of the appointment reminder did you like the most

8. What part(s) of the appointment reminder did you like the least

9. What changes would you make to the appointment reminder to make it more effective?

10. If you have any other comments please list them below

Please turn the page and view appointment reminder 2. This is a paper version of a reminder that can be sent via email. Once you have read through the reminder you will be asked a series of short questions, and you will have finished the experiment.

Please answer the following questions by circling the answer choice:

1. The information presented in the appointment reminder is accurate

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

2. The information presented in the appointment reminder is credible

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

3. The appointment reminder will help a diabetic patient better attend his/her appointment

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

4. The appointment reminder provides good reasons why a patient should attend his/her appointment

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

5. The name of the sender (From line) listed on the appointment reminder is appropriate

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

6. The subject line of the appointment reminder is informative

(Strongly Disagree) 1 2 3 4 5 (Strongly Agree)

7. What part(s) of the appointment reminder did you like the most

8. What part(s) of the appointment reminder did you like the least

9. What changes would you make to the appointment reminder to make it more effective?

10. If you have any other comments please list them below

This is the end of the experiment. Thank you for your time!

Appendix C

Enhancing Adherence to Appointments through Automated Telephone Reminder Messages

Message Scripts: Version 1.0

Message 1: Generic Message

This is an important appointment reminder from Baytown Health Center for [First Name, Last Name]. To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Your next appointment at the health center is on [day of week] [day] [month] at [time]

Thanks for your attention.

Message 2: Heuristic Message

This is an important appointment reminder from Baytown Health Center for [First Name, Last Name].

To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Dr Zare, Medical Director at Baytown asked me to remind you that your next appointment at the health center is on [day of week] [day] [month] at [time].

If you need to reschedule your appointment please let us know as soon as possible as we are normally fully booked.

We look forward to seeing you on the date you scheduled your appointment.

Thanks for your attention.

Message 3: Systematic messages

This is an important appointment reminder from Baytown Health Center for [First Name, Last Name].

To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Your next appointment at the health center is on [day of week] [day] [month] at [time]

As you know it is very important to keep your appointment.

By attending your appointments regularly you may improve your health and prevent complications.

You can also ask questions, and share any concerns and changes in your health profile with your doctor

Also when you attend your appointment it helps us keep the clinic running smoothly and see other patients on time

Thanks for your attention.

Message 4: Mixed Message

This is an important appointment reminder from Baytown Health Center for [First Name, Last Name].

To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Dr Zare, Medical Director at Baytown asked me to remind you that your next appointment at the health center is on [day of week] [day] [month] at [time].

As you know it is very important to keep your appointment.

By attending your appointments regularly you may improve your health and prevent complications.

You can also ask questions, and share any concerns and changes in your health profile with your doctor

Also when you attend your appointment it helps us keep the clinic running smoothly and see other patients that on time.

If you need to reschedule your appointment please let us know as soon as possible as we are normally fully booked.

We look forward to seeing you on the date you scheduled your appointment.

Thanks for your attention.

IVR Response Options

To repeat this message Press 1

To confirm your appointment Press 2

If you are unable to attend your appointment and to speak with a Customer Representative Press 3

Other notes

1. These calls will occur 2 days before an appointment
2. All calls will be recorded by a Televox Actor
3. The calls need to be in English and Spanish
 1. User should select language at beginning of call. If no selection made it should play in English.
4. If an answering machine picks up the message should be left in both English and Spanish (need advice how this is handled for others from Televox)

Appendix D

Enhancing Adherence to Appointments through Automated Telephone Reminder Messages

Message Scripts: Version 3.0

Message 1: Generic Message

Hello, this is an appointment reminder from Baytown Health Center for [First Name, Last Name]. To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Your next appointment at the health center is on [day of week] [day] [month] at [time].

If you need to reschedule the appointment, please call 713-526-4243

Thank you.

Message 2: Heuristic Message

Hello, this is an appointment reminder from Baytown Health Center for [First Name, Last Name]. To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Dr Zare, Medical Director at Baytown, asked me to remind you that your next appointment is on [day of week] [day] [month] at [time].

In case you can't attend, please let us know as soon as possible, as we are normally fully booked.

We look forward to seeing you on the date you scheduled your appointment.

If you need to reschedule the appointment, please call 713-526-4243

Thank you.

Message 3: Systematic messages

Hello, this is an appointment reminder from Baytown Health Center for [First Name, Last Name]. To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Your next appointment is on [day of week] [day] [month] at [time]

As you know it is very important to keep your appointment.

By attending your appointments regularly you may improve your health.

You can also ask questions, and share any changes about your health with your doctor.

If you need to reschedule the appointment, please call 713-526-4243

Thank you.

Message 4: Mixed Message

Hello, this is an appointment reminder from Baytown Health Center for [First Name, Last Name]. To continue in English Press 1.

[Repeat above intro message in Spanish, with option to Press 2 to continue in Spanish]

Dr Zare, Medical Director at Baytown asked me to remind you that your next appointment is on [day of week] [day] [month] at [time].

As you know it is very important to keep your appointment.

By attending your appointments regularly you may improve your health.

You can also ask questions, and share any changes about your health with your doctor.

In case you can't attend, please let us know as soon as possible, as we are normally fully booked.

We look forward to seeing you on the date you scheduled your appointment.

If you need to reschedule the appointment, please call 713-526-4243.

Thank you.

IVR Response Options

To repeat this message Press 1

If you are unable to attend your appointment and to speak to a receptionist Press 2