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THE HEALTH BELIEF MODEL: A STUDY OF COMPLIANCE IN A VITAMIN C DISPOSITION STUDY

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THE HEALTH BELIEF MODEL: A STUDY OF COMPLIANCE
IN A VITAMIN C DISPOSITION STUDY

by
Tina Kay Leonard

A Thesis Submitted to the Faculty of the
DEPARTMENT OF NUTRITION AND FOOD SCIENCE
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF SCIENCE
WITH A MAJOR IN DIETETICS
In the Graduate College
THE UNIVERSITY OF ARIZONA

1986
STATEMENT BY AUTHOR

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SIGNED: Tina K. Leonard

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

E. T. SHEEHAN
Associate Professor of Nutrition
DEDICATION

I dedicate this thesis to my parents, Thurman K. Leonard and Anna L. Leonard. Your everlasting love, encouragement, support, and belief in me have helped guide me in the pursuit of this dream. My education is something I will continue to enjoy and treasure every day of my life.
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The study incorporated both a study questionnaire and clinical trials in order to identify Health Belief Model variables that may be correlated to compliant behavior. The variables explored included health beliefs, health value, barriers, benefits, importance of the study, knowledge, researcher-participant relationship, social support, and demographics. A pre and post-study questionnaire, based upon nine variables of the Health Belief Model, was given to twenty participants in a vitamin C disposition study in order to identify Health Belief Model variables that may be correlated to compliant behavior. The small sample size made it difficult to draw conclusions on which variables were correlated to compliant behavior. Results revealed that there were no significant differences between the age groups in perceptions of the variables tested. The two-tailed T test revealed positive T values for the health value variable and negative T values for the health belief, barriers and importance variables indicating that these variables were modified at some time during the study period.
CHAPTER 1

INTRODUCTION

Problem Statement

The validity of nutrition research is highly dependent upon the compliance of free living participants with the study protocol. Compliance is vital to the collection of accurate data in order to ensure the valid interpretation of data. The ability to predict compliance prior to the acceptance of participants into research studies has the potential to save both time and money and to enhance the credibility of the resulting data.

The Health Belief Model has been used in the explanation of health related behaviors in relationship to preventative actions, illness behavior, chronic illness behavior, and sick role behaviors. Applying the Health Belief Model to the study of compliance as related to nutrition research is a new area of study. Nutrition research differs from the usual use of the Health Belief Model by being a short term and a one time commitment. In addition, past research has focused on populations with a narrow age range. This study offers the opportunity to compare both young and old age groups in both a simple and complex study regimen.
Research Objectives

The major research objectives for this study are listed as follows:

Research Objective #1: To identify variables possibly predictive of compliance by means of a pre-study questionnaire.

Research Objective #2: To identify whether these variables differ between age groups and how they differ.

Research Objective #3: To develop an instrument to use in the identification of compliers for use in future research studies.

Research Objective #4: To examine if Health Belief Model variables are modified from the pre-questionnaire to the post-questionnaire.

Statement of Hypothesis

Ho: Descriptive/Exploratory: Identify Health Belief Model variables, through a pre-study questionnaire, that may be correlated to compliant behavior.

Definitions

1. Compliance: The degree to which a subject's behavior corresponds to the guidelines of the study. For this study this included: adherence to the vitamin C depleted diet, keeping weekly appointments, keeping 3-day food intake records, and taking the vitamin C supplement during the repletion period.
2. **Non-compliance:** Deviation from the criteria described above in number one.

3. **Health Belief Model (HBM):** A psychological and behavioral theory derived from a well established body of data in which various models attempt to explore why individuals do or do not engage in a variety of health related behaviors. It consists of a number of dimensions (Janz et al., 1984).

4. **Variable/Dimension:** Different components, with a measurable gradation, of the Health Belief Model used to explain or describe why a certain action takes place (Jette et al., 1984).

5. **Cue to Action:** Relevant stimulant that triggers the appropriate behavior; the stimulus is either internal or external (Becker et al., 1975).

6. **Health Motivation:** A psychological state of readiness to take a specific action and the extent to which a particular action is believed to be beneficial in reducing the threat (Maiman et al., 1974). This represents differences in concern over health-related matters (Becker et al., 1975), and the degree to which an individual believes that his or her health is under their own control.

7. **Researcher-participant Relationship:** Compliance is thought to be higher if the expectations of the participants are met or if they are satisfied with their interaction with the researcher (Jette et al., 1981).
8. **Knowledge:** The condition of understanding or being familiar with something gained through experience or association.

9. **Barriers:** The participants perceived potential negative aspects of the study regimen may act as impediments to undertaking the behavior (Janz et al., 1984). Inversely related to compliance. Deals with complexity, duration, side effects, expense, pain or discomfort (Becker et al., 1975).

10. **Benefits:** Participants perceived positive aspects of the study regimen (Becker et al., 1975).

11. **Social Support:** The degree to which significant others support what the participant is attempting to achieve.

12. **Demographics:** The statistical study of human populations.

13. **Importance of the Study:** The degree to which a participant perceives his actions are of importance to the results. If the participant perceives the study to be very important then this is correlated positively to compliance.
CHAPTER 2

REVIEW OF LITERATURE

Medical professionals recognize compliance as a critical factor in the success or failure of therapeutic regimens. The literature on the subject of compliance is vast. Some studies that have researched compliance include: Amundson, 1985; Cerkoney et al., 1980; Fischer, 1980; Fuller et al., 1983; Haynes, 1985; Kincey, 1983; Lewis et al., 1983; McDonald et al., 1985; Mulder, 1981; Peck et al., 1982; Podeil, 1976; Ruffalo et al., 1985; Robbins, 1980; Sackett, 1976; Schaffer, 1981; Weintraub et al., 1973; Widmer et al., 1983.

Compliance is critical to the validity of nutrition research. The definition of compliance used in relationship to this study is the degree to which a subject's behavior corresponds to the guidelines of the study. This means adherence to the vitamin C depleted diet, keeping appointments, keeping weekly three day food records, and taking the vitamin C supplement during the repletion period. Non-compliance is is defined as any deviation from the study guidelines.

Socio-psychological theories have been used in the health field in an attempt to predict and explain compliance to health related actions. One of these theories, the Health Belief Model, has been widely used for this purpose and appears applicable to the explanation and prediction of compliance in nutrition research.
The Health Belief Model was developed from a well established body of psychological and behavioral theory. It is composed of many dimensions and variables which interact to influence an individual's behavior. The Health Belief Model has received considerable theoretical and research attention since it was first introduced in the 1950's by a group of Public Health Service social psychologists who were trying to develop a theory to help understand the lack in use of disease preventatives and the lack in use of screening tests for early detection of asymptomatic diseases (Janz et al., 1984; Jette et al., 1981; Becker et al., 1977; Rosenstock, 1974). The orientation of their work was toward the development of a theory useful in explaining a particular program but also adaptable to other problems as well. The theory focused on the current dynamics confronting the individual rather than on prior experiences. The theory was developed on the premise that an individual exists in a life space made up of regions which are either positively valued, negatively valued or neutral. Disease is perceived negatively, therefore a person would move away from this region unless doing so would cause them to go to a more negative region. Daily life is a process of being pulled by positive forces and repelled by negative forces (Rosenstock, 1974). The original Health Belief Model postulated that taking a health related behavior was due to an individual's beliefs along three variables: (1) the threat of illness including the likelihood of contracting an illness and the degree of severity of the illness; (2) the value of a behavior in decreasing or preventing the susceptibility to and/or the severity
of an illness; and (3) the physical, psychological, financial and other barriers to the proposed action (Jette et al., 1981; Becker et al., 1977). In recent years the Health Belief Model has been expanded and reformed to include a number of additional variables which influence health related behaviors: (1) health motivation; (2) patient/physician relationship; (3) therapeutic regimen; (4) demographics; (5) efficacy of treatment; (6) locus of control; (7) social support; (8) knowledge; and (9) cues to action (Jette et al., 1981). Since 1974 the Health Belief Model has continued to be a major theory used to explain and predict the acceptance of health and medical care recommendations (Janz et al., 1984). The Health Belief Model now proposes that taking a health related behavior in the subjective world of the acting individual to include the following theoretical conditions and components: (1) psychological readiness to take an action relative to a certain health condition, determined both by the individual's perceived susceptibility to the condition and by the individual's perceptions of the severity of the consequences of contracting the condition, (2) the evaluation of the proposed health action in relationship to its feasibility and potential benefits in reducing the actual or perceived susceptibility and/or severity to the condition, weighed against perceptions of psychological or other barriers of taking the proposed health action, and (3) an internal (state of the body) or external (mass media, social interactions, personal knowledge of someone affected by the condition) trigger or cue to action must
behavior is a process of an individual's subjective desire to decrease susceptibility and severity considering the perceived benefits and costs of taking the action. The Health Belief Model is used in the explanation of health related behaviors in relationship to preventative action, illness behavior, chronic illness behavior occurring currently or the risk of it in the future, and sick role behaviors.

The perceived susceptibility variable has been proven to have explanatory and predictive value. If an individual perceives themselves as highly susceptible or vulnerable to a disease condition they are more likely to pursue a health related action that will result in a decrease in this susceptibility (Becker, et al. 1975).

The severity variable under specified conditions has explanatory and predictive value dependant upon how the individual perceives the seriousness of the disease condition and its effects if contracted both organic and social. The presence of symptoms increases the perception of severity and also compliance to medical regimens. Both asymptomatic individuals with low levels of perceived severity and symptomatic individuals with very high levels of perceived seriousness are conditions which are inhibitive to taking a preventative health action. Acceptance of preventative health recommendations related to perceived severity are dependent upon the circumstances. Acceptance of prescribed medical regimens increased with increased perceptions of the seriousness of a current disease condition (Becker et al., 1975).
The behavior taken is dependant on how beneficial the various alternatives would be in each case as influenced by the norms and pressures of social groups. Benefits are positively correlated to compliance. Taking the health-related action is a function of how beneficial the action is perceived to be (Becker et al., 1975). For example individuals who delay seeking a diagnosis for cancer symptoms may be indicative of a conflict between a feeling of susceptibility to what is considered as a most serious disease and a conviction that there are no good methods of prevention and/or control (Blackwell, 1963; Green et al., 1974).

The negative aspects of taking a health-related action serve as barriers to taking that action and cause conflicting motives of avoidance. High perceptions of barriers are dependable predictors of noncompliance. A given action may be perceived as being effective in reducing the threat of disease, but seeing the action as being inconvenient, expensive, complex, having side effects, being of long duration, painful, unpleasant or upsetting are barriers to taking that action (Becker et al., 1977).

Combinations of beliefs of the Health Belief Model give good positive correlations to compliance. Joint influence of a number of variables has been found to increase predictive power (Becker et al., 1975). If the negative aspects of taking an action were high and the readiness to act were low the barriers act to prevent the action. Conversely if the negative aspects were low and the readiness to act were high, the action would likely be taken. If the barriers to action and the readiness to act were both high this
conflict is much more difficult to resolve. Individuals may deal with these dissonant situations through cognitive or psychological mechanisms, by taking an alternate action of nearly equal efficacy, by removing themselves psychologically, by fluctuating between choices in order to relieve the pressure of the discrepancy between barriers and benefits, or by an increase in fear or anxiety (Becker et al., 1977). Perceived danger may be balanced by beliefs about efficacy of coping or about the remoteness of the threat (Rosenstock, 1974).

The variable cues to action have been added to the original variables of perceived susceptibility, severity, benefits and barriers to taking an action. The levels of susceptibility and severity provide the energy or force to act and the perception of benefits as related to barriers provide the path of action. A combination of these variables can reach a high level of intensity without resulting in an action unless some cue to action triggers the process into motion. The cue to action is required to activate the readiness variables by making the acting individual consciously aware of his feelings by allowing them to focus on the particular situation. The cue can be internal (perceptions of body state) or external (mass media, personal knowledge of condition, interpersonal interactions). The intensity of the cue required to trigger an action varies due to differences in the level of perceived susceptibility and severity. High perceived levels of susceptibility and severity may require only a small cue to action. The opposite is also true indicating cues may be only of little
intrinsic significance or they may need to be of a greater intensity (Becker et al., 1977; Maiman et al., 1974).

Additional variables have proven to be predictive of compliance. Health motivation is strongly correlated to compliance. It is dependant on the perceived value of behavioral objectives, internal drives or emotions and environmental determinants resulting in a health-related behavior (Ruffalo et al., 1985). Health motivation represents differences in the degree of concern about health matters and refers to differential emotional arousal in individuals caused by some given class of stimuli (Becker et al., 1977). Health motivation is operationalized as a psychological state of readiness to take a specific health related action and the extent to which taking the specific action is believed to be beneficial in decreasing the threat. This variable also includes a concept of an individuals need or desire to achieve health-related goals. Health-related goals are the desire to attain or maintain a positive state of health and to avoid a negative state of health such as illness (Maiman et al., 1974).

Modifying and enabling variables include demographic, socio-psychological, and structural variables. They have the role of conditioning both individual perceptions and the perceived benefits of an action. These variables may affect health motivations and perceptions, but are not seen as directly causal of compliance (Becker et al., 1977). Compliance has not consistently been related to demographic variables except for extremes of age (Becker et al., 1975). Use of preventive and detection services as well as
utilization of diagnostic and treatment services is positively correlated to the following characteristics: middle aged individuals, female sex, higher educated, higher income, and white race (Rosenstock, 1974). The researcher-participant relationship is a modifying factor. If the relationship is positive and meets the expectations of the participant, compliance increases. Enabling factors are socio-behavioral variables themselves or affect socio-behavioral dimensions. Social support affects compliance indirectly through the production of beliefs or directly as a consequence of socialization or conforming to a social group.

The Health Belief Model has been revised and adapted for use in a multitude of studies including retrospective and prospective studies. Retrospective studies are done in situations requiring the identification of beliefs and prior behavior at the same point in time, allowing no way of establishing that the beliefs preceded the behavior. The relevance of this type of study is questionable. Prospective studies are done prior to a behavior and follow through to determine how well they predicted what occurred. Two-part studies allow beliefs to be identified at one point in time with behavior measured later, thereby establishing that the beliefs precede the behavior.

A retrospective study dealing with screening for tuberculosis by a chest x-ray indicated that a particular health action is a function of two interacting variables perceived susceptibility and perceived benefits. Mass media was used to urge individuals to get a chest x-ray (Hochbaum, 1958). Kegeles correlated a number of
beliefs (perceived susceptibility, severity, benefits of taking preventative action, and perceived barriers) exhibited by respondents to their frequency of making preventative dental visits. Results showed an increase in the frequency of preventative visits with increases in the number of beliefs exhibited. Dental treatment was offered to the public free or inexpensively (Kegeles, 1963; Kegeles, 1964). A study on cognitive dissonance indicated that the decision to accept or reject a health service may itself modify perceptions in areas relevant to that health action (Festinger, 1957). Cognition is required for an attitude change. An individual must think about all of the elements and relations in question, and notice through this process that the relations in question are not in equilibrium in order for the dissonance to occur that may modify attitude change (Maiman et al., 1977). Additional retrospective studies include participation in free screening for cervical cancer (Flach, 1960) and a free breast cancer screening program (Fink et al., 1972).

Leventhal et al., (1960) conducted a prospective study dealing with the impact of Asian influenza on American community life. Their results suggested that prior beliefs in perceived susceptibility and severity are instrumental in determining subsequent action. The public was alerted by newspaper and public health officials to the positive aspects of immunizations (Leventhal et al., 1960). Kegeles conducted a prospective study following up on his previous study on preventative dental care to determine if beliefs identified in the original study were
correlated with health behavior during a subsequent three year period. Perceptions of severity or benefits alone were not correlated to subsequent behavior, perceived susceptibility was correlated to subsequent behavior. The combination of perceived susceptibility and benefits gave the most accurate prediction of behavior and proved to be important in predicting behavior. The public was urged in this study to use the free or inexpensive dental treatment (Kirscht et al., 1966).

In these various studies health beliefs are measured through the use of questionnaire items which differ greatly between studies. Due to the fact that research studies explore very different areas it is necessary to adapt questionnaires to the specific topic to be researched. This presents a problem as to the reliability and validity of the measures of the variables tested. Research has shown that health belief variables represented by multiple questionnaire items improve the reliability of health belief measures (Jette et al., 1981). The questionnaire items related to a specific variable are combined into indexes and then evaluated (Becker et al., 1977). Janz and Becker developed a significance ratio where the number of positive and significant findings for a Health Belief Model dimension are divided by the total number of studies which reported significance levels for that dimension. Forty-six studies were utilized 18 prospective and 28 retrospective. The results indicated significant positive findings for the barriers dimension of 91%, the benefits dimension 81%, the susceptibility dimension 77%, and the severity dimension 59%. The
predictive effect of each dimension holds for both the prospective and retrospective studies (Janz et al., 1984). This comprehensive study provides substantial evidence supporting Health Belief Model dimensions as reliable and significant contributors to the explanation and prediction of health-related behaviors in spite of the different measures and methods used. This research evidence holds true across a wide diversity of populations, settings, health conditions, and health-related actions, including different techniques and tools used to assess health beliefs and behavioral outcomes represented by these studies. The dimensions of the Health Belief Model remain predictive in spite of the different measures and methods used (Janz, 1984).

Jette found that moderately reliable indices covering a wide spectrum of distinct health beliefs can be constructed and then replicated across independent samples. Distinct health beliefs do in fact exist and the Health Belief Model dimensions are distinct from each other and can therefore be considered to be different beliefs (Jette et al., 1981). Although model variables are measured differently in every study they are still capable of predicting compliance (Becker et al., 1975).

The stability and reliability of health beliefs over time has not been established. Taking health-related behaviors is a function of interactions with individuals, situations, and events and may vary from time to time. Little is known about the genesis of beliefs or under what conditions they are acquired or to what extent long standing habits affect health and health practices. The
extent and effect health education and/or participation in specific studies has in the modification of health beliefs or attitudes is unknown, but warrants further investigation. The Health Belief Model implies that health beliefs have some type of organization. Therefore the entire structure should be affected by a change. Decisions to take a health related action and taking that action may have an effect on the entire belief structure with unknown consequences (Rosenstock, 1974).
CHAPTER 3

METHODS AND PROCEDURES

Design of the Study

The study "The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study" was designed as a substudy to parallel the design of the study "The Effects of Age on Vitamin C Disposition." The study design outline is as follows:

Study Design Outline

I. Pre-Clinical Phase
   A. Subject recruitment
   B. Screening of subjects
   C. Physical examination of subjects
   D. Inclusion or exclusion of subjects
   E. Obtain informed consent in accordance with the standards of the University of Arizona Human Subjects Committee.

II. Clinical Phase
   A. Week 1:
      1. Collect a blood and urine sample from each subject to obtain a baseline vitamin C level.
      2. Give the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre-questionnaire.
      3. Educate subjects on the vitamin C depleted diet with handout materials.
4. Educate subjects on how to complete the 3-day food intake records.
5. Begin vitamin C restricted diet (<10 mg/day).
6. Begin supplementation with the multivitamin-mineral supplement (minus vitamin C).

B. Weeks 2 through 5:

1. Collect fasting blood and urine samples once each week at 8:30 A.M.
2. Collect 3-day food intake records for previous week.
3. Continue to keep 3-day food intake records.
4. Continue vitamin C restricted diet.
5. Continue supplementation with the multivitamin-mineral supplement.

C. Week 5:

1. Collect blood and urine samples immediately before and at various intervals of fifteen minutes to twelve hours for 72 hours after the administration of the first supplemental dose of vitamin C (500 mg).
2. Collect 3-day food intake records for previous week.
3. Continue vitamin C restricted diet.

D. Week 6 through 9:

1. Collect fasting blood and urine samples once each week at 8:30 A.M.
2. Collect 3-day food intake records for previous week.
3. Continue to keep 3-day food intake records.
4. Continue vitamin C restricted diet.
5. Continue supplementation with 500 mg. of vitamin C every morning.
6. Continue supplementation with multivitamin-mineral supplement.

E. Week 10:
1. Collect blood and urine samples immediately before and at various intervals of 15 minutes to 12 hours for 72 hours after the administration of a 500mg. dose of vitamin C.
2. Collect 3-day food intake records for the previous week and at the end of the present week.
3. Continue vitamin C restricted diet until last blood and urine sample collected.

III. Post Clinical Phase
A. Interview with medical supervisor to ensure the subjects are in a state of good health.
B. Payment of subjects.

Figure 1 summarizes the study design outline.
Table 1 summarizes strategies used to enhance compliance.
Figure 1. Experimental design of the study.

WEEK OF CLINICAL PHASE OF STUDY

I. Pre-clinical Phase
   - Recruitment screening

II. Clinical Phase
   - Vitamin C depletion period
     - Collect weekly blood & urine
     - Collect 3-day food records
   - Vitamin C supplementation period
     - Collect weekly blood & urine
     - Collect 3-day food records
     - Supplement with vitamin C

III. Post-clinical Phase
   - Administer compliance post-questionnaire
   - Educate on vitamin C depleted diet
   - Begin vitamin C depleted diet

A = collection of blood and urine samples over 24 to 72 hours in depleted subjects.
B = collection of blood and urine samples over 24 to 72 hours in supplemented subjects.
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire</td>
<td>Bring attention to compliance and factors related to compliance.</td>
</tr>
<tr>
<td>Education</td>
<td>Instruct subjects about vitamin C restricted diet and 3-day food records.</td>
</tr>
<tr>
<td></td>
<td>Handout educational materials.</td>
</tr>
<tr>
<td></td>
<td>Ask for questions or problems at weekly appointments.</td>
</tr>
<tr>
<td></td>
<td>Available for questions at all times through the phone.</td>
</tr>
<tr>
<td>Food Records</td>
<td>Familiarize subjects with the vitamin C restricted diet.</td>
</tr>
<tr>
<td>Researcher-participant Relationship</td>
<td>Weekly appointments and phone contact.</td>
</tr>
<tr>
<td>Weekly Blood and Urine Levels</td>
<td>Monitoring tool reflective of intake.</td>
</tr>
<tr>
<td>Payment at Study Completion</td>
<td>$250.00</td>
</tr>
</tbody>
</table>
Sample Population and Sampling Method

A total of 20 healthy young men ages 20 to 25 and 20 healthy elderly men ages 65 to 74 were recruited from the Tucson area with the goal of identifying fifteen in each age group. Subjects were recruited through bulletins posted at the Pima Council on Aging and through newspaper advertisements in the Arizona Daily Wildcat, Lo Que Pasa, and the Health Science News. Each potential subject was contacted by phone and a screening form was completed.

The following criteria were used in assessing the subjects eligibility to be included in the study:

1. No tobacco use at present, in the past six-months, or during the study period.
2. No alcohol consumption at present or during the study period.
3. No consumption of caffeine containing beverages in excess of three cups (240 ml. each) of coffee or tea or three glassful (360 ml. each) of cola or other caffeine containing beverages per day during the study period.
4. No current use of prescription or over-the-counter medications (including vitamin-mineral supplements).
5. No subject greater or less than 20% of their ideal body weight.
6. No subject currently trying to lose or gain weight.
Eligible subjects then received a physical examination by the medical supervisor. If the exam was normal the following laboratory tests were performed:

3. Urinalysis: pH, specific gravity, albumin, glucose, sedimentation, color, appearance, ketones and occult blood.

If the above laboratory values fell outside the normal range the medical supervisor evaluated the results to determine if this value represented a high risk or abnormal subject which should be excluded from the study. Based upon these strict criteria for selection, subjects were included in or excluded from the study.

Instrument Development

The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study Pre-questionnaire (Appendix A) was developed utilizing nine belief variables of the Health Belief Model. Each variable was represented by multiple questionnaire items. The variables included are as follows: knowledge, barriers, benefits, researcher/participant relationship, social support, demographics, importance of the study, health value, and health belief (Becker et al., 1975; Macrae et al., 1984). Questions were designed to correspond specifically to factors inherent in the study, "The Effect of Age on Vitamin C Disposition." Appendix C lists
questionnaire items with the belief variable they hypothetically measure (Jette et al., 1981).

A five point Likert type scale was used to score most questions with choices of "Extremely", "Highly", "Moderately", "Slightly", and "Not at all" or "Very great", "Great", "Moderate", "Slightly", and "Not at all". Prior to finalization, "The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study Questionnaires were reviewed by nine experts: six in the area of nutrition, and one in each of the following areas: instructional research and development, social behavior, and pharmaceutical sciences.

The final form of the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study Pre-questionnaire was printed on eleven sheets of white nine and one-half by eleven inch bond paper. There are two sections. Section one contains fifty-nine questions and section two contains ten questions.

The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study Post-questionnaire (Appendix B) was developed utilizing nine belief variables of the Health Belief Model. The Post-questionnaire was developed in order to compare the acquired knowledge and beliefs to the actual knowledge and beliefs as defined in the pre-questionnaire. Each variable is represented by multiple questionnaire items. The post-questionnaire parallels the pre-study questionnaire, but is worded in the past tense. Certain questionnaire items were excluded. Appendix C lists questionnaire
items with the belief variable they hypothetically measure (Jette et al., 1981).

The final form of The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study Post-questionnaire was printed on nine sheets of white nine and one-half by eleven inch bond paper. There are two sections. Section one contains fifty-three questions and section two contains four questions.

Data Collection

Subjects were admitted to the study in five groups of four or five subjects. Each group was given "The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study Pre-questionnaire" prior to education on the vitamin C restricted diet in order to measure their actual knowledge and beliefs upon entering into the study before their actual participation. Subjects were allowed as much time as necessary to complete the questionnaire. The questionnaire was given to each group by the same researcher who was present throughout until the last questionnaire was completed. Questionnaires were then collected by the researcher.

Table 2 summarizes methods used to assess compliance.

Appendix D presents the Compliance Assessment Form used to evaluate the compliance of each participant.

Methodological Assumptions

1. The Health Belief Model dimensions are distinct enough to be considered as different beliefs (Jette et al., 1981).
Table 2. Methods used to assess compliance.

<table>
<thead>
<tr>
<th>Type of Method</th>
<th>Frequency</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct Method:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serum Vitamin C Levels</td>
<td>Weekly</td>
<td>.2 - .3 mg/dl depleted phase</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ .5 mg/dl supplemented phase</td>
</tr>
<tr>
<td><strong>Indirect Method:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled Appointments</td>
<td>Weekly</td>
<td>Attendance</td>
</tr>
<tr>
<td>Three Day Food Intake Records</td>
<td>Weekly</td>
<td>Collection and evaluation</td>
</tr>
</tbody>
</table>
2. The subjects answered the questionnaire as honestly as possible.

Limitations

1. The sample population was recruited from certain groups which had access to the different modes of advertising utilized. This sample may not represent the general population.

2. Subjects must meet strict criteria to be admitted to the study which may indicate they had a higher level of health motivation than those who were excluded from the study.

3. Subjects agree to participate which indicates they may be different from the general population and therefore may have had a higher level of health motivation.

4. The questionnaire dealt with nine variables of the Health Belief Model which decreased the ability to be specific but increased coverage over a wide range.

5. The sample size was limited.

6. The Health Belief Model is being used in an untested manner.

7. Efforts were made to enhance compliance which may have affected the results.
Data Analysis

Analysis of compliance was done through the assessment of adherence to the vitamin C depleted diet, keeping weekly appointments, keeping weekly three day food intake records, and analysis of weekly serum vitamin C levels. A score of 100% indicated compliant behavior, less than 100% indicated non-compliant behavior.

Statistical significance for Health Belief Model variables were assessed by a series of two-tailed T tests for the difference between the means of the groups compared. Pearson correlation coefficients assessed relationships between health belief model variables for the groups compared. Reliability of how the questionnaire items correlated to the variable they were hypothesized to measure were analysed by using correlation matrix, inter-item correlation, standardized item alpha, alpha if item deleted and corrected item-total correlation.
CHAPTER 4

RESULTS

The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre-questionnaire was administered to twenty subjects (nine young and eleven old). The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study post-questionnaire was administered to the same twenty subjects. Twenty pre-questionnaires and twenty post-questionnaires were completed and used in the data analysis.

Descriptive Data

Demographics

Data pertaining to demographic characteristics of the study subjects are presented in Table 3. Participants ranged in age from 21 to 73. All of the subjects were male. Seventy percent of the subjects reported themselves as married, 20% as single, and 10% as divorced. Most of the subjects reported themselves as having a college or graduate degree (65%). Therefore, most of the subjects appeared to be well-educated. Forty-five percent reported being employed full or part-time, 20% reported being full time students and 35% reported being retired. Ninety-five percent of the study participants were Caucasian and 5% were Hispanic.
Table 3. Distribution of the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study Pre and Post Questionnaire respondents for six demographic variables.

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Distribution of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>N = 20</td>
</tr>
<tr>
<td></td>
<td>20 - 29</td>
</tr>
<tr>
<td></td>
<td>65 - 74</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>all</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Single</td>
</tr>
<tr>
<td></td>
<td>Married</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
</tr>
<tr>
<td></td>
<td>Separated</td>
</tr>
<tr>
<td></td>
<td>N = 20</td>
</tr>
<tr>
<td>Education Level</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>School</td>
</tr>
<tr>
<td></td>
<td>Grade</td>
</tr>
<tr>
<td></td>
<td>Completed</td>
</tr>
<tr>
<td></td>
<td>Some</td>
</tr>
<tr>
<td></td>
<td>HS</td>
</tr>
<tr>
<td></td>
<td>Grad</td>
</tr>
<tr>
<td></td>
<td>Trade</td>
</tr>
<tr>
<td></td>
<td>Some</td>
</tr>
<tr>
<td></td>
<td>College</td>
</tr>
<tr>
<td></td>
<td>Degree</td>
</tr>
<tr>
<td></td>
<td>Some</td>
</tr>
<tr>
<td></td>
<td>Graduate Degree</td>
</tr>
<tr>
<td></td>
<td>N = 20</td>
</tr>
<tr>
<td>Employment Status</td>
<td>Full Time</td>
</tr>
<tr>
<td></td>
<td>Part Time</td>
</tr>
<tr>
<td></td>
<td>Student</td>
</tr>
<tr>
<td></td>
<td>Student</td>
</tr>
<tr>
<td></td>
<td>N = 20</td>
</tr>
<tr>
<td>Ethnic Group</td>
<td>American Indian</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
</tr>
<tr>
<td></td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>Caucasian</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
</tr>
<tr>
<td></td>
<td>Oriental</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>N = 20</td>
</tr>
</tbody>
</table>


Social Support

Table 4 presents the social support variable of the Health Belief Model of participants who are not living alone for the pre-questionnaire and the post-questionnaire items.

Prior to the start of the study most participants reported that their significant other would be either "Extremely" supportive (47%) or "Highly" supportive (41.2%) of their participation in the study. Eleven point eight percent reported support of their participation would be "Moderate." Eighty-two percent of the participants reported that their significant other would have an effect on their compliance while 17.6% reported "No" effect. Five point nine percent perceived this effect would be "Extremely high", 47.1% "High", 29.4% "Moderate", and 17.6% "None." Thirty-five point three percent reported this effect would be "Very positive", 52.9% reported "Positive" and 11.8% reported "Neutral."

After the completion of the study participants reported that their significant other was "Extremely" (31.6%), "Highly" (31.6%), "Moderately" (31.6%), or "Slightly" (5.3%) supportive of their participation. Sixty-two point five percent reported their significant other had an effect on compliance while 37.5% reported they did not. The effect on compliance was reported as being "Extremely high" (15.8%), "High" (31.6%), "Moderate" (5.3%), "Slight" (31.6%), to "None" (15.8%). This effect was reported as being "Very positive" (35.3%), "Positive" (47.1%), or "Neutral" (17.6%).
Table 4. The social support variable of participants in the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study for subjects who are not living alone expressed as a percentage.

<table>
<thead>
<tr>
<th>Social Support Questionnaire Item:</th>
<th>Pre-questionnaire</th>
<th>Post-questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>percentage</td>
<td>percentage</td>
</tr>
<tr>
<td>Participant’s roommate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supportive of participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>extreme</td>
<td>47.1</td>
<td>31.6</td>
</tr>
<tr>
<td>high</td>
<td>41.2</td>
<td>31.6</td>
</tr>
<tr>
<td>moderate</td>
<td>11.8</td>
<td>31.6</td>
</tr>
<tr>
<td>slight</td>
<td>--</td>
<td>5.3</td>
</tr>
<tr>
<td>Did they effect compliance?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>82.4</td>
<td>62.5</td>
</tr>
<tr>
<td>no</td>
<td>17.6</td>
<td>37.5</td>
</tr>
<tr>
<td>How much of an effect on compliance?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>extreme</td>
<td>5.9</td>
<td>15.8</td>
</tr>
<tr>
<td>high</td>
<td>47.1</td>
<td>31.6</td>
</tr>
<tr>
<td>moderate</td>
<td>29.4</td>
<td>5.3</td>
</tr>
<tr>
<td>slight</td>
<td>--</td>
<td>31.6</td>
</tr>
<tr>
<td>none</td>
<td>17.6</td>
<td>15.8</td>
</tr>
<tr>
<td>Type of effect on compliance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>very positive</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td>positive</td>
<td>52.9</td>
<td>47.1</td>
</tr>
<tr>
<td>neutral</td>
<td>11.9</td>
<td>17.6</td>
</tr>
</tbody>
</table>
Therefore, this indicates that the perception of a significant others support of participation, effect on compliance, amount and type of effect on compliance was significantly higher at the start of the study than it actually was perceived as being during the study.

Researcher-participant Relationship

Table 5 presents the researcher-participant relationship variable. One questionnaire item dealt with this variable. At the start of the study the participants had been in some contact with the primary researcher through recruitment and screening procedures. The majority of the participants reported that they were "Very satisfied" (60%) with their treatment. Twenty percent reported they were "Satisfied" with their treatment and 20% reported they were "Neither satisfied nor dissatisfied."

After the completion of the study participants reported satisfaction with their treatment throughout the study period to be "Very satisfied" (65%), "Satisfied" (25%), "Neither" (5%), and 5% reported being "Dissatisfied."

Knowledge Variable

Table 6 presents percentages answering correctly for knowledge variable questionnaire items for the pre and post-questionnaires. Under each item values are reported for the young age group, the old age group and young and old age groups combined. Questionnaire items exploring the knowledge variable on parameters inherent in the study, "The Effect of Age on Vitamin C Disposition"
Table 5. Researcher-participant relationship reported as percentages for the pre and post questionnaire for the young age group, old age group, and for the age groups combined.

<table>
<thead>
<tr>
<th>Perception</th>
<th>Young</th>
<th></th>
<th>Old</th>
<th></th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>Participants satisfaction with their treatment by the researchers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very satisfied with treatment</td>
<td>66.7</td>
<td>44.4</td>
<td>54.5</td>
<td>81.8</td>
<td>60.0</td>
</tr>
<tr>
<td>Satisfied with treatment</td>
<td>11.1</td>
<td>44.4</td>
<td>27.3</td>
<td>9.1</td>
<td>20.0</td>
</tr>
<tr>
<td>Neither satisfied nor dissatisfied with treatment</td>
<td>22.2</td>
<td>--</td>
<td>18.2</td>
<td>9.1</td>
<td>20.0</td>
</tr>
<tr>
<td>Dissatisfied with treatment</td>
<td>--</td>
<td>11.1</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Table 6. The Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre vs post questionnaires in young and old subjects reported as percentages for the non-dimensional knowledge variable.

<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>Pre-questionnaire</th>
<th>Post-questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Young</td>
<td>Old</td>
</tr>
<tr>
<td>Body Functions Associated with Vitamin C</td>
<td>64.4</td>
<td>51.8</td>
</tr>
<tr>
<td>Food Items which Contain Vitamin C</td>
<td>64.5</td>
<td>63.0</td>
</tr>
<tr>
<td>Food Items that can't be used at all during the study period</td>
<td>84.5</td>
<td>81.8</td>
</tr>
<tr>
<td>Food Items that can be used in Moderate Amounts Foods Can Use</td>
<td>57.8</td>
<td>55.6</td>
</tr>
<tr>
<td>Symptoms Associated with Low Levels of Vitamin C</td>
<td>64.5</td>
<td>48.0</td>
</tr>
<tr>
<td>Recommended Daily Allowance</td>
<td>44.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Overall X = 58.1</td>
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<td></td>
</tr>
</tbody>
</table>
showed significant increases in their post-questionnaire knowledge as compared to the pre-questionnaire knowledge for both young and old age groups. The overall correct responses ranged from 58.12\% answering correctly on all questionnaire items on the pre-questionnaire to 76.7\% answering correctly on the post-questionnaire.

**Correlational Data**

Two-Tailed T Test Young and Old Age Groups Combined

Table 7 presents the data which were analysed statistically using the 2-tailed T test which is presented in table 8. Table 8 presents results of the 2 tailed T test pre-questionnaire as compared to post-questionnaire for six Health Belief Model variables for the young and old age groups combined. Of the six Health Belief Model variables examined in this study, health belief, health value, barriers, and importance all showed significant changes between the pre and the post-questionnaire (p < .01). The 2-tailed T test revealed positive T values for the health value variable (T=4.97, p < .01). The positive T value suggests that perceptions of health value which rated higher on the post-questionnaire may reveal an increased belief that health is to some degree under their own control.

The 2-tailed T test revealed a negative T value for the health belief variable (T=-13.19, p < .01), the barriers variable (T=-28.07, p < .01), and the importance variable (T=-12.43, p <
Table 7. The mean, standard deviation, variance, and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre and post-questionnaire for six Health Belief Model variables.

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Post-questionnaire</th>
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<tr>
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<tr>
<td>Health Value</td>
<td>20</td>
<td>8.15</td>
</tr>
<tr>
<td>Barrier</td>
<td>20</td>
<td>3.83</td>
</tr>
<tr>
<td>Benefit</td>
<td>20</td>
<td>4.70</td>
</tr>
<tr>
<td>Importance</td>
<td>20</td>
<td>1.71</td>
</tr>
<tr>
<td>Researcher Participant Relationship</td>
<td>20</td>
<td>3.40</td>
</tr>
</tbody>
</table>
Table 8. The paired T-test and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre-questionnaire as compared to the post-questionnaire for six Health Belief Model variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>(difference) Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>Corr</th>
<th>2-tail Prob</th>
<th>T Value</th>
<th>Degrees of Freedom</th>
<th>2-tail Prob</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.86</td>
<td>.00</td>
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<td>18</td>
<td>.00*</td>
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<tr>
<td>Health Value</td>
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<td>1.66</td>
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<td>.34</td>
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<td>.92</td>
<td>.00</td>
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<td>- .35</td>
<td>1.18</td>
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<td>.68</td>
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<td>.53</td>
<td>.12</td>
<td>.85</td>
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<td>Researcher</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<td>Relationship</td>
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<td>.20</td>
<td>.39</td>
<td>- .54</td>
<td>19</td>
<td>.59</td>
</tr>
</tbody>
</table>

* < .01
The negative T values suggest that perceptions of health beliefs, barriers, and importance which rated higher on the pre-questionnaire were modified during the study period and rated lower on the post-questionnaire.

Two-tailed T Test for Young Age Group as Compared to the Old Age Group

Table 9 and Table 10 present the data used in the statistical calculation of the 2-tailed T test presented in Table 11. Table 11 presents results of the 2-tailed T test pre-questionnaire for six Health Belief Model variables for the young age group and the old age group. Of the six Health Belief Model variables examined in this study, health belief, health value, barriers, and importance all showed significant changes between the pre- and the post-questionnaire (p < .01).

Comparison of the pre and the post-questionnaire revealed results similar to those reported in Table 8. Negative T values were found for the health belief variable for both the young age group (T=-8.96, p < .01) and the old age group (T=-9.25, p < .01), the barriers variable for both the young age group (T=-13.83, p < .01) and the old age group (T=-35.50, p < .01) and the importance variable for both the young age group (T=-10.91, p < .01) and the old age group (T=-8.04, p < .01).

The 2-tailed T test revealed positive T values for the health value variable for both the young age group (T=3.02, p < .05) and the old age group (T=4.08, p < .01). The positive T value
Table 9. The mean, standard deviation, variance, and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre-questionnaire in young and old subjects for six Health Belief Model variables.

<table>
<thead>
<tr>
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<th></th>
<th>Old</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Mean</td>
<td>Standard Deviation</td>
<td>Variance</td>
<td>N</td>
<td>Mean</td>
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<td>5.98</td>
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<td>2.17</td>
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<td>2.15</td>
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<td>8.18</td>
</tr>
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<td>3.69</td>
<td>.73</td>
<td>.53</td>
<td>11</td>
<td>3.95</td>
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<tr>
<td>Benefit</td>
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<td>2.36</td>
<td>11</td>
<td>4.55</td>
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<td>1.52</td>
<td>.64</td>
<td>.41</td>
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<td>1.86</td>
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<td>3.56</td>
<td>1.01</td>
<td>1.03</td>
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<td>3.27</td>
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Table 10. The mean, standard deviation, variance and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study post-questionnaire in young and old subjects for six Health Belief Model variable.

<table>
<thead>
<tr>
<th>Variable</th>
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<th></th>
<th></th>
<th>Old</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Variance</td>
<td>N</td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Variance</td>
</tr>
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<td>1.25</td>
<td>1.56</td>
<td>10</td>
<td>4.16</td>
<td>1.12</td>
<td>1.25</td>
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<td>1.39</td>
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<td>1.36</td>
<td>1.86</td>
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<td>11</td>
<td>3.09</td>
<td>1.45</td>
<td>2.09</td>
</tr>
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</table>
Table 11. The 2-tailed T-Test and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre-questionnaire as compared to the post-questionnaire for young and old subjects for six Health Belief Model variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>(difference) Mean</th>
<th>Std Dev</th>
<th>Std Error</th>
<th>Corr</th>
<th>2-Tail</th>
<th>T Value</th>
<th>Degrees Freedom</th>
<th>2-Tail Prob</th>
</tr>
</thead>
<tbody>
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<td>1.32</td>
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<td>.41</td>
<td>.28</td>
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<td>8</td>
<td>.02**</td>
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<td>.90</td>
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<td>.00*</td>
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<td>.96</td>
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<td>-10.91</td>
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<td>.00*</td>
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<td>.00*</td>
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<td>2.27</td>
<td>1.85</td>
<td>.56</td>
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<td>.25</td>
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<td>.17</td>
<td>.43</td>
<td>10</td>
<td>.68</td>
</tr>
</tbody>
</table>

* p < .01  
** p < .05
suggests that modification from the pre to the post-questionnaire in health value for both groups with respect to control over health.

Two-tailed T Test Young Age Group as Compared to the Old Age Group for the Pre-questionnaire

Table 12 presents results of the 2-tailed T test on the pre-questionnaire for the young age group as compared to the old age group on six Health Belief Model variables. No significant differences were found for any of the six variables when the two age groups were compared.

Two-tailed T Test Young Age Group as Compared to the Old Age Group for the Post-questionnaire

Table 13 presents results of the 2-tailed T test on the post-questionnaire for the young age groups as compared to the old age group on six Health Belief Model variables. No significant differences were found for any of the six variables when the two age groups were compared.

Pearson Correlation Coefficients for Six Health Belief Model Variables for the Pre-questionnaire the Young Age Group as Compared to the Old Age Group

Table 14 presents results of correlational analysis of each variable of the Health Belief Model as compared to each other variable for the pre-questionnaire. In the old age group the variables barriers when compared to importance (.57, p < .05), health beliefs when compared to importance (.58, p < .05) and health
Table 12. The two tailed T-test comparing the young and old age groups for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study pre-questionnaire for six Health Belief Model variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>F Value</th>
<th>2-Tail Prob</th>
<th>T Value</th>
<th>Degrees of Freedom</th>
<th>2-Tail Prob</th>
<th>T Value</th>
<th>Degrees of Freedom</th>
<th>2-Tail Prob</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.62</td>
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<td>.58</td>
<td>.57</td>
<td>17.95</td>
<td>.57</td>
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</table>
Table 13. The two tailed T-test comparing the young and old age groups for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition Study post-questionnaire for six Health Belief Model variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>F Value</th>
<th>2-tail Prob</th>
<th>T Value</th>
<th>Degrees of Freedom</th>
<th>2-tail Prob</th>
<th>T Value</th>
<th>Degrees of Freedom</th>
<th>2-Tail Prob</th>
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<td>.47</td>
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<tr>
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<td>-1.11</td>
<td>18</td>
<td>.28</td>
<td>-1.12</td>
<td>17.15</td>
<td>.28</td>
</tr>
<tr>
<td>Researcher Participant Relationship</td>
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Table 14. Pearson correlation coefficients and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition study pre-questionnaire for the young and old age groups for six Health Belief Model variables.

<table>
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<th>Old Age Group</th>
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</tr>
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<td>Benefits</td>
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<td>.46</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Benefits</td>
<td>9</td>
<td>-.45</td>
</tr>
<tr>
<td>Importance</td>
<td>9</td>
<td>-.63</td>
</tr>
<tr>
<td>RPR**</td>
<td>9</td>
<td>.03</td>
</tr>
<tr>
<td>Benefits to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Importance</td>
<td>9</td>
<td>.48</td>
</tr>
<tr>
<td>RPR**</td>
<td>9</td>
<td>.53</td>
</tr>
<tr>
<td>Importance to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPR**</td>
<td>9</td>
<td>.13</td>
</tr>
</tbody>
</table>

* p < .05
** Researcher Participant Relationship
value when compared to benefits (.55, p < .05) revealed significant positive correlations.

Significant negative correlations were found in the young age group for the variables barriers when compared to importance (-.63, p < .05), and in the old age group for the variables benefits when compared to importance (-.53, p < .05) and health value when compared to importance (-.63, p < .05).

Pearson Correlation Coefficients for Six Health Belief Model Variables for the Post-questionnaire the Young Age Group as Compared to the Old Age Group

Table 15 presents results of correlational analysis of each variable of the Health Belief Model as compared to each other variable for the post-questionnaire. In the young age group the variables health belief when compared to health value (.88, p < .01), health value when compared to benefits (.60, p < .05) and in the old age group benefits as compared to importance (.56, p < .05) and benefits when compared to researcher participant relationship (.56, p < .05) revealed significant positive correlations. In the young age group the variables barriers as compared to benefits (-.64, p < .05) and in the old age group the variables barriers as compared to health value (-.60, p < .05) and barriers as compared to researcher participant relationship (-.60, p < .05) revealed a significant negative correlation.
Table 15. Pearson Correlation coefficients and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition study post-questionnaire for the young and old age groups for six Health Belief Model variables.

<table>
<thead>
<tr>
<th>Variable to:</th>
<th>Young Age Group</th>
<th>Old Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>N</td>
<td>Correlation</td>
</tr>
<tr>
<td>Health Belief</td>
<td>9</td>
<td>.88</td>
</tr>
<tr>
<td>Barriers</td>
<td>9</td>
<td>.08</td>
</tr>
<tr>
<td>Benefits</td>
<td>9</td>
<td>.43</td>
</tr>
<tr>
<td>Importance</td>
<td>9</td>
<td>.26</td>
</tr>
<tr>
<td>RPR</td>
<td>9</td>
<td>.14</td>
</tr>
<tr>
<td>Health Value</td>
<td>N</td>
<td>Correlation</td>
</tr>
<tr>
<td>Barrier</td>
<td>9</td>
<td>-.02</td>
</tr>
<tr>
<td>Benefits</td>
<td>9</td>
<td>.60</td>
</tr>
<tr>
<td>Importance</td>
<td>9</td>
<td>.34</td>
</tr>
<tr>
<td>RPR*</td>
<td>9</td>
<td>.01</td>
</tr>
<tr>
<td>Barriers to:</td>
<td>N</td>
<td>Correlation</td>
</tr>
<tr>
<td>Benefits</td>
<td>9</td>
<td>-.64</td>
</tr>
<tr>
<td>Importance</td>
<td>9</td>
<td>-.50</td>
</tr>
<tr>
<td>RPR*</td>
<td>9</td>
<td>-.01</td>
</tr>
<tr>
<td>Benefits to:</td>
<td>N</td>
<td>Correlation</td>
</tr>
<tr>
<td>Importance</td>
<td>9</td>
<td>.52</td>
</tr>
<tr>
<td>RPR</td>
<td>9</td>
<td>.13</td>
</tr>
<tr>
<td>Importance to:</td>
<td>N</td>
<td>Correlation</td>
</tr>
<tr>
<td>RPR*</td>
<td>9</td>
<td>-.45</td>
</tr>
</tbody>
</table>

* p < .01
** p < .05
*** Researcher Participant Relationship
Pearson Correlation Coefficients for Six Health Belief Model Variables for the Pre-questionnaire the Young and Old Age Groups Combined

Table 16 presents results of correlational analysis of each variable of the Health Belief Model as compared to each other variable with the young and old age groups combined. The pre-questionnaire revealed the variables health belief when compared to importance (.42, p < .05) had a positive correlation. A significant negative correlation as found for the variables barriers when compared to benefits (-.46, p < .05).

Pearson Correlation Coefficients for the Post-questionnaire Young and Old Age Groups Combined

The post-questionnaire revealed the variables health value when compared to health belief (.58, p < .05) had a significant positive correlation. The variables health value when compared to benefits (-.58, p < .01) revealed a significant negative correlation.

Reliability Measures for the Health Belief Variable for the Pre-questionnaire

Table 17 presents the statistical analysis of reliability for the health belief variable for the pre-questionnaire. Results indicate that most of the individual items under the health belief variable for the pre-questionnaire are measuring this variable (inter-item correlation=.31, standardized alpha=.76). The item Q21 fell below the corrected item-total criterion (.23) and would
Table 16. Pearson correlation coefficients and sample size for the Health Belief Model: A Study of Compliance in a Vitamin C Disposition study pre-questionnaire for six Health Belief Model variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-questionnaire</th>
<th></th>
<th>Post-questionnaire</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Correlation</td>
<td>Probability</td>
<td>N</td>
</tr>
<tr>
<td>Health Belief to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>19</td>
<td>-.20</td>
<td>.21</td>
<td>19</td>
</tr>
<tr>
<td>Barriers*</td>
<td>19</td>
<td>.16</td>
<td>.26</td>
<td>19</td>
</tr>
<tr>
<td>Benefits</td>
<td>19</td>
<td>.20</td>
<td>.21</td>
<td>19</td>
</tr>
<tr>
<td>Importance</td>
<td>19</td>
<td>.42</td>
<td>.04**</td>
<td>19</td>
</tr>
<tr>
<td>RPR***</td>
<td>19</td>
<td>.10</td>
<td>.34</td>
<td>19</td>
</tr>
<tr>
<td>Health Value to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barriers</td>
<td>20</td>
<td>.03</td>
<td>.33</td>
<td>20</td>
</tr>
<tr>
<td>Benefits</td>
<td>20</td>
<td>.35</td>
<td>.06</td>
<td>20</td>
</tr>
<tr>
<td>Importance</td>
<td>20</td>
<td>-.37</td>
<td>.05</td>
<td>20</td>
</tr>
<tr>
<td>RPR***</td>
<td>20</td>
<td>-.26</td>
<td>.13</td>
<td>20</td>
</tr>
<tr>
<td>Barriers to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefits</td>
<td>20</td>
<td>-.46</td>
<td>.02**</td>
<td>20</td>
</tr>
<tr>
<td>Importance</td>
<td>20</td>
<td>-.05</td>
<td>.42</td>
<td>20</td>
</tr>
<tr>
<td>RPR***</td>
<td>20</td>
<td>-.20</td>
<td>.20</td>
<td>20</td>
</tr>
<tr>
<td>Benefits to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Importance</td>
<td>20</td>
<td>-.14</td>
<td>.27</td>
<td>20</td>
</tr>
<tr>
<td>RPR***</td>
<td>20</td>
<td>.34</td>
<td>.07</td>
<td>20</td>
</tr>
<tr>
<td>Importance to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPR***</td>
<td>20</td>
<td>-.16</td>
<td>.25</td>
<td>20</td>
</tr>
</tbody>
</table>

* p < .05
** p < .01
*** p < .004

Research Participant Relationship
Table 17. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study pre-questionnaire health belief variable.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Corrected Item- total Correlation (a)</th>
<th>Alpha if item deleted (b)</th>
<th>Correlational Matrix Inter-item (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q21</td>
<td>.23</td>
<td>.70</td>
<td>3/7</td>
</tr>
<tr>
<td>Q22</td>
<td>.66</td>
<td>.67</td>
<td>5/7</td>
</tr>
<tr>
<td>Q23</td>
<td>.52</td>
<td>.70</td>
<td>3/7</td>
</tr>
<tr>
<td>Q24</td>
<td>.36</td>
<td>.74</td>
<td>2/7</td>
</tr>
<tr>
<td>Q43</td>
<td>.36</td>
<td>.74</td>
<td>1/7</td>
</tr>
<tr>
<td>Q44</td>
<td>.62</td>
<td>.69</td>
<td>1/7</td>
</tr>
<tr>
<td>Q45</td>
<td>.57</td>
<td>.70</td>
<td>1/7</td>
</tr>
</tbody>
</table>

inter-item correlation = .31
standardized item alpha = .76

a criteria > .50
b criteria > .70 for an immature scale
c expressed as a ratio of correlations meeting criteria r=.30-.70
The total number of questionnaire items is in the denominator. The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
slightly improve the standardized alpha (.78) if dropped. Reference back to the theoretical framework justifies leaving this item intact. The item Q43 fell below the corrected item-total criterion (.36), but would not improve the standardized alpha (.74) if dropped.

Reliability Measures for the Health Value Variable for the Pre-questionnaire

Table 18 presents the statistical analysis of reliability for the health value variable for the pre-questionnaire. Results reveal that the individual items under the health value variable for the pre-questionnaire are not measuring this variable indicated by the inter-item correlation (.08) and standardized alpha (.25) falling below the criterion for reliability. The results indicate that this variable should be revised with the addition of more questionnaire items and retested with a larger sample size.

Reliability Measures for the Barriers Variable for the Pre-questionnaire

Table 19 presents the statistical analysis of reliability for the barriers variable for the pre-questionnaire. Results reveal the majority of the items under the health belief variable for the pre-questionnaire measured this variable (inter-item correlation=.30, standardized alpha=.79). The item Q32 fell below the corrected item-total criterion (.30) and would improve the standardized alpha (.79) if dropped. The result indicate that this item should be retested with a larger sample size.
Table 18. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study pre-questionnaire health value variable.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Corrected Item-total Correlation (a)</th>
<th>Alpha if Item Deleted (b) Inter-item (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>.34</td>
<td>.69</td>
</tr>
<tr>
<td>Q2</td>
<td>.18</td>
<td>.55</td>
</tr>
<tr>
<td>Q3</td>
<td>.06</td>
<td>.29</td>
</tr>
<tr>
<td>Q4</td>
<td>.21</td>
<td>.43</td>
</tr>
</tbody>
</table>

inter-item correlation=.08  
standardized item alpha=.25

a criteria >.50  
b criteria >.70  
c expressed as a ratio of correlations meeting criteria r=.30-.70  
The total number of questionnaire items is in the denominator.  
The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
Table 19. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study pre-questionnaire barriers variable.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Corrected Item- total Correlation (a)</th>
<th>Alpha if Item Deleted (b)</th>
<th>Correlation Matrix Inter-item (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q30</td>
<td>0.44</td>
<td>0.79</td>
<td>4/9</td>
</tr>
<tr>
<td>Q32</td>
<td>0.09</td>
<td>0.83</td>
<td>0/9</td>
</tr>
<tr>
<td>Q33</td>
<td>0.40</td>
<td>0.79</td>
<td>4/9</td>
</tr>
<tr>
<td>Q34</td>
<td>0.68</td>
<td>0.75</td>
<td>7/9</td>
</tr>
<tr>
<td>Q36</td>
<td>0.45</td>
<td>0.79</td>
<td>4/9</td>
</tr>
<tr>
<td>Q37</td>
<td>0.52</td>
<td>0.78</td>
<td>6/9</td>
</tr>
<tr>
<td>Q38</td>
<td>0.41</td>
<td>0.79</td>
<td>4/9</td>
</tr>
<tr>
<td>Q46</td>
<td>0.77</td>
<td>0.73</td>
<td>4/9</td>
</tr>
<tr>
<td>Q47</td>
<td>0.66</td>
<td>0.76</td>
<td>4/9</td>
</tr>
</tbody>
</table>

Inter-item correlation = 0.30  
Standardized item alpha = 0.79

a criteria > 0.50  
b criteria > 0.70  
c expressed as a ratio of correlations meeting criteria r = 0.30-0.70  
The total number of questionnaire items is in the denominator. The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
Reliability Measures for the Importance Variable for the Pre-questionnaire

Table 20 presents the statistical analysis of reliability for the importance variable for the pre-questionnaire. Results reveal all of the individual items for the importance variable for the pre-questionnaire have significant ratios of inter-item correlations outside the correlation matrix criteria of .30 - .70. This indicated that the items are redundant and will artificially inflate the standardized alpha (.80). The importance variable should be revised and retested with a larger sample size.

Reliability Measures for the Health Belief Variable for the Post-questionnaire

Table 21 presents the statistical analysis of reliability for the health belief variable for the post-questionnaire. Results reveal the majority of the individual items under the health belief variable for the post-questionnaire measured this variable (inter-item correlation=.53, standardized alpha=.87). The item QQ34 fell below the corrected item-total criterion (.42) and would slightly improve the standardized alpha (.88) if dropped. Reference back to the theoretical framework justifies leaving this item intact.

Reliability Measures for the Health Value Variable for the Post-questionnaire

Table 22 presents the statistical analysis of reliability for the health value variable for the post-questionnaire. Results reveal that the individual items under the health value variable for
Table 20. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study pre-questionnaire importance variable.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Corrected Item-total Correlation (a)</th>
<th>Alpha if Item Deleted (b)</th>
<th>Correlation Matrix Inter-item (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q11</td>
<td>.14</td>
<td>.89</td>
<td>0/7</td>
</tr>
<tr>
<td>Q35</td>
<td>.71</td>
<td>.77</td>
<td>4/7</td>
</tr>
<tr>
<td>Q39</td>
<td>.80</td>
<td>.75</td>
<td>1/7</td>
</tr>
<tr>
<td>Q42</td>
<td>.76</td>
<td>.76</td>
<td>1/7</td>
</tr>
<tr>
<td>Q50</td>
<td>.85</td>
<td>.75</td>
<td>1/7</td>
</tr>
<tr>
<td>Q55</td>
<td>.82</td>
<td>.76</td>
<td>1/7</td>
</tr>
<tr>
<td>Q60</td>
<td>.22</td>
<td>.84</td>
<td>0/7</td>
</tr>
</tbody>
</table>

inter-item correlation = .37
standardized item alpha = .80

a criteria > .50
b criteria > .70
c expressed as a ratio of correlations meeting criteria r = .30 - .70
The total number of questionnaire items is in the denominator. The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
Table 21. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study post-questionnaire health beliefs variable.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Corrected Item-total Correlation (a)</th>
<th>Alpha if Item deleted (b)</th>
<th>Correlation Matrix Inter-item (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QQ15</td>
<td>.73</td>
<td>.83</td>
<td>2/6</td>
</tr>
<tr>
<td>QQ16</td>
<td>.74</td>
<td>.83</td>
<td>2/6</td>
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<tr>
<td>QQ17</td>
<td>.81</td>
<td>.82</td>
<td>3/6</td>
</tr>
<tr>
<td>QQ32</td>
<td>.70</td>
<td>.84</td>
<td>4/6</td>
</tr>
<tr>
<td>QQ33</td>
<td>.65</td>
<td>.84</td>
<td>4/6</td>
</tr>
<tr>
<td>QQ34</td>
<td>.42</td>
<td>.88</td>
<td>3/6</td>
</tr>
</tbody>
</table>

Inter-item correlation=.53
Standardized item alpha=.87

a criteria > .50
b criteria > .70
c expressed as a ratio of correlations meeting criteria r=.30-.70.
The total number of questionnaire items is in the denominator.
The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
Table 22. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study post-questionnaire health value variable.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Corrected Item-total Correlation (a)</th>
<th>Alpha if Item Deleted (b)</th>
<th>Inter-item Correlation Matrix (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QQ1</td>
<td>.47</td>
<td>.26</td>
<td>1/4</td>
</tr>
<tr>
<td>QQ2</td>
<td>.23</td>
<td>.50</td>
<td>1/4</td>
</tr>
<tr>
<td>QQ3</td>
<td>.49</td>
<td>.25</td>
<td>1/4</td>
</tr>
<tr>
<td>QQ4</td>
<td>.05</td>
<td>.61</td>
<td>2/4</td>
</tr>
</tbody>
</table>

inter-item correlations = .21
standardized alpha = .52

a criteria > .50
b criteria > .70
c expressed as a ratio of correlations meeting criteria r = .30-.70

The total number of questionnaire items is in the denominator. The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
the post-questionnaire are not measuring this variable (inter-item correlation=.21, standardized alpha=.52). The results indicate that this variable should be revised with the addition of more questionnaire items and retested with a larger sample size.

Reliability Measures for the Barriers Variable for the Post-questionnaire

Table 23 presents the statistical analysis of reliability for the barriers variable for the post-questionnaire. Results reveal most of the individual items under the barriers variable for the post-questionnaire are measuring this variable (inter-item correlation=.40, standardized alpha=.86). The item QQ30 fell below the corrected item-total criterion (.31) and would slightly improve the standardized alpha (.87) if dropped. Reference back to the theoretical framework justifies retesting this item with a larger sample size.

Reliability Measures for the Importance Variable for the Post-questionnaire

Table 24 presents the statistical analysis of reliability for the importance variable for the post-questionnaire. Results reveal most of the individual items under the importance variable for the post-questionnaire are measuring this variable (inter-item correlation=.50, standardized alpha=.86). The item QQ27 fell below the corrected item-total criterion (.44) and would slightly improve the standardized alpha (.86) if dropped. Reference back to the theoretical frame work justifies leaving this item intact.
Table 23. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study post-questionnaire barriers variable.

<table>
<thead>
<tr>
<th>Item</th>
<th>Corrected Item- total Correlation (a)</th>
<th>Alpha if Item Deleted (b)</th>
<th>Correlation Matrix Inter-item (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QQ23</td>
<td>.41</td>
<td>.86</td>
<td>3/9</td>
</tr>
<tr>
<td>QQ25</td>
<td>.76</td>
<td>.83</td>
<td>5/9</td>
</tr>
<tr>
<td>QQ26</td>
<td>.74</td>
<td>.83</td>
<td>6/9</td>
</tr>
<tr>
<td>QQ28</td>
<td>.53</td>
<td>.85</td>
<td>5/9</td>
</tr>
<tr>
<td>QQ29</td>
<td>.77</td>
<td>.82</td>
<td>6/9</td>
</tr>
<tr>
<td>QQ30</td>
<td>.31</td>
<td>.87</td>
<td>1/9</td>
</tr>
<tr>
<td>QQ35</td>
<td>.73</td>
<td>.83</td>
<td>6/9</td>
</tr>
<tr>
<td>QQ36</td>
<td>.60</td>
<td>.84</td>
<td>4/9</td>
</tr>
<tr>
<td>QQ37</td>
<td>.46</td>
<td>.86</td>
<td>2/9</td>
</tr>
</tbody>
</table>

Inter-item correlations=.40
Standardized item alpha=.86

a criteria > .50
b criteria > .70
c expressed as a ratio of correlations meeting criteria r=.30-.70
The total number of questionnaire items is in the denominator. The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
Table 24. Reliability measures for The Health Belief Model: A Study of Compliance in a Vitamin C Disposition study post-questionnaire importance variable.

<table>
<thead>
<tr>
<th>Item</th>
<th>Corrected Item-Alpha if Correlation Matrix</th>
<th>Alpha if Item Deleted (b)</th>
<th>Correlation Matrix Inter-item (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QQ6</td>
<td>.64</td>
<td>.83</td>
<td>3/6</td>
</tr>
<tr>
<td>QQ27</td>
<td>.44</td>
<td>.86</td>
<td>3/6</td>
</tr>
<tr>
<td>QQ31</td>
<td>.65</td>
<td>.83</td>
<td>5/6</td>
</tr>
<tr>
<td>QQ39</td>
<td>.60</td>
<td>.84</td>
<td>5/6</td>
</tr>
<tr>
<td>QQ44</td>
<td>.80</td>
<td>.80</td>
<td>5/6</td>
</tr>
<tr>
<td>QQ49</td>
<td>.81</td>
<td>.79</td>
<td>3/6</td>
</tr>
</tbody>
</table>

inter-item correlation=.50
standardized item alpha=.86

a criteria >.50
b criteria >.70
c expressed as a ratio of correlations meeting criteria r=.30-.70

The total number of questionnaire items is in the denominator. The numerator is the number of questionnaire items that correlate to each other indicating that there is consistency between responses. This is a subjective measure of reliability.
CHAPTER 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Discussion

Sample Demographics

Participants were grouped either in the young age group (20-29) or the old age group (65-74). All participants were male, the majority were married, well educated, employed or students, and Caucasian. No correlation could be made between demographic variables and compliance due to the fact that all participants were compliant.

Variables Predictive of Compliance

Research Objective #1: To identify variables possibly predictive of compliance by means of a pre-study questionnaire.

Clinical trials require 100% compliance in order to ensure reliable and valid data. For this reason attempts are made to enhance compliance which in this study resulted in all participants following the strict study guidelines. This made it impossible to define which variables could be used to identify compliers by a pre-study questionnaire in future research studies. In order to determine what variables are possibly predictive of compliance requires comparison of a group of compliers to a group of non-compliers.
Variables Differ Between Age Groups

Research Objective #2: To identify if variables differ between age groups and how they differ.

The two-tailed T test comparing the young and old age groups for six Health Belief Model variables for the pre-questionnaire and then the post-questionnaire revealed no significant differences between the age groups. The results indicated that perceptions of the variables tested in this study were similar between the two distinct age groupings.

Development of an Instrument for use in Identifying Compliers

Research Objective #3: To develop an instrument to use in the identification of compliers for use in future research studies.

Reliability measures the precision of a measuring instrument and is to some extent a subjective measure. Analyses of reliability were run for four of the nine Health Belief Model variables. The variables demographics, social support and knowledge are non-dimensional and therefore could not be analysed by reliability measures. The variables benefits and researcher-participant relationship could not be analyzed for reliability because the number of questionnaire items under each variable were too low. These should be revised with the addition of more questionnaire items and then tested on a larger sample size prior to future use. Examination of the reliability indices (standardized item alpha (> .7), inter-item correlation (.3-.7), alpha if item deleted (> .7), corrected item-total correlation (> .5) and
correlation matrix (.3-.7) revealed that the pre-questionnaire items under the variables health belief and barriers and the post-questionnaire items under the variables health belief, barriers and importance were reliable measures of each of these variables. This indicated that there is internal consistency in the questionnaire items for each of these variables and that the items under each variable are in fact measuring that variable. Proving the variables in the instrument to be reliable does not imply that the instrument will be reliable in the identification of compliers. As stated in research objective 1 due to the fact that there were no non-compliers to compare with the compliers it was impossible to define what variables were correlated to compliance and which were not.

The pre-questionnaire variables health value and importance and post-questionnaire variable health value did not meet the criteria for reliability and should be revised and retested. All variables should be retested on larger sample size.

Comparison of reliability measures for the pre and post-questionnaires for the importance variable is interesting in that it did not meet the reliability criteria for the pre-questionnaire, but it did meet the criteria for the post-questionnaire. This may be reflective of participants not being aware at the beginning of the study of what the importance of the study protocol entailed. Therefore how participants may have answered the items under the importance variable may reflect very different perceptions of what is of importance. After completion of the study the participants
may have understood the importance of items under this variable and answered in a more consistent manner.

Modification of Health Belief Model Variables

Research Objective #4: To examine whether the Health Belief model variables are modified from the pre-questionnaire to the post-questionnaire.

The variable health beliefs looked at participants' beliefs in reference to sensitivity of blood and urine tests to vitamin C intake and to the possible effects of vitamin C in relationship to a cold. Perceptions of health beliefs were modified during the course of the study period shifting to beliefs that these parameters were less sensitive and a belief that vitamin C has less of an impact on colds.

The variable health value explored whether participants perceived their health as being to some degree within their own control. Perceptions of health value were modified during the study period and rated higher after completion of the study indicating an increased belief that health is to some degree within their own control.

The variable barriers explored the participants' perceptions of study length, difficulty, inconvenience, anxiety and concern over the study protocol. Perceptions of barriers were modified during the study period and rated lower after completion of the study.
indicating that the barriers were not as difficult, inconvenient, long, or as high a concern in actuality.

The variable importance explored the degree to which the participants perceived various aspects of the studies protocol as being important to the results. Perceptions of the importance of the study protocol were modified during the course of the study, shifting to perceptions of the protocol being of less importance to the results.

The knowledge variable explored the participant's actual and acquired knowledge of vitamin C relative to food content, its Recommended Dietary Allowance, and vitamin C's functions. Knowledge of vitamin C significantly increased during the course of the study period as would be expected.

The researcher-participant relationship explored whether participants were satisfied with their treatment by the research group. Perceptions of the researcher participant relationship were modified during the study period and rated higher with the majority of the participants, with the exception of one participant who reported being dissatisfied.

The social support variable was only valid for those participants who were not living alone. This variable explored support of participation in the study, the effect on compliance, and the amount and type of effect on compliance that significant others had on participants. Participants perceptions of the support
significant others would give them was significantly higher at the onset of the study than it actually was during the study period. No one reported a significant other as having a negative effect. Most participants not living alone lived with their wives who were responsible for preparing the meals. The decreased perception of items relating to support at the completion of the study period may be a reflection of the complexity of the dietary restrictions requiring a lot of thought and effort when preparing meals and therefore may have caused some tension. Another possibility is that social support may be more important during certain points of the study than at other points. Therefore it may not be consistent. The interpretation of social support is difficult because it deals with not only emotional support, but also day to day planning and maintenance of the study regimen.

Conclusions

The following conclusions are based on the survey results:

1. The small sample size made it impossible to draw conclusions regarding the identification of which of the following variables, health belief, barriers, benefits, importance, and researcher-participant relationship may be correlated to compliant behavior through a pre-study questionnaire.

2. No differences were found between age groups for the variables tested. This may in part be due to nutrition research being a one time short term commitment unlike
preventative action, health screening, treatment for health related conditions, and sick role behaviors which would have more of an impact on the participant in the long run.

3. The instrument developed in this study for use as a screening tool to identify good compliers for recruitment in future research studies requires further testing on a larger population and revision prior to using it for this purpose. The benefits variable requires additional questionnaire items in order to fully test this variable. The questionnaire items under the variables health belief and barriers were proven to be reliable measures of these variables.

4. Modification of the variables (health beliefs, health value, barriers, and importance) during the study period brings up the question of how this information can be used to enhance compliance in future research studies. Improvement of compliance may be the most valuable use of a pre-questionnaire at this time. At the start of the study, the participants perceived a high level of importance, barriers, and health beliefs with a low perception of health value. Information obtained through a pre-study questionnaire can give researchers the opportunity to individualize methods to enhance compliance. In this study, contact by researchers with participants throughout the study period provided the
opportunity to enhance the perceptions of importance and health beliefs, while down playing the barriers. At some unknown point during this study period the degree of the perceptions of these variables decreased. It is not known whether this had an affect on compliance. Alterations of the perceptions held at the onset of the study and throughout the study period may result in no significant modifications of these variables and in future studies may enhance compliance.

5. Reliability measures indicated that the questionnaire items under the health values variable should be revised and retested in future questionnaires. It is possible that the health values variable may not be appropriate for use in nutrition research studies which are short term, one time commitments. The health value variable may be more appropriate for use in long term commitments where perceptions of health being to some degree within their own control would be more appropriate.

Recommendations

1. To improve the testing of the instrument requires revision of some variables and an increase in the sample size (N=10 subjects/variable tested) so that a factor analysis and inter-item correlation can be
analyzed in order to assess the reliability and validity of this instrument for future use.

2. **Determination of optimal ways of conceptualizing, measuring, & modifying the Health Belief Model variables needs further investigation if the Health Belief Model is to be an effective tool for predicting and understanding health-related behaviors, and also for changing health related behavior.**

3. **Standardization of analysis approaches would facilitate comparison of findings from different investigations.**

4. **Determination of how Health Belief Model variables change over time naturally and/or due to intervention is important to understanding health related behaviors and therefore how to alter these behaviors in order to improve compliance.**

5. **Determination of interrelationships between variables and how these interact to influence behavior.**
APPENDIX A

THE HEALTH BELIEF MODEL: A STUDY
OF COMPLIANCE IN A VITAMIN C DISPOSITION STUDY
PRE-QUESTIONNAIRE
STUDY QUESTIONNAIRE
for
"The Effects of Age on Vitamin C Disposition"

This questionnaire has been developed, to identify factors which may play a role in compliance. Please answer them as carefully as possible. This questionnaire does not in any way affect your participation in the primary study, "The Effects of Age on Vitamin C Disposition."

The questionnaire contains a number of "key words" which we have capitalized in order to help you understand what we are concerned with. This page lists our definitions of these words because people often perceive the meaning of words in different ways. A question may be worded very similar to another except for the "key word".

DEFINITIONS:

1. ANXIETY - uneasiness of the mind over something; concern
2. CONCERNED - uneasy state, uncertainty, and apprehension; to be a trouble or distress.
3. DEPLETED - to lessen in quantity, content, or amount.
4. DIFFICULT - hard to do, understand, carry out, deal with.
5. IMPORTANT - valuable in content, worth, or relationship.
6. INCONVENIENT - gives trouble or annoyance; not suited to personal comfort or easy performance; inopportune.
7. MODERATE - following a reasonable limit; average amount; avoiding extremes.
8. SUPPLEMENT - something that makes an addition to complete or fill up; additional.
9. UNCOMFORTABLE - not free of physical discomfort, stress, or tension; annoyances; grief; trouble.
INSTRUCTIONS: Circle the letter corresponding to the one choice which you feel best describes your response.

1. How concerned are you about your own health?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

2. To what extent do you think your health is mainly due to your own actions and decisions?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

3. To what extent do you think your health is within your control?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

4. Do you feel vitamin supplements are important?
   A. Yes
   B. No

5. Do you normally take any vitamin supplements?
   A. Yes
   B. No

6. If you normally take vitamin supplements list which vitamin(s) you take, the dosage, the frequency and the brand(s).

7. If you normally take vitamin supplements how many milligrams of vitamin C do you get from the supplements per day?
   __________________ mg.

8. If you normally take vitamin supplements what is your reason for doing so?
   A. To maintain your overall health.
   B. Because your doctor recommended it.
   C. In order to compensate for a poor diet.
   D. To be sure you get enough vitamins.
   E. Other (please specify)

9. What do you think is your chance of having side effects during the study?
   A. A very high chance
   B. A high chance
   C. A moderate chance
   D. A small chance
   E. None
10. What do you think is the usual success of a treatment should side effects occur?
   A. Very good
   B. Good
   C. Fair
   D. Poor
   E. Very poor

11. To what extent do you think your strict adherence to the guidelines of the study will affect the results?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

12. To what extent do you think the results of your participation in this study will contribute to scientific knowledge concerning vitamin C?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

13. To what extent do you think your participation in this study will be "IMPORTANT" to society?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

14. Rate the following factors concerning why you chose to participate in this study. Use the numbers 1-8 (1 being the most important reason). If you feel two or more factors are of equal importance to you rate them with the same number.

   ______ contribution to scientific knowledge
   ______ contribution to society
   ______ personal interest
   ______ monetary reward ($250.00)
   ______ contribution to the university
   ______ importance to self
   ______ something to do
   ______ other reasons? (please specify) ____________________________________________________________________________

15. How satisfied are you with your treatment by the members of the research team involved in this study?
   A. Very satisfied
   B. Satisfied
   C. Neither satisfied nor dissatisfied
   D. Dissatisfied
   E. Very dissatisfied

16. How well do you think this study was explained to you?
   A. Extremely well
   B. Reasonably well
   C. Fairly well
   D. Poorly
   E. Very poorly
17. Circle the letter(s) corresponding to the item(s) that is (are) in any way associated with vitamin C. (It may be all of the items, any number of the items, or none of the items.)
   A. Iron absorption
   B. Healing of a wound
   C. Healing of a broken bone
   D. The incidence and duration of the common cold
   E. Vitamin B12 deficiency

18. Of the food items listed below which do you think contain vitamin C? (It may be in all of the items, any number of the items, or none of the items.)
   A. Cantaloupe
   B. Tomatoes
   C. Broccoli
   D. Spinach
   E. Plain Jello (without fruit added)
   F. Peanut butter
   G. Potatoes
   H. Peas
   I. Cranberries
   J. Coffee and tea

19. Of the food items listed below which do you think you should not have at all during the study period? (It may be all of the items, any number of the items, or none of the items.)
   A. Oranges
   B. Nuts
   C. Frozen juices
   D. Green beans
   E. Rice

20. Of the food items listed below which do you think you can have in "MODERATE" amounts during the study period? (It may be all of the items, any number of the items, or none of the items.)
   A. Lettuce
   B. Applesauce
   C. Milk
   D. Carrots
   E. Raisins

21. To what extent do you think vitamin C would affect your chances of getting a cold?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

22. To what extent do you think a vitamin C "DEPLETED" diet would affect the severity of a cold?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all
23. To what extent do you think a vitamin C "SUPPLEMENT" would affect the severity of a cold?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

24. When you catch a cold do you think you need ________
   A. More vitamin C than usual
   B. Less vitamin C than usual
   C. The same amount of vitamin C as usual

25. Which symptoms do you think are associated with a low vitamin C intake? (It may be all of the items, any number of the items, or none of the items.)
   A. Bleeding gums
   B. Sore tongue
   C. Night blindness
   D. Bruising easily
   E. Skin flaking

26. Where did you learn about vitamin C?
   (You may circle more than one letter.)
   A. T.V.
   B. School
   C. Health food store
   D. Magazine/book/newspaper
   E. Dietitian/nutritionist
   F. Other (please specify)

27. Do you think man can produce vitamin C in his/her body?
   A. Yes
   B. No

28. What is the U.S. Recommended Dietary Allowance for Vitamin C?
   A. 40 mg.
   B. 60 mg.
   C. 125 mg.
   D. 250 mg.
   E. 500 mg.

29. Does the U.S. Recommended Dietary Allowance differ for different age groups?
   A. Yes
   B. No

30. How would you rate the length of the vitamin C depletion study?
   A. Very long
   B. Long
   C. Neither long nor short
   D. Short
   E. Very short

31. In question number 30 why did you choose this rating?
32. To what extent do you think the length of this study makes it difficult to comply with the vitamin C depleted diet and taking the vitamin supplements?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

33. To what extent will following a special diet discourage you from participating in this study?
   A. Very great
   B. Great
   C. Moderate
   D. Slightly
   E. Not at all

34. How "DIFFICULT" do you think it will be to adhere to the vitamin C depleted diet?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

35. How "IMPORTANT" do you think it will be to follow the vitamin C depleted diet during the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

36. How "DIFFICULT" do you think it will be to remember which foods to avoid during the vitamin C depleted diet?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

37. How "INCONVENIENT" do you think it will be to follow the vitamin C depleted diet? (i.e., eating out, eating at friends house, etc.)
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

38. How "DIFFICULT" do you think it will be to remember to take the one daily multiple vitamin supplement provided during the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all
39. How "IMPORTANT" do you think it will be to remember to take the one daily multiple vitamin supplement provided during the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

40. How "DIFFICULT" do you think it will be to remember the diet and the one daily multiple vitamin supplement during the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

41. How "DIFFICULT" do you think it will be to remember to take the one daily multiple vitamin supplement plus the two vitamin C supplements during the second part of the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

42. How "IMPORTANT" do you think it will be to the study to remember to take the two vitamin C supplements during the second part of the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

43. How sensitive do you think the weekly blood and urine tests will be in determining your vitamin C level?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

44. How sensitive do you think the weekly blood and urine tests will be in determining whether or not you adhered to the vitamin C depleted diet?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

45. How sensitive do you think the weekly blood and urine tests will be in determining whether or not you took the vitamin C supplements?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all
46. How "INCONVENIENT" do you think it will be to come in weekly for your blood and urine tests?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

47. How "UNCOMFORTABLE" do you think it will be to have the small sample of your blood drawn every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

48. How much "ANXIETY" do you think you will experience to have the small sample of your blood drawn every week?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None

49. How "CONCERNED" are you about having the small sample of your blood drawn every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

50. How "IMPORTANT" do you think it is to the study to have the small sample of your blood drawn every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

51. How "INCONVENIENT" do you think it will be for you to spend a day at the Pharmacy College in the middle and at the end of the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

52. How much "ANXIETY" do you think you will experience in spending the two days at the Pharmacy College?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None
53. How "DIFFICULT" do you think it will be to keep an accurate three day food intake record every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

54. How "INCONVENIENT" do you think it will be to keep an accurate three day food intake record every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

55. How "IMPORTANT" do you think it will be to keep an accurate three day food intake record every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

56. What do you think is the researchers purpose in having you keep the food records?
   (You may circle more than one answer.)
   A. To catch me doing something wrong.
   B. To help me adhere to the diet.
   C. To monitor my weekly vitamin C intake.
   D. To analyze for other vitamins and minerals in my diet.
   E. I have no idea what the purpose is.

57. Overall how "DIFFICULT" do you think it will be to follow all the guidelines of this study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

58. Overall how "INCONVENIENT" do you think it will be to follow all the guidelines of this study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

59. Overall how much "ANXIETY" do you think you will experience in following all the guidelines of this study?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None
60. Overall how "IMPORTANT" do you think it will be, to the researchers obtaining valid results, for you to follow all the guidelines of this study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

PERSONAL INFORMATION

1. Marital Status
   A. Single
   B. Married
   C. Widowed
   D. Divorced
   E. Separated
   F. Other (please specify)

2. Educational Levels
   A. No formal education
   B. Some grade school
   C. Grade school
   D. Some high school
   E. High school graduate or equivalent
   F. Trade school
   G. Some college
   H. College graduate
      (specify major)
   I. Some graduate school
   J. Graduate school completed

3. Employment Status
   A. Employed full time
   B. Employed part time
   C. Student full time
   D. Student part time
   E. Retired
   F. Unemployed

4. Ethnic Group
   A. American Indian
   B. Asian
   C. Black
   D. Caucasian
   E. Hispanic
   F. Oriental
   G. Other (please specify)

5. What are your living arrangements?
   A. Living alone
   B. Living with your spouse
   C. Living with your family
   D. Other (please specify)
6. Who prepares your meals?
   A. Self
   B. Spouse
   C. Family
   D. Friend
   E. Other (please specify) ____________________________

7. If you are not living alone to what extent will the person(s) in Item 66 above be supportive of your participation in this study?
   A. Extremely supportive
   B. Highly supportive
   C. Moderately supportive
   D. Slightly supportive
   E. Not at all supportive

8. If not living alone will your room mate have an effect on your compliance to the study?
   A. Yes
   B. No
   C. Maybe

9. How much of an effect will your room mate have on your compliance?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None

10. Will this effect be?
    A. Very positive
    B. Positive
    C. Neutral
    D. Negative
    E. Very negative
APPENDIX B

THE HEALTH BELIEF MODEL: A STUDY
OF COMPLIANCE IN A VITAMIN C DISPOSITION STUDY
POST-QUESTIONNAIRE
STUDY QUESTIONNAIRE
for
"Effects of Age and Intake on Vitamin C Disposition"

This questionnaire has been developed, to identify factors which may play a role in compliance. Please answer them as carefully as possible. This questionnaire does not in any way affect your participation in the primary study, "The Effects of Age and Intake on Vitamin C Disposition."

The questionnaire contains a number of "key words" which we have capitalized in order to help you understand what we are concerned with. This page lists our definitions of these words because people often perceive the meaning of words in different ways. A question may be worded very similar to another except for the "key word".

DEFINITIONS:
1. ANXIETY - uneasiness of the mind over something; concern
2. CONCERNED - uneasy state, uncertainty, and apprehension; to be a trouble or distress.
3. DEPLETED - to lessen in quantity, content, or amount.
4. DIFFICULT - hard to do, understand, carry out, deal with.
5. IMPORTANT - valuable in content, worth, or relationship.
6. INCONVENIENT - gives trouble or annoyance; not suited to personal comfort or easy performance; inopportune.
7. MODERATE - following a reasonable limit; average amount; avoiding extremes.
8. SUPPLEMENT - something that makes an addition to complete or fill up; additional.
9. UNCOMFORTABLE - not free of physical discomfort, stress, or tension; annoyance; grief; trouble.
INSTRUCTIONS: Circle the letter corresponding to the one choice which you feel best describes your response.

1. To what extent do you think your health is mainly due to your own actions and decisions?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

2. To what extent do you think your health is within your control?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

3. Do you feel vitamin supplements are important?
   A. Yes
   B. No

4. Will you take any vitamin supplements now?
   A. Yes
   B. No

5. If you decide to take vitamin supplements now what is your reason for doing so?
   A. To maintain your overall health.
   B. Because your doctor recommended it.
   C. In order to compensate for a poor diet.
   D. To be sure you get enough vitamins.
   E. Other (please specify) __________________________

6. To what extent do you think your strict adherence to the guidelines of the study affected the results?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

7. To what extent do you think the results of your participation in this study will contribute to scientific knowledge concerning vitamin C?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

8. To what extent do you think your participation in this study will be "IMPORTANT" to society?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all
9. How satisfied are you with your treatment by the members of the research team involved in this study?
   A. Very satisfied
   B. Satisfied
   C. Neither satisfied nor dissatisfied
   D. Dissatisfied
   E. Very dissatisfied

10. How well do you think this study was explained to you?
    A. Extremely well
    B. Reasonably well
    C. Fairly well
    D. Poorly
    E. Very poorly

11. Circle the letter(s) corresponding to the item(s) that is (are) in any way associated with vitamin C. (It may be all of the items, any number of the items, or none of the items.)
    A. Iron absorption
    B. Healing of a wound
    C. Healing of a broken bone
    D. The incidence and duration of the common cold
    E. Vitamin B12 deficiency

12. Of the food items listed below which do you think contain vitamin C? (It may be all of the items, any number of the items, or none of the items.)
    A. Cantaloupe
    B. Tomatoes
    C. Broccoli
    D. Spinach
    E. Plain Jello (without fruit added)
    F. Peanut butter
    G. Potatoes
    H. Peas
    I. Cranberries
    J. Coffee and tea

13. Of the food items listed below which do you think you should not have had at all during the study period? (It may be all of the items, any number of the items, or none of the items.)
    A. Oranges
    B. Nuts
    C. Frozen juices
    D. Green beans
    E. Rice

14. Of the food items listed below which do you think you could have in "MODERATE" amounts during the study period? (It may be all of the items, any number of the items, or none of the items.)
    A. Lettuce
    B. Applesauce
    C. Milk
    D. Carrots
    E. Raisins
13. To what extent do you think vitamin C affects your chances of getting a cold?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

14. To what extent do you think a vitamin C "DEPLETED" diet affects the severity of a cold?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

15. To what extent do you think a vitamin C "SUPPLEMENT" affects the severity of a cold?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

16. When you catch a cold do you think you need ______.
   A. More vitamin C than usual
   B. Less vitamin C than usual
   C. The same amount of vitamin C as usual

17. Which symptoms do you think are associated with a low vitamin C intake? (It may be all of the items, any number of the items, or none of the items.)
   A. Bleeding gums
   B. Sore tongue
   C. Night blindness
   D. Bruising easily
   E. Skin flaking

18. Do you think man can produce vitamin C in his/her body?
   A. Yes
   B. No

19. What is the U.S. Recommended Dietary Allowance for Vitamin C?
   A. 40 mg.
   B. 60 mg.
   C. 120 mg.
   D. 250 mg.
   E. 500 mg.

20. Does the U.S. Recommended Dietary Allowance differ for different age groups?
   A. Yes
   B. No

21. How would you rate the length of the vitamin C depletion study?
   A. Very long
   B. Long
   C. Neither long nor short
   D. Short
   E. Very short
24. In question number 33 why did you choose this rating?

25. To what extent do you think the length of this study made it difficult to comply with the vitamin C depleted diet and taking the vitamin supplements?
   A. Very great
   B. Great
   C. Moderate
   D. Slight
   E. Not at all

26. How "DIFFICULT" do you think it was to adhere to the vitamin C depleted diet?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

27. How "IMPORTANT" do you think it was to follow the vitamin C depleted diet during the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

28. How "DIFFICULT" do you think it was to remember which foods to avoid during the vitamin C depleted diet?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

29. How "INCONVENIENT" do you think it was to follow the vitamin C depleted diet? (i.e; eating out, eating at friends house, etc.)
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

30. How "DIFFICULT" do you think it was to remember to take the vitamin C supplement during the second part of the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all
31. How "IMPORTANT" do you think it was to the study to remember to take the vitamin C supplement during the second part of the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

32. How sensitive do you think the weekly blood and urine tests will be in determining your vitamin C level?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

33. How sensitive do you think the weekly blood and urine tests were in determining whether or not you adhered to the vitamin C depleted diet?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

34. How sensitive do you think the weekly blood and urine tests were in determining whether or not you took the vitamin C supplements?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

35. How "INCONVENIENT" do you think it was to come in weekly for your blood and urine tests?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

36. How "UNCOMFORTABLE" do you think it was to have the small sample of your blood drawn every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

37. How much "ANXIETY" do you think you experienced to have the small sample of your blood drawn every week?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None
38. How "CONCERNED" were you about having the small sample of your blood drawn every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

39. How "IMPORTANT" do you think it was to the study to have the small sample of your blood drawn every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

40. How "INCONVENIENT" do you think it was for you to spend a day at the Pharmacy College in the middle and at the end of the study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

41. How much "ANXIETY" do you think you experienced in spending the two days at the Pharmacy College?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None

42. How "DIFFICULT" do you think it was to keep an accurate three day food intake record every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

43. How "INCONVENIENT" do you think it was to keep an accurate three day food intake record every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

44. How "IMPORTANT" do you think it was to keep an accurate three day food intake record every week?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all
45. What do you think was the researchers' purpose in having you keep the food records? (You may circle more than one answer.)
   A. To catch me doing something wrong.
   B. To help me adhere to the diet.
   C. To monitor my weekly vitamin C intake.
   D. To analyze for other vitamins and minerals in my diet.
   E. I have no idea what the purpose is.

46. Overall how "DIFFICULT" do you think it was to follow all the guidelines of this study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

47. Overall how "INCONVENIENT" do you think it was to follow all the guidelines of this study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

48. Overall how much "ANXIETY" do you think you experienced in following all the guidelines of this study?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None

49. Overall how "IMPORTANT" do you think it was, to the researchers obtaining valid results, for you to follow all the guidelines of this study?
   A. Extremely
   B. Highly
   C. Moderately
   D. Slightly
   E. Not at all

50. How often did you not comply to the guidelines of the study?

51. In what way did you not comply?

52. Was this intentional or unintentional? (circle)
53. Explain your answer to question 52.


PERSONAL INFORMATION

1. If you are not living alone to what extent was your room mate supportive of your participation in this study?
   A. Extremely Supportive
   B. Highly supportive
   C. Moderately supportive
   D. Slightly supportive
   E. Not at all supportive

2. If not living alone did your room mate have an effect on your compliance to the study?
   A. Yes
   B. No
   C. Maybe

3. How much of an effect did your room mate have on your compliance?
   A. An extreme amount
   B. A high amount
   C. A moderate amount
   D. A slight amount
   E. None

4. Was this effect?
   A. Very positive
   B. Positive
   C. Neutral
   D. Negative
   E. Very negative

Comments:


-9-
APPENDIX C

QUESTIONNAIRE ITEMS WITH THE HEALTH BELIEF MODEL VARIABLE THEY HYPOTHETICALLY MEASURE.
<table>
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<th>Health Belief Model Variable</th>
<th>Pre-questionnaire Item</th>
<th>Post-questionnaire Item Corresponding to Pre-questionnaire</th>
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Note: The table lists the pre-questionnaire and post-questionnaire items for different variables in the Health Belief Model.
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**Personal Information Section**

| Social Support | 7 | 1 |
|               | 8 | 2 |
|               | 9 | 3 |
|               | 10 | 4 |
APPENDIX D

COMPLIANCE ASSESSMENT FORM
## Compliance Assessment Form

<table>
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<tr>
<th>Method used to Assess Compliance</th>
<th>Week of the Study</th>
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**Identification Number:**

**Direct Method:**
- Serum Vitamin C Levels

**Indirect Method:**
- Scheduled Appointments
- Three Day Food Intake Records
REFERENCES


