Effects of Statin Medications on Health Related Behaviors

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Philadelphia College of Osteopathic Medicine
Department of Psychology

THE EFFECTS OF STATIN MEDICATIONS
ON HEALTH RELATED BEHAVIORS

By Stephen M. Timchack

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Psychology

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PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
DEPARTMENT OF PSYCHOLOGY

Dissertation Approval

This is to certify that the thesis presented to us by STEPHEN M. TIMCHACK
on the 19th day of DECEMBER, 2007, in partial fulfillment of the requirements for the
degree of Doctor of Psychology, has been examined and is acceptable in both scholarship
and literary quality.

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ABSTRACT

The current study focuses on the psychological effects of statin medications. Specifically, this study examines the health related beliefs and behaviors that may be altered by the consumption of this fast acting class of life saving drugs. Although the statin class of medication generally produces favorable physiological results, as evidenced by reduced levels of serum cholesterol, and in some case increases in high-density lipoproteins, the health related belief system and heath related behaviors may actually be altered in a negative fashion by engendering a sense of overconfidence; this in turn may alter beliefs and diminish the importance of adhering to a healthy diet and active exercise schedule. Surveys were developed to solicit patient agreement along a five point Likert scale. Items were constructed to assess health related beliefs, medication overconfidence, locus of control, and exercise habits. Sixty-four primary care patients from Northeastern and Southeastern Pennsylvania were randomly selected to complete the surveys.
# TABLE OF CONTENTS

LIST OF TABLES........................................................................................................... vii

LIST OF FIGURES......................................................................................................... viii

CHAPTER

1. INTRODUCTION
   Hypercholesterolemia................................................................. 6
   Statin Therapy ........................................................................... 8
   Diet, Exercise and Health Beliefs ............................................... 11
   Health Belief Model and Social Learning Theory ....................... 17
   Biopsychosocial Model ............................................................. 20
   Overconfidence ......................................................................... 25
   Adherence/Non-adherence and Locus of Control ....................... 26
   Rationale .................................................................................. 28
   Purpose of Study ..................................................................... 30
   Research Questions and Hypotheses ........................................ 31

2. METHODOLOGY ............................................................................. 33
   Participants ............................................................................. 33
   Design .................................................................................. 34
   Description of Instruments and Measures .................................. 34
   Procedures ............................................................................... 35

3. RESULTS .................................................................................. 39
   Responses to Survey .............................................................. 39
   Descriptive Statistics ................................................................ 43
   Hypothesis 1 ........................................................................... 53
   Hypothesis 2 ........................................................................... 53
   Hypothesis 3 ........................................................................... 54
   Hypothesis 4 ........................................................................... 55
   Hypothesis 5 ........................................................................... 55

4. DISCUSSION ............................................................................ 57
   Limitations of the Study ........................................................... 61
   Implications for Clinical Practice and Future Research .............. 62
   Conclusion ............................................................................ 63

REFERENCES .................................................................................. 64

APPENDICES
   Appendix A .......................................................... Letter of Solicitation
   Appendix B .......................................................... Demographic Survey
   Appendix C ........................................... Survey of Health Related Beliefs and Behaviors
### List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
</table>
| 1.    | List of Variables by Subscale  
Overconfidence | 41 |
| 2.    | List of Variables by Subscale  
Diet Non-Adherence after Medication | 42 |
| 3.    | List of Variables by Subscales  
Diet Non-Adherence before Medication | 42 |
| 4.    | List of Variables by Subscale  
Exercise Adherence before Medication | 43 |
| 5.    | List of Variables by Subscale  
Exercise Adherence after Medication | 43 |
| 6.    | Intercorrelations for Personal Beliefs and Exercise  
And Diet Non-Adherence before and after Statin Medication Therapy | 56 |
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Number of Participants by Sex</td>
<td>44</td>
</tr>
<tr>
<td>2.</td>
<td>Number of Participants by Ethnicity</td>
<td>45</td>
</tr>
<tr>
<td>3.</td>
<td>Number of Participants by Age Ranges</td>
<td>45</td>
</tr>
<tr>
<td>4.</td>
<td>Number of Participants by Length of Time on Medication</td>
<td>46</td>
</tr>
<tr>
<td>5.</td>
<td>Number of Participants by Number of Weekly Exercise Sessions</td>
<td>47</td>
</tr>
<tr>
<td>6.</td>
<td>Number of Participants Classified by Body Mass Index</td>
<td>48</td>
</tr>
<tr>
<td>7.</td>
<td>Number of Participants by Self-Rating of Integrity of Dietary Habits</td>
<td>49</td>
</tr>
<tr>
<td>8.</td>
<td>Knowledge About The Origins of Cholesterol</td>
<td>50</td>
</tr>
<tr>
<td>9.</td>
<td>Change in Cholesterol Levels</td>
<td>51</td>
</tr>
<tr>
<td>10.</td>
<td>Change in Medication Dosage</td>
<td>52</td>
</tr>
<tr>
<td>11.</td>
<td>Number of Participants by Medication Dosage</td>
<td>52</td>
</tr>
<tr>
<td>12.</td>
<td>Participants Level of Agreement</td>
<td>54</td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION

Unfortunately, or fortunately, depending on one’s perspective, the effects of a fast-paced, technologically advanced, and almost completely automated society have all but taken over the American landscape. It is a rare event to see a construction site without the advanced machinery preparing a foundation, factories where assembly lines are still dominated by humans, or an office building where the staircase is the primary means of conveyance to higher floors. Although the trades, business, and professional areas of the American economy have enjoyed considerable technological expansion in conducting everyday business and providing niceties to the working world, it appears there may be some health-related tradeoffs. Indeed, many of the technological advancements have made the workplace much safer, healthier, and more efficient for all, but at what point do we cross the line of balancing necessary human physical activity and complete automation?

Interestingly, consumers have grown quite accustomed to receiving the benefits of technology, and have become quite concerned when contractors, business consultants, or medical professionals perform their trades without the use of the latest technology or state of the art equipment. Some argue that Americans have become so accustomed to expecting the latest trends in technology, best ergonomics, most sophisticated medical procedures, and longest acting pain relieving drugs that we may miss the opportunity to examine critically what these advancements actually replace, negate, or simplify. In short, many have become, and continue to be, quite dependent on technological and medical advancements to the extent that other areas of functioning may actually be
starting to suffer, specifically, the condition of one’s physical health and mental well
being. Has technology provided the confidence to overlook completely the simple,
repetitive behaviors and common sense beliefs that may have prevented the onset of
chronic medical conditions? Can dramatically increasing rates of obesity, hypertension,
hypercholesterolemia, and diabetes be the sole effects of an almost completely automated
and technologically advanced society? Furthermore, have these advances in technology,
particularly in the field of medicine, encouraged a belief system consistent with
overconfident eating habits, poorer participation in health related behaviors such as
exercise, and shoddier health outcomes in general? Advances, including those in
automotive technology, bio-medical science, residential engineering, medicine, surgery,
and business, have provided the population with conveniences and necessities that
dramatically enhance the quality of human life in many ways. Yet the long-term impact
of technology on our health-status, behavior, and belief system certainly appears to be an
understudied area of concern.

Particularly, advances in medicine and medical technology are generally seen as
very positive contributions to humanity, and it is not the intention of this research to
condemn or appear anti-progressive; rather, the intention is to heighten the level of
awareness with respect to the misplaced positive health-related behaviors and beliefs,
which may be negatively influenced as a result of the availability of medicines and
medical technology. To illustrate this point further, and begin to frame a conceptual
argument, it is useful to cite the convenience and speed at which fast-food restaurants
serve their drive-thru customers during lunch, some in 90 seconds or less—guaranteed.
Whereas this ability is certainly the product of a great technology serving the demands of
its culture, one needs to consider the lost or missed opportunities for a variety of simple, but valuable, human functions. These of course include casual socialization, a much needed distraction from a stressful work place, simple physical movement like walking through a parking lot in lieu of drive-thru, or simply having the opportunity to eat one’s lunch slowly. Although disparagement is not directed at the fast-food industry, there does need to be a heightened awareness of current cultural demands and the impact on psychological and physiological health.

Succumbing to pressures of eating while “on the go” happens to a great number of Americans, yet one may not recognize the ill affects that these conveniences have on the human body. Drawing attention to eating while making the morning commute or grabbing lunch between appointments may not sound like very interesting conversation requiring much scientific consideration; it simply is not a healthy habit. However, what does appear to require attention and discussion is the marketing and consumption of medications such as antacids, gastric acid reducers, antihypertensives, anti-anxiety, antidepressants, anti-cholesterol, diuretics, and sleep medications. For instance, Richter (1992) reported the results of a Gallup survey indicating that 44% of all adult Americans experience heartburn at least once every month, 10% of all adult Americans complain of acid reflux symptoms weekly and 40% of adult Americans took antacids for symptom relief; however, only one in four discuss these symptoms with their doctors. Although, no causal statements between poor eating habits and acid reflux are made here, the sales trends in medicines used to treat gastroesophageal reflux disorder (GERD) and the national epidemic of obesity may appear to provide an interesting correlation. Although the side effects that a technological and turbulent culture has on human health will remain
theoretically debatable, the ever present and real health-related effects continue to appear at an alarming rate across the United States.

In the final review of *Healthy People 2000*, the Center for Disease Control and Prevention (CDC) reported an estimated 60 million Americans have cardiovascular disease (CVD) and more than 950,000 die yearly from the condition. This disease alone accounts for approximately 40 percent of all American deaths per year. The CDC also reports that coronary heart disease and stroke, the two primary conditions of CVD, account, respectively, for the first and third leading causes of deaths in Americans; coronary heart disease, alone, accounts for an estimated 12 million cases in the United States every year. In an attempt to study health problems and move toward healthier outcomes for Americans, the CDC has prioritized a list of health related issues and behaviors that currently affect Americans and have specifically developed targeted areas of priority regarding healthy outcomes. The first priority area targeted for improvement includes physical activity and fitness. Physical activity and vigorous exercise practiced on a routine schedule can improve the quality of life for many, if not all, individuals with health related problems. McGuinnis and Foege (1993) report that 14 percent of all deaths in the United States were related to diet and activity habits; whereas, Kujala, Kaprio, Sarna, and Koskenvuo (1998) conclude that leisure time physical activity is associated with decreased mortality, even after genetic and other familial factors were considered. Additionally, the 1996 Surgeon General’s report on *Physical Activity and Health* clearly indicates that physical activity has been shown to reduce the risk of developing or dying from heart disease, diabetes, colon cancer, or hypertension, also indicating that physical activity improves mental health as well as the health of muscles, bones, and joints. Quite
simply, the benefits of physical activity cannot be overstated. Physical activity simply pays very rich dividends and yet Americans seem to be ignoring this life sustaining data. For example, in related findings, the CDC published an early release of selected estimates based on data from the 2004 National Health Interview Survey in which trends in health conditions and health related behaviors were compared from 1997 through 2004. In this report, the CDC cited an increasing trend in the prevalence of diabetes among adults ages 18 and older from 5.1% in 1997 to 7.0% in 2004, and an increasing trend in obesity among adults ages 18 and older from 19.4% in 1997 to 24.5% in 2004. Conversely, the CDC also reported similar longitudinal type data on health-related behaviors and beliefs, but with discouraging results. For example the CDC, in an early release estimate, reported that adults ages 18 and older who engaged in regular leisure time physical activity actually increased from 29.9% in 1998 to 31.9% in 2000, but did not change significantly from 2000 to 2003 and actually decreased from 2003 to 2004. Furthermore, the CDC assessed the perception of individual health status in adults ages 18 and older, reporting an estimated decrease in the number of adults who reported their health status as excellent or very good from the years 2001 (68.4%) to 2004 (66.5%). Considering these statistics and trends in health-related behaviors and health beliefs, and the increasing trends in CVD, a review is needed to identify the influence of mediating or moderating variables which may place undue emphasis on clinical interventions while minimizing the effect of exercise and healthy eating needs. A discussion of these potential variables and their interaction in patients with hypercholesterolemia are discussed in subsequent sections; this is essentially, in fact, the nature of this research. However, a
review of the basic terminology, course of disease, and clinical interventions will provide the reader with a more comprehensive understanding of the factors under study.

**Hypercholesterolemia**

Hypercholesterolemia, simply known as high cholesterol, affects 18% of Americans aged 18 to 74; this disease slowly clogs the circulatory system over a lifetime and directly leads to coronary heart disease, the single leading cause of death in the developed world (Harvard Health Publications, 2005; McGinnis & Foege, 1993). Vigorous physical activity and a sensible diet can control and even reverse high cholesterol without the use of medical intervention (Shelby, 2005). However, for some 13 million Americans, on cholesterol-lowering medicines, diet and exercise do not appear to be a reliable treatment option. Thankfully, science has produced very powerful drugs that can counteract the long-term effects of hypercholesterolemia; therefore, high cholesterol and CVD become very treatable and preventable medical conditions. Moreover, the negative effects of arteriosclerosis, a condition directly related to and caused by high cholesterol, is also reversible (Harvard Health Publication, 2005). Cholesterol is a fatty, waxy, and naturally occurring substance belonging to a class of chemicals known as lipids and is an essential energy provider which fuels cells, serves as a primary building block of cell membranes, is used to make bile acids assisting in the digestion of food, and also is a very important precursor to vitamin D and hormones, including estrogen and testosterone (Harvard Health Publications, 2005). Obviously, cholesterol is very important to the body. Although the liver produces it naturally, and cholesterol is naturally absorbed through the intestinal tract, the human body generally
produces more than an abundant supply. A problem, however, begins to develop when non-endogenous, or dietary cholesterol, becomes overabundant and upsets the ratio of lipids throughout the body. That is, cholesterol is classified into several different types, all with various and distinct influences on the body. Serum cholesterol, or blood cholesterol, is the total, regulated level of cholesterol available in the blood; a desirable level of total cholesterol is less than 200mg (Harvard Health Publications, 2005).

Excessive serum cholesterol, and other metabolic debris that is left over after the body has consumed a sufficient amount of essential nutrients, travels through the vast network of arterial vessels throughout all regions of the body. The circulatory system is the distribution system for the transportation of lipids throughout the body. Although the bloodstream is an efficient delivery system for many types of nutrients, for compounds, and of course for oxygen; before some compounds can be transported via the bloodstream they must be packaged and prepared for circulation. Because cholesterol is a lipid, or fat, dumping it directly in the bloodstream would cause it to congeal and form unusable and dangerous clots. Therefore, in order for cholesterol to be transported effectively, it must be molecularly wrapped in proteins. The lipids, now wrapped in proteins, form tiny particles called lipoproteins. Although the bloodstream carries many types of lipoproteins, when it concerns heart disease the most important lipoproteins include high-density lipoproteins (HDL), low-density lipoproteins (LDL), and very-low-density lipoproteins (VLDL) (Harvard Heath Publications, 2005). Each of these lipoprotein substances has very different effects on the body. For example, LDLs may come from two sources, genetic heritage and dietary habits, but regardless of their origins, excessive LDLs become problematic and dangerous to the circulatory system.
That is, after a substantial amount of time, excessive pressure in the bloodstream, or exposure to toxic agents such as nicotine, homocysteine, or excessive blood sugar, the circulatory system may sustain “nicks” or small abrasions on the inner smooth lining of vessel walls. In a natural process, the body attempts to repair these “nicks” with LDL’s; in turn, excessive repairs of “nicks” trigger more LDLs needed to repair, thereby causing an overabundance of “repair” lipids over a “nick”, ultimately creating a plaque build-up, obstructing blood flow leading to cardiovascular and cerebrovascular disease.

Conversely, as LDL’s contribute to arteriosclerosis, HDLs provide a collection function, “picking-up” other fatty substances, such as LDL’s and VLDL’s and move them through the bloodstream to the liver and intestine, places where lipids are disposed.

Understanding the process of arteriosclerosis and eventual CVD is by no means simple or uncomplicated. However, George, Kong, Thoman, and Stewart (2005) concluded that knowledge of the disease process, among other factors, is optimal for treatment adherence in patients with chronic obstructive pulmonary disease (COPD). Therefore patient education becomes an important primary prevention factor in helping promote medication adherence and overall healthy patient outcomes. Yet, the apparent physiological dichotomy of average American citizens’ trend toward increasing rates of obesity and CVD is the leading cause of death in Americans.

**Statin Therapy**

As the pharmaceutical industry continues to advance the science, technology, and variety of treatments used to control high cholesterol, Americans are in fact enjoying longer life spans and improved quality of living. In particular, powerful cholesterol-
lowering drugs called reductase inhibitors, or commonly called statins, are continuing to show promising evidence against the ill effects of high cholesterol (Harvard Health Publications, 2005). Current research also reveals an arterial anti-inflammatory function, antioxidant effects, and an anti-carcinogenic function in animal models, in addition to an impressive cholesterol-lowering function of the statin class of medications (Davigon & Laaksonen, 1999). To date there are five well-known, brand-name statin medications on the market used to remediate hypercholesterolemia (Harvard Health Publications, 2005). Zocor, Crestor, Lipitor, Vytorin, and Provachol vary in their chemical compounding, but essentially provide the same effects on the human body. The statin drugs work, in part, by increasing the absorption rate of low-density lipoproteins (LDL’s) by the liver as it filters blood, and these generally are well tolerated in large clinical trials (Tomlinson, Chan, & Lan, 2001). Although some fortunate people have been endowed with naturally low levels of LDL’s, and sufficiently high levels of HDL’s, others have to maintain a vigil over the types of foods consumed and the amounts of exercise practiced throughout the week. When considering how one becomes diagnosed with hypercholesterolemia, two critical factors are important to consider. Genetics and healthy behavior are two of the most influential variables associated with the development of high cholesterol (Harvard Health Publications, 2005). Although the treatment for inheritable high cholesterol is primarily medication, with adjunctive exercise and proper diet, patients with non-inheritable high cholesterol are initially and strongly encouraged to initiate treatment with dietary and lifestyle modifications. Shelby (2005) reports that aggressive dietary changes can lower the lipid profile more than 30% by consuming a diet high in
sterols, high in soluble fiber, and coupled with the consumption of less than 200 milligrams of cholesterol daily.

To date, there is little in the literature with regard to the psychological effects of the cholesterol lowering drugs called statins. Although not all cardiac related drugs warrant such study, the statin class medications are an interesting group because they are, in part, prescribed as preventative and prophylactic against coronary artery disease (CAD) and cerebral infarct (stroke) (Davigon and Laaksonen, 1999). Additionally, statin medications are well known to the public, with an estimated 50 million patients on statin therapy; this class of drugs is one of the most frequently prescribed in America today (Harvard Health Publications, 2005). As a point of interest, although statin medications have become very popular, the rates of obesity in middle aged adults, young adults, and children have also significantly increased over the past several years (CDC, 2004).

Further, despite well published guidelines by the American Heart Association regarding healthy eating, the average American consumes, in a conservative estimate, 256 milligrams of cholesterol a day, which is 20% over the amount suggested for a healthy lifestyle (Shelby, 2005). Given the over-consumption of cholesterol laden food items, the lack of diet adherence in general, and the propensity for a sedentary lifestyle, it would appear logical that Americans are exposing themselves to early mortality. An argument can easily be made that, as a possible result of medical and pharmaceuticals technology, Americans may be paying less and less attention to their diet and exercise habits and becoming more and more reliant on the use of statin medication to control the effects of poor dining choices and sedentary lifestyles. However, it may be unfair to criticize all as simply making bad choices; as mentioned previously, not all cholesterol comes entirely
from food sources. In fact, the human body would create more than enough cholesterol, even if none were obtained from diet (Harvard Health Publications, 2005).

Davigon and Laaksonen (1999) have provided additional evidence to suggest that, in addition to their low-density-lipoprotein lowering effects, statin medication have other beneficial effects including anti-inflammatory properties, antioxidant effects, anticarcinogenic effects in animals, anticoagulant effects, stabilization of atherosclerotic plaques, and inhibition of graft rejection after heart and kidney transplantation. With further promising research to come, even suggesting even that statins remove plaque build-up on arterial walls thereby reversing CVD, and providing a minimal blood thinning action, it would appear that several patients and physicians will gain even greater confidence and have much to celebrate regarding this remarkable class of drugs; this may lead to higher levels of over-confident eating.

Diet, Exercise, and Health Beliefs

With seemingly effortless access to fast food, generally poor eating habits, and an increasing sedentary lifestyle, the American population is ripe for a variety of primary health concerns, including hypercholesterolemia, diabetes, and hypertension. The amount, and the availability of fast food is certainly not the primary reason so many Americans have, or will develop, hypercholesterolemia, hypertension, or diabetes; however, the American diet in general, the attitude toward exercise and physical activity, portion regulation, eating habits, health care beliefs, stress management skills, and beliefs around the effectiveness and protectiveness of cardiac and anti-hypertensive medicines
must be investigated further to determine what influence, if any, these variables have on positive health behaviors and healthy outcomes.

The National Institute of Health Technology Assessment Conference reports that one-quarter of Americans are overweight; as many as 40% of women and 24% percent of men are trying to lose weight at any given time; moreover, many have tried diet, exercise, behavior modification, as well as the use of drugs to achieve their goals. Yet, the NIH also reports that, in controlled settings, participants who remained in weight loss programs generally lost 10% of their weight; however, a disappointing one-third to two-thirds of their weight was regained within one year and nearly all the weight was regained within five years. Currently, obesity has become an epidemic problem in American culture, with the ill-effects being suffered across all racial divisions, and age groups—especially children. For example, Popkin and Udry (1998) reported a sample of third generation American children of various ethnic backgrounds including Anglo, African-American, Hispanic, and Asian-American adolescents; in their sample of 13,783, the authors found that 26.5% were obese, and of this sample the majority of obese children were black non-Hispanics, followed by Hispanics, white non-Hispanics, and last, Asian American adolescents. Furthermore, Popkin and Udry (1998) report that in all ethnic groups obesity was more prevalent in males than in females and Asian-American and Hispanic adolescents born in the U.S. were more than twice as likely to be obese than were first generation residents. To illustrate further the obesity epidemic in the United States, Allison, Fontaine, Manson, Stevens, VanItallie (1999) report the estimated number of annual deaths directly attributable to obesity in 1991 was 325,000. Kujala, Kaprio, Sarna, and Koskenvuo (1998), however, report diet and exercise habits can, and
do, dramatically improve longevity and the quality of life for many. Although not all individuals who are obese ultimately suffer cardiac events directly related to poor diets, the data regarding current rates of obesity and the mortality rates due to obesity are discouraging, and appear to reflect a negative change in the American cultural approach to diet and exercise. However, it is important to mention that not all cases of hypercholesterolemia are related to the lack of exercise. For example, Halverstadt, Phraes, Ferrell, Wilund, Goldberg, and Hagberg (2003) report that HDL levels are an important risk factor for cardiovascular disease that may be modified through exercise training; however, the levels of HDLs, and subfractions thereof, are highly variable among individuals, suggesting the response to exercise training may also be influenced by significant genetic variation and the interaction of genetic variation with physical activity. Although most, if not all health care providers will generally agree that routine exercise simply pays rich health dividends, not all obese or overweight individuals are solely interested in the health-related effects of exercise. The current struggle with weight loss, diet adherence, and exercise routines are common topics of conversation among many; however, not all individuals are losing and maintaining a healthy weight for the right reasons. Campos, Saguy, Ernsberger, Oliver, and Gaesser (2006) report the current diversity of cultural and ideological factors as driving the current, world-wide obsession with thinness, especially for young women and girls who have tendencies to demonize certain foods, as well as the development of heavier bodies, in the spirit of fashion and cultural trends.

Although there is overwhelming evidence to suggest that smoking habits, excessive alcohol consumption, diet, and rates of physical activity are important
determinants of CHD, the complex interactions between diet, lifestyle and lipoprotein metabolism collectively determine the eventual development of arteriosclerosis and related cardiac complications (Kromhout, Menotti, Kesteloot, and Sans, 2002). Yet other authors have argued that weight control should not be the primary targets when helping patients avoid CHD. For instance, Campos, Saguy, Ernsberger, Oliver, and Gaesser (2006), contend that too many obesity researchers, diet researchers, and clinicians believe that the only point of a healthy lifestyle is simply to make people thin, or to keep them from getting fat. Conversely, the need to maintain healthy and protective lipid profiles is generally the first strategy in helping patients achieve healthy outcomes. To this end, a balanced, but varied diet, rich in fiber, fruits, vegetables, and antioxidants, as well as heart protective omega-3 oils should be the focus of lifestyle and belief changes. Although any reader can find these healthy suggestions, and much more, in a wide variety of general periodicals, in health related magazines, and in physician education brochures, the American public, as well as American physicians, are continually bombarded with trendy advertisements stressing the importance of discussing the potential benefits of new medications.

At a cursory review, it appears that Americans greatly value the efficacious results that powerful medications have on a myriad of medical conditions which, if not treated, can lead to life-threatening physiological disease and profound psychological distress. By simply picking up any common periodical and perusing the contents, the health care priorities of the American public become very clear. That is, the American culture appears to be a medicine-seeking population. For instance, the American Academy of Physicians Assistants report that in 2005, physician assistants alone wrote
278,000,000 prescriptions. This statistic indicates an increase of more than 26 million prescriptions from 2004. Interestingly, Calandra (2001) reports that over the past decade, health club memberships have increased by only one-third to approximately 30 million total members throughout the United States. These trends in prescription-seeking and in exercise habits suggest a greater need for expedient medical treatment and less concern for lifestyle modification. The sheer number of medication advertisements and the attractive manner in which they are advertised can provide any casual reader or television viewer with a reasonable amount of evidence for the value Americans place on medications. In fact, most pharmaceutical advertisements provide a simplified symptom checklist, on which potential patients, or more accurately, consumers are asked to endorse the presence, or absence, of certain symptoms. This advertising process may minimize, or negate the need for patients to manage their diabetes, hypertension, or hypercholesterolemia with lifestyle modification, namely diet and exercise, while concomitantly undermining the physician’s role as educator. With a patient-driven healthcare market, it is apparent that the pharmaceutical industry maintains successful marketing programs, which are directly targeting patient populations. Additionally, patients are provided with enough information about the helpful effects of prescription drugs while simultaneously emphasizing the current debilitating effects of their unique disease states, that a state of anxiety occurs and energizes their prescription seeking behavior and their beliefs that medication is the most time sensitive and efficacious treatment option. Yet the literature regarding the efficacy of diet and exercise habits in treating primary health conditions and the ill effects of a sedentary lifestyle is very well
established (Shelby, 2005; McGuinnis & Foege, 1993; Kujala, Kaprio, Sarna, & Koskenvuo, 1998).

The current study is important because health-related beliefs and health-related behaviors are becoming increasingly important factors when considering the potential mediating or moderating variables that may drive patients’ chief complaints, treatment adherence, or medication reliance. For example, a review of the literature on diabetes management suggests levels of noncompliance with treatment is related to an individual’s personal health belief model, and to prejudgment by health care professionals about what patients can accomplish, based on their age, education, or socioeconomic status; this may lead to negative outcomes (Leichter, 2005). Additionally, noncompliance with medication regimes among patients with bipolar disorder reveals rates of noncompliance as high as 64%; knowledge of the factors associated with noncompliance would enhance clinical management and help patients achieve positive outcomes (Colom, Vieta, Martinez-Aran, Reinares, Benabarre, & Gasto, 2000). As such, a reasonable argument can be made for patients who medicate on cholesterol lowering drugs. Specifically, it is desirable to study the psychological effects that statin medications have on patients’ belief systems. Initially, some fundamental questions are raised. For example, does taking statin medicine enhance a patient’s overconfident eating behavior after he or she begins the regime and is able observe how quickly positive effects are obtained? Similarly, does taking the medicine foster an overconfident belief in the medicine’s protective value, thereby reducing the perceived need to participate in routine exercise programs and to reduce sedentary lifestyle? The answer to these questions will yield
important conclusions, impacting the patient’s quality of life, his or her belief system, as well as a physician’s prescribing behavior and role as educator.

**Health Belief Model and Social Learning Theory**

As a mediating or moderating variable that potentially influences a person’s belief system, the Health Belief Model (HBM) can have long reaching influences on health and behavior. An entire discipline of clinical psychology has been dedicated to the investigation, understanding, and remediation of illogical, even unhealthy beliefs. The study of Social Learning and Cognitive Therapy, with particular influence from the HBM, can provide the necessary cognitive framework when considering potential mediating or moderating variables, which may ultimately influence a person’s health related outcomes. Although the strength and salience of an individual’s belief system originate from a variety of sources, cognitive therapists suggest that core beliefs, or schema, are developed over the course of an individual’s lifetime and are influenced by environmental, cultural, and personal variables including family and social history, reinforcement histories, education, temperament, intelligence, socio-economic status, and even religious practices (Freeman, Pretzer, Fleming, & Simon, 1990). In attempting to understand how cognitive and behavioral variables influence beliefs associated with health maintenance and disease prevention, a review of the major conceptual models will provide a more specific foundation of knowledge in understanding what motivates some persons to adhere to medical regimes, participate in healthy diets, practice regular exercise, regulate overconfidence, and maintain overall healthy outcomes.
The HBM is a conceptual system for helping to understand, explain, and predict preventative health behaviors (Janz & Becker, 1984). The HBM offers five descriptive areas which are believed to influence health beliefs and behavior: 1) the individual’s perceived susceptibility to illness, 2) the perceived seriousness of the disease, 3) the perceived benefits of taking action, 4) barriers interfering with action, 5) cues to taking action, and self-efficacy; these are the major tenets that frame the HBM (Wiebe and Christensen, 1997). Investigating individuals’ beliefs according to these major domains will yield patients’ conceptualization of their conditions, as well as their resources to cope with, and take action against the diseases or predict how patients maintain healthy beliefs and behaviors. The HBM has been applied to a variety of chronic medical conditions. For example, Patino, Sanchez, Eidson and Delmater (2005), have applied the HBM to a sample of minority adolescents with type I diabetes and concluded that evidence was provided to suggest that youth with type I diabetes mellitus reported greater short-term health risks, compared to longer-term risks, but perceived less risk to themselves as compared to others. Although the study did not provide support for the HBM’s predicting regimen adherence, the application of the HBM is nevertheless helpful in gaining a preliminary understanding about the reasons why some patients hold particular belief systems that may be counterproductive to healthy outcomes. Similarly, George, Kong, Thoman, and Stewart (2005) concluded that health beliefs, knowledge about and faith in the treatment, routinization of drug therapy, knowledge and acceptance of the disease process and recommended course of treatment are critical variables for optimal adherence in patients with chronic obstructive pulmonary disease (COPD). Although many attempts have been made to understand the theoretical reasons for non-
adherence, the mainstay of several studies has been isolated to specific clinical populations and has examined specific factors including patient intelligence, familial support, socioeconomic status, patient education, dosing effects, and physician/patient interaction, to cite only a few. Although the influence of these variables cannot be overstated, George, Kong, Thoman, and Stewart (2005) also report patient education directed at focusing on the course of the disease, as well as education regarding the need for long-term treatment may help improve patient adherence; yet the authors also report patients may be likely to alter the recommended course of management, based on how they feel and believe, especially if the disease is relatively symptomatic as is the case for COPD.

Similar in some respects to the HBM, Social learning theory suggests that the social environment is a significant source of behavior cues providing the impetus for influence over human behavior. Baranowski, Perry, and Parcel (1997) suggest that a systematic review of the relevant environmental constructs associated with non-adherence, places health care providers in an advantageous position to facilitate positive patient outcomes and discourage unhealthy outcomes. For example, individual components of Social Learning Theory; including environment, expectation, self-control, and reinforcement, among other components, suggest that patients will not actively engage in healthy outcomes if they do not expect the outcome to be successful; therefore, engendering a sense of self-efficacy becomes a primary factor in facilitating positive patient outcomes (Glanz, Lewis, & Rimer, 1990).

Another model for predicting healthy patient outcomes involves a review of Self-Regulation Theory. Leventhal, (1984) suggests that a patient’s adherence to any
treatment regime is intimately connected with the manifestation of physical symptoms and illness memories, thereby mediating the compliance process. For instance, a clear example of Self-Regulation Theory can be found in a review of kidney transplant patients studied by Siegal and Greenstein (1998). In their study, the authors reported patients were most likely to adhere to their treatment regimes when they were convinced that their medications must never be missed, their medications’ effects are no longer effective after a day, and physical symptoms interfered with the activities they needed to complete. Conversely, partial compliers were not likely to believe that the medication was essential, that the therapeutic half-life was greater, and that their physical symptoms were considered milder when compared with the previous group.

**Biopsychosocial Model**

In order to assess any health-related question properly, a belief in, and practice of the biopsychosocial model provides one of the most comprehensive traditions to conceptualize a patient’s presenting problem(s). Stedman’s medical dictionary defines the biopsychosocial model as a conceptual model, which assumes that the psychological and social factors must also be included along with the biological factors in understanding an individual’s medical illness or disorder. In assessing and treating for healthy patient outcomes, the biopsychosocial model mandates that patients undergo assessment(s) that are multifaceted and interdisciplinary, covering various disciplines that review individual factors specific to each area of expertise. This level of integration allows for comprehensive review of all systems that may play roles in disease manifestation, maintenance, and recovery. Conversely, the traditional biomedical model
postulates a conceptualization that excludes psychological and social forces in patient assessment and diagnosis, whereas the biopsychosocial model is more comprehensive and punctuates the importance of individual psychological and social differences. In studying the psychological, social, and behavioral effects of hypercholesterolemia, diet and exercise adherence, and providing overconfident beliefs about cholesterol-lowering medicine’s effects on healthy behavior, the value of endorsing the biopsychosocial model cannot be overstated. That is, because high cholesterol cannot be attributed solely to genetic factors, the psychological, behavioral, and social influences of practicing routine exercise, consistently maintaining a healthy diet, and also practicing effective stress management, such as controlling anger, maintaining good sleep hygiene, and scheduling routine relaxation time, become increasingly important in understanding how patients develop high levels of cholesterol, maintain the integrity of their treatment regimes, or participate in rehabilitative and preventative health measures. Concomitantly, understanding the micro and macro-social forces impacting on a patient’s level of functioning is also critical in the biopsychosocial review of each patient’s individual medical and psychological history. For instance, as the American culture becomes increasingly time-sensitive, goal-focused, and achievement-oriented, understanding and incorporating of the social influences of behavior, such as emotional stress, pollution, over-crowding, normative social influence of dieting and exercise, informational social influence of medications, private acceptance, conformity, personal sleep habits, and the human body’s response to long term adaptation to stressors must be considered in the holistic assessment of each patient.
As a part of the greater ecological systems, and perhaps one of the most influential determinants of human behavior, the socially mediated forces that impact upon a patient’s healthy or unhealthy outcomes includes the ever present economic market in which they currently function. As pharmaceutical companies continue to implement the very effective direct-to-consumer advertisements (DTCA), the medical marketplace continues to be shaped by the sheer power and wealth that the pharmaceutical industry brandishes over consumers, prescribers, and legislators, using their very sophisticated and indulgent marketing campaigns in a fashion, ultimately, most advantageous to their own endeavors. For instance, Donohue and Berndt, (2004) reported that spending on DTCA increased from $266 million in 1994 to $2.6 billion in 2002, making this form of pharmaceutical marketing the object of substantial controversy. Rosenthal, Brendt, Donahue, Epstein, and Frank (2003) have additionally reported in a study, that the effects of DTCA accounted for 12% of the increase in prescription drug sales between 1999 and 2000. Consequently, an argument can be made for the development of overconfident belief systems that are essentially developed out of, and maintained by the propagation of a seemingly endless barrage of medication commercials and advertisements, by treatment programs, and by favorable prognosis as proliferated by the DTCA campaigns. In fact, Mintzes Barer, Kravitz, Bassett, Lexchin, Kazanjian, Evans, Pan, and Marion (2003) concluded that more advertising leads directly to more requests for advertised medicines and more prescriptions in general; furthermore, the authors contend that if DCTA is brought into a conversation between patients and physicians, that conversation is quit likely to end with a prescription, often despite the physician ambivalence about treatment choice.
It is important to understand that most if not all pharmaceutical companies practice this strategy as a marketing and sales tool in attempts to gain the greater market share for their products. That is, the influence DCTA campaigns on patients, the social, professional pressure to physicians, and tangible reinforcers that physicians receive on an almost daily basis may actually serve to entice patients to ask for the most well-advertised medication and for the physicians to actually prescribe the most sought after medications. Lacasse and Leo (2005), in the case of antidepressant medications and the controversial serotonin hypothesis, maintain that DTCA campaigns are seductive to physicians and patients because patients who present with a “chemical imbalance” and are convinced that they are suffering from a neurotransmitter deficiency are most likely to seek a prescription for an antidepressant and they may be skeptical of physicians who suggest other interventions such as cognitive-behavior therapy. Nevertheless, the social messages embedded in some DCTA campaigns speak directly to patient consumers by suggesting the disease is predominantly caused by genetic inheritance with little influence from environmental or behavioral factors. Upon careful review of these campaigns, one can hear the bias toward the genetic inheritance of disease, thus assuaging the guilt of patients for not practicing exercise habits of healthy eating. Either directly or indirectly, the large and wealthy pharmaceutical industry is shaping the relevant health beliefs and behaviors of many American patients and possibly of physicians. A review of other industrialized countries may provide interesting social correlations, especially when considering countries with advanced economies such as Asia and countries of the European Union.
Possessing an understanding of the biopsychosocial factors that influence high cholesterol can further help physicians to educate and treat their patients in a number of ways. The information and data revealed in the current study can assist physicians in understanding the nature of a patient’s treatment adherence according to the influential and ever present biopsychosocial factors. Moreover, conceptualizing the whole patient from this perspective will provide suggestions of possible treatment barriers or of facilitators acting upon the patient, suggesting data for, or against, the likelihood that patients will, or will not, become over-confident regarding the effects of their medications, violate their dietary plans, or fail to practice cardiovascular exercise routinely. Similarly, patients can also benefit from understanding their own biopsychosocial conceptualizations by improving their self-awareness regarding the behavioral and social factors that influence healthy or unhealthy behaviors. For instance, patients on cholesterol-lowering medicines can discover particular behavioral habits that may be unhealthy but are very consistent with their current social or work environments. They can also discover a particular cognitive susceptibility to health related beliefs, such as over-confident eating, or the influence of social learning on health maintenance habits. An example may include the DTCA campaigns providing the social learning opportunities to create a minimization or rationalization effect, thereby undermining the importance of diet and exercise adherence. To illustrate further the importance of the various biopsychosocial factors, Peyrot, McMurry, and Kruger (1999) found an interaction between biologic and psychological factors, with psychosocial factors accounting for more variance in glycemic control within Type 1 Diabetic patients; the authors found that stable psychosocial resources (i.e., education, being married, and
positive coping styles) were associated with better chronic glycemic control, but chronic stress and regimen nonadherence were associated with worse transient glycemic control. Similarly, a conceptualization from the biopsychosocial model provided evidence that elderly individuals are at an increased risk for CVD, especially if they are un-partnered, socially isolated, depressed, and report a poorer quality of life (Stuart-Shor, Buselli, Carroll, & Forman, 2003).

**Overconfidence**

An argument can be made that widespread technology, regardless of the field, may make consumers feel secure, comfortable, brave, lazy, entitled, or even overconfident. As the pharmaceutical industry continues to research and develop new drugs designed to promote wellness, cure diseases, and reverse debilitating conditions, some investigation seems necessary regarding the cognitive effects of such medical advancements. That is, do medicines mediate or moderate psychological belief systems related to health and wellness, prevention and cure, or even diet and exercise habits? In particular, the present study is designed to investigate the psychological effects that cholesterol-lowering drugs have on healthy patient outcomes. The need to study the psychological, specifically cognitive and behavioral effects of this class of medications is punctuated by their ever-growing popularity. As a construct, overconfidence suggests that an individual seems to believe that their reasoning processes, belief systems, and subsequent conclusions are just fine the way they are, and there is no need to take remedial action in the way they think or act (Aronson, Wilson, & Akert, 2005).
Adherence/Non-adherence and Locus of Control

There are indications that health beliefs are significant predictors of adherence; specifically, the perceived threat of an illness as a health related belief has received widespread attention in the literature regarding treatment compliance and adherence (Carpenter, 2005). In the previous section, the role of overconfidence was reviewed, and was hypothesized as having an impact on the influence that statin medications have on healthy patient outcomes. Whether a patient adheres or does not adhere to his or her treatment regimen appears to be in some fashion related to overconfidence, and as Carpenter (2005) describes, it is also significantly related to the construct of perceived threat. That is, the motivation for any individual patient to non-adhere to a treatment protocol will be complex and interconnected with biological factors including the treatment’s physiological effects, social factors including the ease, costs, and availability of prescribed treatments, and psychological variables including an individual’s beliefs, about illness; these factors, however, may be central in the prediction of adherence to diet, exercise, and medication regimens. In particular, then, the current study suggests that there is a level of overconfidence which may develop because patients on statin therapy may be more likely to develop beliefs which are consistent with the notion that they are completely, or mostly, protected from future cerebrovascular or cardiac events. To further substantiate this claim, the psychological construct of perceived threat could also be likened to a patient’s locus of control. Locus of control refers to a learning process during which individuals develop a belief system whereby they believe, or predict, that certain outcomes are a result of their action (internals) or a result of other forces independent of themselves (externals) (Rotter, 1954). Essentially, understanding
patients' locus of control is helpful regarding their levels of perceived control of their illness and environmental demands. Similarly, the construct of Health Locus of Control was also derived from Social Learning Theory and developed out of Rotter's original work in 1954. However, Wallston, and Wallston (1978) recognized that there was difficulty in predicting health behavior specifically from generalized expectancy measures such as Rotter's scale. Moreover, Wallston and Walston (1978) also discovered through observations of recently diagnosed diabetic patients and their families that medical staff continued to stress the importance of the patient's active role in his or her own health care. It was clear, based on their efforts that the medical staff was trying to establish an internal locus of control in this patient population in anticipation of facilitating treatment adherence and positive outcomes. Through this observation, Wallston and Wallston (1978) developed the Health Locus of Control Scale (HLC), a scale similar to Rotter's original Internal/External Locus of Control Scale, but with specific application and item content unique to health care situations. The HLC scale is recommended in conjunction with behavioral measures to evaluate health education programs. Because it appears that individuals with higher levels of internal locus of control appear more likely to engage in positive health related behaviors and fewer non-adherent behaviors, it is evident that the Health Locus of Control accentuates the significance of physicians as an educators, endorsing also the need to involve themselves in training patients to hold more internal beliefs (Wallston & Wallston 1981). Thus patients would apparently be more likely to adhere to medical treatments, to low fat diets, and to exercise regimens if they perceived their behavior did in fact demonstrate causal relationships with positive and healthy outcomes; also included would be the physicians'
reinforcement of this belief. However, for some patients, the possibility of experiencing positive reinforcement, in this case healthy outcomes, as a result of their own healthy habits including exercise, dieting, or medication adherence may be too temporally and spatially discontiguous to affect their healthy behavior practices positively. For instance, Weiner (1986) suggests that Attribution Theory also provides a basis for understanding the human desire to assign attribution or causality to particular events in their lives when they are spatially and temporally contiguous. Additionally, Byrns (2000) studied the low back pain of factory workers and concluded that employees who attributed pain to internal constructs including knowledge of back safety, for instance, had a tendency to experience less distress as compared with those who assigned external attributions. Last, the Protection Motivation Theory proposed by Rogers suggests that the value of fear coupled with communication and self-efficacy may lead to the motivation necessary for developing coping mechanisms such as positive, health-related behaviors. Ultimately, determining what facilitates or inhibits patients from adhering to prescribed courses of treatment is as individual and unique as the patients themselves. The theories described above, provide a preliminary review of the potential mechanisms which may energize non-adherence.

Rationale

After direct observation and interaction with several individuals receiving statin therapy for hypercholesterolemia, a common pattern of behavior and a common theme of beliefs became ever present. That is, pursuant to these observations and interactions, individuals who were currently receiving statin therapy were feeling apparently more confident, less guilty, generally less concerned about indulging in overeating, making
poor diet choices, skipping exercise sessions; they also verbalized the belief that statin medications protected them from all the consequences associated with overeating, poor dieting, and lack of, or diminished, exercise routine. Although this observation was indeed casual and involved only a few individuals, these observations and interactions did energize curiosity and the desire to study this phenomenon under more controlled and efficacious conditions. To illustrate this point further, during the course of interaction, the majority of these individuals, both males and some females, reported less concern about eating a high fat lunch or dinner because they were now on a “cholesterol medicine,” and some even reported they could “not worry as much” as they had, prior to taking the medicine, because the medicine controlled their high cholesterol so effectively and efficiently that they felt comfortable indulging. Further discussion revealed that individual exercise habits and general non-adherence to diet were perceived to be equally less important, and were frequently and routinely violated. For instance, some reported beliefs of failure because exercise and diet regime did not significantly lower cholesterol, indicating that some individuals were genetically predisposed to have elevated cholesterol; others held beliefs of frustration, indicating difficult exclusionary diets and a strenuous exercise program lowered cholesterol levels only incrementally, yet low doses of statin medication lowered cholesterol levels much more significantly and in a quicker amount of time. Interestingly, the individuals who felt frustrated by the notion that the statin medication worked so well and so easily versus the need to change their lifestyles, including diet and exercise habits, felt more confident, by individual report, to eat anything and in any amount they desired.
It was this level of casual discussion, observation, and questioning that provided the impetus for the current research. Several research questions began to arise and the aspiration to investigate overconfident beliefs and subsequent unhealthy eating behaviors became apparent. Although the select few idiosyncratic observations and interactions may undeniably represent a skewed sample of the statin-taking population, it nevertheless provides a rationale to study the phenomenon in a systematic and objective manner.

Purpose of Study

The purpose of the current study is to examine the psychological and behavioral concomitants that statin medications have on patients’ eating habits, levels of overconfidence regarding diet non-adherence and exercise non-adherence, and their overconfident beliefs in the protective value of statin medications. Essentially, the central purpose of the present study is to identify relationships, if any, between the behavioral action of routinely taking cholesterol-lowering medication and the health related beliefs and behaviors which may be negatively altered to produce poor health outcomes pursuant to ingesting medication on a routine basis. The exact purpose of the study is not to review the powerful influence of placebos, nor to question the effectiveness of the statin family of medicines; however, the psychological influences, both behavioral and cognitive correlates, of consuming a statin drug on a regular regime is a worthwhile research endeavor by itself.
Research Questions and Hypotheses

The research questions for this study were based on presumptions that patients who medicate on cholesterol-lowering agents, specifically statin medications, are susceptible to beliefs that motivate overconfident eating behaviors, diet and exercise non-adherence, as well as substantiating overconfident beliefs in the protective value of statin therapy. In general, the hypotheses of this study purport that individuals who manage their hypercholesterolemia through statin therapy will be likely to develop beliefs and behaviors that are consistent with unhealthy levels of overconfident eating, of diet and exercise non-adherence, and of overconfident beliefs in the medications’ protective value. Specifically then, five hypotheses were separated and developed. They are as follows:

**Question 1:** Is it accurate to suggest that among patients receiving statin therapy, the medication will successfully reduce levels of cholesterol from pre-medication levels, yet others among these patients will not respond positively to statin therapy?

**Hypothesis 1:** Not all individuals taking statin therapy for hypercholesterolemia will effectively lower and manage their high cholesterol due to other factors which mediate or moderate counterproductive unhealthy outcomes.

**Question 2:** Will those patients whose cholesterol is significantly reduced by the effects of medication, endorse a level of agreement on statements that suggest diminished levels of exercise from pre- to post-medication time periods?

**Hypothesis 2:** Patients who have reportedly improved their levels of cholesterol will be likely to engage in less frequent exercise.
Question 3: Will those patients whose cholesterol is significantly reduced by the effects of medication endorse a level of agreement on statements that suggest diminished levels of diet adherence from pre- to post-medication time periods?

Hypothesis 3: Patients who have reportedly improved their levels of cholesterol will be likely to engage in less frequent diet adherence.

Question 4: Will those patients, whose cholesterol is significantly reduced by the effects of medication, possess over-confident beliefs about the protectiveness of their statin medication?

Hypothesis 4: Patients on statin therapy with improved levels of cholesterol will possess levels of overconfident belief regarding the medications protectiveness.

Question 5: Will beliefs about the causes of high cholesterol be related to diet and exercise non-adherence and medication overconfidence?

Hypothesis 5: Beliefs and knowledge about the causes of high cholesterol are related to exercise non-adherence, diet non-adherence, and medication overconfidence.
CHAPTER 2
METHODOLOGY

Participants

The participants for this study were randomly selected from a population of primary care patients receiving care from their primary care physicians’ offices in eight locations. The primary care practices were located in Northeastern and Southeastern Pennsylvania; one practice was located in New York. Either male or female participants of any racial background who were above 18 years of age, with a diagnosis of hypercholesterolemia (high cholesterol) were able to participate in this study. The completed questionnaires of 64 participants with a diagnosis of hypercholesterolemia, who were receiving statin therapy, were included as analyzed data sets. Participants not diagnosed with hypercholesterolemia and/or younger than 18 years of age were excluded from the study. Participants were advised of their right to not participate in the study, as well as their right to withdraw from the study at any point in time. Participants were also required to read and comprehend the English language.

Participants were not required to sign an informed consent form, because no personally identifiable information was asked, recorded or otherwise collected. However, a letter of solicitation was attached as a cover letter identifying the investigators, their contact information, as well as the contact information of PCOM’s Institutional Review Board. There were no personal identifiers that could provide evidence for tracking a participant’s endorsements on the collected surveys. Participants who were eligible for the inclusionary criteria were asked if they would be willing to participate in a research study designed to study the psychological effects of cholesterol.
medication; they were asked to endorse their levels of agreement on a survey specific to the design and intention of the study.

**Design**

The current study uses various statistical methods including anovas, reliability coefficients, and descriptive statistics. Additionally, correlation measures are used to assess the degrees of relationships, if any, between numbers of different demographic factors and respondent's health related behaviors. The above mentioned statistical tests were engaged to determine the statistical properties between various factors, including health related beliefs specific to diet non-adherence, to medication overconfidence, and to exercise non-adherence. The demographic data described in the descriptive statistics consist of age, sex, medication dosage, length of time on medication, type of medication, frequency of exercise habits, and knowledge regarding disease and preventative care.

**Description of Instruments and Measures**

A 22 item demographic survey, and a 45 item survey of health-related beliefs and behaviors was constructed to solicit the levels of agreement that participants had on statements regarding several health-related beliefs and behaviors, including dietary habits, exercise habits, knowledge and beliefs about high cholesterol, locus of control, knowledge and beliefs about medication, knowledge and beliefs about the influence of exercise and diet on high cholesterol, basic demographic information, and a selection of statements determining the levels of beliefs and frequency of health-related behavior,
before and during statin therapy. The statements have been developed by the author and designed to provide an indication of agreement along a five-point Likert scale.

**Procedures**

*Creation of Packets*

The measures were developed, assembled into identical packets (Appendix A), and were introduced with a brief solicitation letter (Appendix B) indicating the names of the researchers, a brief narrative describing the nature of the study, how to contact the researchers in the event that any questions arose, the right to discontinue at any point, detailed instructions about how to complete the surveys and an approximation of the length of time it would take to complete the surveys. The information contained in the cover letter was presented to the subject in language that was devoid of technical jargon. Each packet, including all forms within each packet, was numbered /coded to ensure, that in the event a packet became disassembled, the researchers could match corresponding forms accordingly. Again, the study did not require the participant to provide any personally identifiable information on any forms or to any researcher directly. There were a total of 100 packets assembled; there was a response of 64 completed surveys.

*Survey Development*

The investigators developed the surveys for this study with careful and comprehensive consideration from the relevant literature. Statements were designed to elicit a level of agreement along a five point Likert scale. In all, 42 statements were generated and each statement was fit into a specific subscale being studied. For example,
the purposes of this study were to reveal relationships between and among the consumption of statin medication, overconfidence, and diet and exercise non-adherence; therefore, statements were constructed to solicit feedback along each of these factors. Surveys were also checked for ease of understanding, relevance, and content validity by a panel of fourth year graduate students in the context of a research methods class, by the Director of Research in Clinical Psychology at Philadelphia College of Osteopathic Medicine, and by the Chairperson of this research project. All comments and suggestions for change were carefully considered and the surveys were adjusted and revised when necessary.

Site Selection

Site selection was determined by the willingness of the primary care physician to have his or her patients become available to volunteer in this study. The primary care practices previously listed were verbally solicited by investigators to determine their willingness to participate in the study. Physicians in private practices, group practices, or hospital-affiliated practices were advised to consult their individual institutional review boards, if necessary, and inform investigators of any additional institutional review board requirements. Ultimately, none of the sites had additional institutional review board requirements.

Participant Recruitment

Once the study officially began, a researcher personally delivered the packets to the sites and provided information and training on the distribution of packets to patients.
One primary care nurse or receptionist at each site was identified as the distributor and collector of the completed packets. The manner in which the packets were assembled and constructed allowed for an entirely self-explanatory completion of the packet and required little or no interaction from the distributor. To recruit participants, the distributor asked all patients who presented to the primary care practice over a 10-day period to participate in a research study investigating the psychological effects of cholesterol medication and health-related beliefs. The distributor also indicated to the patient the survey would take approximately 15-20 minutes to complete; that it would contain no items that would identify any personal information, and that the patient could discontinue the survey at any point without any consequence to his or her care. If the patient agreed to participate in the study, the distributor handed the patient a complete packet, asking him or her to read the directions carefully, fill out the survey completely, and hand it back into the distributor when completed. This process continued until 64 different patients, henceforth referenced as participants, had completed the surveys. After 64 individual surveys were completed the data collection phase of the study was complete and no further direct interaction with participants occurred.

Data Entry, Statistical Analysis and Data Reporting

Raw data compiled from completed surveys was coded, and for some items, was reverse scored, and initially entered into a Microsoft Excel spreadsheet for visual inspection and ease in the data management. Subsequently, the coded data were imported into the Statistical Program for the Social Sciences (SPSS, Version 14.0) for
psychometric analysis. Descriptive and inferential statistics were conducted, results analyzed, graphically displayed and reported.
CHAPTER 3

RESULTS

This study was conducted over a one year period, from November, 2006 through November, 2007. A total of 64 participants completed the necessary questionnaires for this study. In order to fulfill the inclusion criteria, all participants were randomly selected from a population of primary care patients diagnosed with high cholesterol, who were currently taking a statin medication to control high levels of cholesterol. Overall, 61 (95.3%) of the participants were diagnosed with high cholesterol and taking a statin medication. The remaining three participants either did not answer the questions associated with diagnosis or were not taking statin medicine. Participation in this study was completely voluntary and each participant completed a survey that did not reveal any personal identifying information. Additionally, data collected on the surveys could not be tracked to individual participants. A signature verifying informed consent was not required because no personally identifying information was collected. However, an introduction letter describing the nature, scope, and potential risks, was attached to each survey packet and included the researcher’s contact information (appendix A). Participants could freely remove themselves from this study at anytime with absolutely no negative influence to their care. All participants were over the age of 18.

Responses to the Survey of Health-Related Beliefs and Behaviors

The Survey of Health-Related Beliefs and Behaviors is a 45 item self-report survey which provides a series of statements whereby participants are asked to rate their levels of agreement on a five point Likert scale, in which one (1) represents disagree; two
(2) represents somewhat disagree; three (3) represents neutral or unsure; four (4) represents somewhat agree and five (5) represents agree (Appendix C). The 45 items on the survey were broken down and classified into subscales. Specifically, subscales were developed to assess levels of agreement with each of the following constructs: medication-overconfidence protection, diet non-adherence after medication, diet non-adherence before medication, exercise adherence before medication, and exercise adherence before medication (see tables 1-5). As a subscale, medication-overconfidence protection was developed to determine if a subject was likely to have an elevated sense of confidence in their medication’s protectiveness against further increasing levels of cholesterol produced by dietary habits (Cronbach’s Alpha = 0.782). The subscale, diet non-adherence before medication involved a set of variables developed to determine the level of a subject’s dietary habits before initiation of his or her current medication regime (Cronbach’s Alpha = 0.748). Diet non-adherence after medication included statements designed to solicit a subject’s agreement on dietary attitudes and behaviors after medication was dispensed and taken (Cronbach’s Alpha = 0.435). Last, exercise non-adherence before and after medication, both of which were single items, were developed to solicit agreement on a subject’s level of cardiovascular exercise prior to starting medication and during his or her current course of statin medication. The exercise subscales were developed as single items; therefore, reliability coefficients were not possible.

In addition, participants were asked to complete a brief demographic survey (appendix B) consisting of 20 items which requested participants to indicate their ages, races, length of time on cholesterol medication, recent changes in dosage, frequency of
exercise, current height, current weight, low-fat diet adherence, medication name, medication dosage, physician satisfaction with cholesterol levels, and questions related to health care knowledge. The following tables, graphs, and discussion represent the final results and provide descriptive statistics, correlations and anovas for the hypotheses of this study.

Table 1
Variables by Subscale

<table>
<thead>
<tr>
<th>Overconfidence</th>
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<tr>
<td>1. Since I’ve been taking cholesterol-lowering medicine, I can eat anything I want.</td>
</tr>
<tr>
<td>3. I believe my cholesterol-lowering medicine, without diet and exercise, completely protects me from developing higher cholesterol levels.</td>
</tr>
<tr>
<td>5. Since I have been taking cholesterol-lowering medicine, I feel less worried about choosing what I eat.</td>
</tr>
<tr>
<td>9. Taking cholesterol-lowering medicine regularly is more important than maintaining a healthy diet.</td>
</tr>
<tr>
<td>10. Taking cholesterol-lowering medicine regularly is more important than exercise.</td>
</tr>
<tr>
<td>11. Because I take cholesterol-lowering medicine I can eat “fast food” 2 or more times a week.</td>
</tr>
<tr>
<td>15. I trust that the cholesterol-lowering medicine I am taking will effectively lower my cholesterol without diet and exercise.</td>
</tr>
<tr>
<td>16. If my cholesterol level continues to remain high while on cholesterol-lowering medicine, I can have my dosage increased and continue eating any of the foods choose.</td>
</tr>
<tr>
<td>21. Taking cholesterol-lowering medicine allows me to occasionally eat fattening food and over indulge.</td>
</tr>
</tbody>
</table>
Table 2
Variables by Subscale

Diet Non-Adherence after Medication

8. Before I began taking cholesterol-lowering medicine, I ate “red” meat more than twice a week.

18. Before I began taking cholesterol-lowering medicine, I ate more than 3 servings of dairy product daily.

26. Before I began taking cholesterol-lowering medicine, I ate “fast food” 2 or more times a week.

27. Before I began taking cholesterol-lowering medicine, I ate more than 5 servings of fruits and vegetables daily.

29. Before I began taking cholesterol-lowering medicine, I was not worried about my diet.

31. Before I began taking cholesterol-lowering medicine, I watched the portion size of my food servings.

Table 3
Variables by Subscale

Diet Non-Adherence before Medication

6. Since I have been taking the cholesterol-lowering medicine, I eat “red” meat more than twice a week.

7. Since I have been taking cholesterol-lowering medicine, I eat more than three servings of dairy products daily.

19. Currently, I eat five or more servings of fruits and vegetables daily.

28. Currently, I eat “red” meat more than twice a week.
Table 4
Variables by Subscale

**Exercise Adherence before Medication**

30. Before I began taking cholesterol-lowering medicine, I practiced cardiovascular exercise 3 times a week (for at least 30 minutes) or more.

Table 5
Variables by Subscale

**Exercise Adherence after Medication**

12. Since I have been taking cholesterol-lowering medicine, I practice cardiovascular exercise 3 times a week or more.

**Descriptive Statistics**

Of the 64 participants who voluntarily completed surveys for this study, 24 participants were males (37.5%) and 40 were females (62.5%) (Figure 1). A total of 51 (79.7%) participants were White, eight (12.5%) were Black, 3 (4.7%) were Hispanic, and two (3.1%) were Asian. None of the participants described himself or herself as “other” (Figure 2). Regarding age, the largest group of participants, 19 in total (29.7%) indicated they were between the ages of 46-55. The second largest group, 14 (21.9%) participants, reported they were between the ages of 56-65. The third largest group of participants with regard to age consisted of the 13 (20.3%) participants who reported their ages as 36-45. The respective age ranges of the remaining participants consisted of 12 (18.8%), who reported their ages as 66 or older, 3 (4.7%) 26-35, and 3 (4.7%), who reported their ages as 18-25 years old (Figure 3). A significant number of participants,
27 (42.2%), reported taking statin medication(s) for a period of 2-4 years, with the second largest group, 23 (35.9%), who indicated a period of one year or less on statin medication(s) (Figure 4).

*Figure 1.* Number of participants by sex.
**Figure 2.** Number of participants by ethnicity

**Figure 3.** Number of participants by age ranges.
Figure 4 represents the length of time on medication; it shows the greater number of participants, 27 (42.2%), reported taking a statin medication for a period of two through four years, and the second largest group, 23 (35.9%) of the participants reported taking a statin medication for a time period of one year or less. The third largest group, 6 (9.4%) of participants reported having been on medicine for a time period of five through seven years, with the fewest number of participants, 2 (3.1%) reportedly have taken statin medication for a period of 8 through ten years. Four participants (6.3%) did not select a time frame, and one respondent reported having taken statin medication for a period of twelve years.

Figure 4. Number of participants by length of time on medication.
Figure 5 displays the frequency of weekly exercise sessions indicated by participants, with the largest groups represented in the following categories, 18 (28.1%) “I rarely practice cardiovascular exercise,” and 18 (28.1%) reported “less than three times weekly.” Fifteen (23.4%) of the participants reported, that they exercised “more than three times weekly,” and 13 (20.3%) who responded as “3 times weekly.”

Figure 5. Number of participants by number of weekly exercise sessions: greater than three times weekly; three times weekly; less than three times weekly; rarely practice cardiovascular exercise.
According the Body Mass Index (BMI), 23 (35.9%) of participants were classified as overweight or obese. The remaining 17 (26.6%) were classified as being of normal weight. One respondent did not provide his or her height and weight, therefore BMI was not able to be calculated.
Figure 7. Number of participants by self-rating of integrity of dietary habits. Key: Honest = Follow a low-fat diet daily and honestly; Cheat = follow a low-fat diet, but sometimes I cheat; D/U = I do not usually follow a low-fat diet; D/K = I do not know what a low-fat diet is.

As illustrated in figure 7, 42 (65.6%) of the participants indicated: "Sometimes I cheat," with 15 (23.4%) who reported they “don’t usually follow,” and 6 (9.4%) participants indicated they follow a low fat diet “daily and honestly.” Only one participant did not know what a low-fat diet was.

Most participants reported knowing the ill effects of untreated cholesterol. Sixty-one (95.3%) reported untreated cholesterol is likely to lead to a heart attack and/or stroke. Regarding the participants’ knowledge of the origins of cholesterol, Figure 8 represents the following: 44 (68.8%) reported cholesterol comes from “all of the above”; 8 (12.5%) reported cholesterol comes from “food”; 5 (7.8%) reported cholesterol is the product of
“genetics,” and 1 (1.6%) reported high cholesterol results from “too little exercise.” Six participants did not respond.

Figure 8. Knowledge about the origins of cholesterol.

Regarding cholesterol levels, 43 (73.4%) of participants indicated their cholesterol levels improved as a result of medication; 12 (18.8%) reported their cholesterol levels stayed the same or worsened (Figure 9). Seventeen (26.6%) indicated their dosage was increased; 37 (57.8%) reported their dosage “stayed the same,” and 5 (7.8%) indicated their dosage decreased (Figure 10). Figure 11 illustrates the number of participants by milligram of dosage.
Figure 9. Change in cholesterol levels. W/SS indicates cholesterol levels have worsened or stayed the same.
Figure 10. Change in medication dosage.

Figure 11. Number of participants by medication dosage.
Hypothesis #1

It was predicted that not all individuals receiving statin therapy for hypercholesterolemia will effectively lower and manage their high cholesterol due to other factors, which may involve behavioral correlates, including exercise non-adherence and diet non-adherence as well as cognitive correlates, including an overconfident belief in the medication’s protectiveness. Although data indicate that 47 (73.4%) participants reported improvement in their cholesterol levels, 12 (18.8%) participants reported their cholesterol levels stayed the same or actually worsened during their course of statin therapy. Interestingly, 17 (26.6%) participants reported their physicians have increased their doses of medication, and 37 (57.8%) indicated their physicians have not changed the dosage of their medications. Last, only 5 (7.8%) participants indicated that their physicians have actually decreased their dosage of medication.

Hypothesis #2

It was predicted that participants who have effectively improved their current levels of cholesterol would be likely to engage in less frequent exercise. A repeated-measures ANOVA was conducted to assess whether or not there was a difference in participants’ reported practice of cardiovascular exercise three times a week or more. Results indicated that, contrary to what was predicted, participants whose cholesterol improved engaged in significantly more exercise after medication treatment ($M = 2.98, s.d. = .21$) than before medication treatment ($M = 2.59, s.d. = .20$; $F(1,45) = 5.56, p < .05$, $\eta^2 = .11$). As suggested by Cohen (1988) an eta above .31 is considered a large effect size. This analysis revealed an eta of .33 (the square root of $\eta^2 = .11$) and is thus considered a large effect size.
Figure 12. Participants’ levels of agreement with the following statements: “Since I have been taking cholesterol-lowering medicine, I practice cardiovascular exercise three times a week or more.” “Before I began taking cholesterol-lowering medicine, I practiced cardiovascular exercise three times a week or more.” Where DA=disagree, S/DS=somewhat disagree, N=neutral/unsure, S/A=somewhat agree, A=agree.

Hypothesis # 3

It was predicted that participants who have effectively improved their current levels of cholesterol would be likely to engage in less frequent diet adherence. A repeated-measures ANOVA was conducted to assess whether or not there was a difference in participants’ reported practice of good dietary practices. Results indicated that, as predicted, participants whose cholesterol improved engaged in significantly less diet adherence after medication treatment ($M = 2.7, s.d. = .14$) than before medication treatment ($M = 3.04, s.d. = .22$; $F(1,25) = 12.84, p < .05, \eta^2 = .34$). This analysis revealed an eta of .58 (the square root of $\eta^2 = .34$) and is thus considered a large effect.
size. This result should, however, be interpreted with caution because only 25 of the 47 respondents whose cholesterol improved completed all of the diet adherence questions from before and after medication treatment.

**Hypothesis # 4**

It was predicted that participants on statin therapy who have improved levels of cholesterol will possess a level of overconfident beliefs regarding the medications protectiveness. Overconfidence was defined as a situation in which a subject responded to any of the overconfidence variables as “somewhat agree,” or “agree” (see Table 1). The data reveal that 83% of the participants indicated they “somewhat disagree” or “disagree” with the statements assessing overconfidence. The remaining 17% indicated they were “neutral/unsure,” or “somewhat agree.”

**Hypothesis # 5**

It was predicted that beliefs about the causes of high cholesterol are related to diet and exercise non-adherence and overconfident medication protection. Surprisingly, individual beliefs are negatively related to exercise and diet non-adherence as well as to medication overconfidence. Specifically, the variables “I believe my cholesterol is caused by poor diet” was negatively related to the variable “Since I have been taking cholesterol-lowering medicine, I practice cardiovascular exercise three time a week or more” (-.397**). Also, the variables “I believe my high cholesterol is caused by lack of exercise” was negative related to the variable “Since I have been taking cholesterol-lowering medicine, I practice cardiovascular exercise three times a week or more” (-.422**).
Table 6
Intercorrelations for Personal Beliefs and Exercise and Diet non-adherence before and after Statin medication therapy.

<table>
<thead>
<tr>
<th></th>
<th>Diet b-4</th>
<th>Diet-non</th>
<th>V30</th>
<th>V12</th>
<th>Overcon</th>
</tr>
</thead>
<tbody>
<tr>
<td>V43</td>
<td>Pearson Correlation</td>
<td>-.285</td>
<td>-.281</td>
<td>.260</td>
<td>.147</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.120</td>
<td>.092</td>
<td>.078</td>
<td>.331</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>31</td>
<td>37</td>
<td>47</td>
<td>46</td>
</tr>
<tr>
<td>V44</td>
<td>Pearson Correlation</td>
<td>.168</td>
<td>.220</td>
<td>-.267</td>
<td>-.397**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.365</td>
<td>.191</td>
<td>.070</td>
<td>.006</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>31</td>
<td>37</td>
<td>47</td>
<td>46</td>
</tr>
<tr>
<td>V45</td>
<td>Pearson Correlation</td>
<td>.171</td>
<td>.113</td>
<td>-.191</td>
<td>-.422**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.358</td>
<td>.505</td>
<td>.198</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>.31</td>
<td>37</td>
<td>47</td>
<td>46</td>
</tr>
</tbody>
</table>

V43 = I believe my high cholesterol is caused by genetics
V44 = I believe my high cholesterol is caused by poor diet
V45 = I believe my high cholesterol is caused by the lack of exercise
Diet b-4 = Diet non-adherence before medication (see table 3)
Diet-non = Diet non-adherence after medication (see table 2)
V30 = Before I began taking cholesterol lowering medicine, I practiced cardiovascular exercise 3 times a week or more
V12 = Since I began taking cholesterol lowering medicine, I practiced cardiovascular exercise 3 times a week or more
Overcon = Overconfidence variables (see table 1)

** Correlations are significant at the 0.01 level (2-tailed).
CHAPTER 4

DISCUSSION

With obesity, hypertension, and coronary heart disease indicated as leading conditions of American mortality, a closer review of patient health-related behavior involving the prevention of chronic disease seems warranted. However, to date there has been scant literature available on the purely psychological effects that medical interventions themselves elicit in patients. Psychologically related variables including health and wellness beliefs, cognitive distortions, overconfidence, logical fallacies, social conformity, normative social influence, various behavioral principles and the related emotional correlates play a critical role in health maintenance and disease prevention; they also may actually play a role in the exacerbation or the pathogeneses of certain diseases. Although medical and surgical interventions are indeed intended to improve the functional capabilities of patients who struggle with a myriad of diseases, one must begin to question if the actual interventions poses any psychological complications which contraindicate, or stand in complete contrast, with the actual procedure.

For example, one intention of this study was to discover a relationship between diet and exercise non-adherence of participants who are currently prescribed statin medications to improve their cholesterol. Another intention of the study was to discover a relationship between patient overconfidence regarding medication protectiveness and respondents’ eating and exercise behaviors. Although these hypotheses make strong conceptual sense, practically they were difficult to validate accurately. That is, capturing sincere, honest patient behavior appears practically impossible. Psychologists are very well aware of, and control for, a respondent’s capacity to provide more favorable results
which are intended to cast a flattering review of their response pattern to the evaluator.

This notion of “faking good,” or over-reporting desirable and virtuous qualities is a common psychological effect of completing any psychological diagnostic instrument. Psychologists understand, as agents of change themselves, that they can evoke counterintuitive or contraindicated behavior in their patients. In psychological terms this may be called debasement, desirability, conformity, obedience to authority, overconfidence or, in some cases properly named, the Hawthorne effect. If psychologists are willing to understand, and subsequently admit this type of influence pursuant to their interventions, it stands to reason physicians, including their interventions, will have similar, if not identical influences.

The findings of this study are interesting because they offer support for some hypotheses, and also reveal new insights beyond the intended scope of this study. Of most notable concern, the findings did provide support for the hypothesis proposing that individuals who experience an improvement in cholesterol levels after taking statin medications begin to reduce their adherence to healthy dietary habits (see Table 6). This finding can lead to a number of speculations regarding how individuals think about the positive effects of cholesterol-lowering medications. One possible explanation may suggest that individuals on statin therapy who experience a significant drop in total cholesterol levels and rapid improvement in lipid profiles may provide an impetus for patient behavior to “regress to the mean.” That is, it is plausible to suspect in the absence of clear and convincing genetic evidence, that overeating, diet non-adherence, and the excessive consumption of foods rich in trans-fatty acids are causally indicated in elevated cholesterol levels. It therefore stands to reason that if diet non-adherence was the
normative behavior before cholesterol medication, behavioral regression toward the mean can explain some of the active diet non-adherence seen in participants who are on statin therapy. Another possible explanation includes the phenomenon of overconfidence. The data in this study reveal no significant difference between taking statin medication and overconfidence, but other data including the prevalence of overweight and obese participants seems to provide evidence for some other factor moderating diet and exercise non-adherence, possibly denial or apathy. However, overconfidence should not be overlooked in future studies of similar interest. That is, social psychology purports the overconfidence effect is a tendency for humans to be more confident about personal beliefs, abilities, and behaviors than are actually accurate. With respect to statin therapy and exercise non-adherence, overconfidence may result from reviewing the diminished laboratory levels of total cholesterol, thereby creating a tendency to predict, or overestimate the corrective power of the medication and underestimate the need to remain faithful to a healthy diet. The danger in this thinking may expose patients to an inadequate understanding of total serum cholesterol as not being necessarily the best reading of elevated lipids in the bloodstream. Together, high density lipoproteins, low density lipoproteins, and triglycerides and their ratio to each other represent more accurate lipid levels in the blood. Although total cholesterol may be reduced by significant percentages, the appropriate ratios of HDL’s to LDL’s to triglycerides may continue to be misaligned. However, the initial interpretation of the reduced total cholesterol number may provide enough evidence for some patients to non-adhere to healthful diets. Again, although there was no statistical evidence for overconfidence in statin medication as a
predictor of diet and exercise non-adherence, future researchers are encouraged to gather a larger, more representative sample size.

Another discovery of this study revealed no significant difference found in the amount of cardiovascular exercise practiced before beginning statin therapy and concurrent with statin therapy (see Figure 10 and 11). However, a serendipitous discovery revealed, a related, but discouraging finding. Results indicate that individual personal health-related beliefs about the causes of high cholesterol were negatively correlated at the 0.01 level of significance (-.397**) with the practice of cardiovascular exercise three times a week or more. For example, participants who agreed with the statement “I believe my cholesterol is caused by poor diet” were then likely to disagree with the following variable: “Since I have been taking cholesterol lowering medicine, I practice cardiovascular exercise three times a week or more.” Interestingly, this finding is in stark contrast to current medical beliefs. Also, data indicate individual personal health beliefs about the lack of exercise causing elevated cholesterol were negatively correlated at the 0.01 level of significance (-.422**) with the practice of cardiovascular exercise three times a week or more. Stated otherwise, participants who agreed with the variable “I believe my cholesterol is caused by the lack of exercise” disagreed with the variable “Since I have been taking cholesterol lowering medicine, I practice cardiovascular exercise three times a week or more.” Considering both negative correlations in light of the data in presented in Table 6, it would appear that participants understand that genetic heritage is not entirely responsible for elevated cholesterol levels, and that diet and exercise are effective ways to reduce it, but they appear unwilling to change their lifestyles. Although this finding is not consistent with the construct of
overconfidence, it may suggest a level of indifference or apathy regarding the use of exercise and diet to control cholesterol. Again, these findings are in contrast to the current medical belief, in which physicians are advised to educate their patients on the benefits of exercise and a healthful diet.

**Limitations of the Study**

The results of this study should be interpreted in light of several potential limitations. Generally, rating scale and survey data can be biased and be influenced by a number of factors. Influences including the wording of statements, arrangement of statements, and the content of the material itself may influence the subject to interpret the statement differently. Also, in studies that employ surveys, questionnaires, or rating scales, the subject may be motivated to respond in a fashion that is more socially acceptable than are their true attitudes, beliefs, and behaviors. Although the statements for the present study were designed to elicit agreement on a Likert scale and were created in a fashion that was free of bias and of non-leading statements, survey data in general are subject more frequently to the abovementioned methodological limitations.

Another foreseeable limitation of the current study includes the sample size and population selected to participate in the study. Although every effort was made to ensure a wide range of randomly selected participants, the samples were procured from a particular geographic location, eastern Pennsylvania. This may provide an under-representation of various cultural and racial demographics. This poses a common and general threat to the external validity of the study. The sample was biased for female
participants, and a larger sample size may have counterbalanced this unforeseen
tendency.

Also, the number of questions used in this study may have produce fatigue in
participants and caused them to respond randomly or in a hasty fashion. This was
evidenced by several incomplete surveys which needed to be discarded. The pace in
primary care medicine tends to be quick; a more focused survey with fewer items may
have been more expedient and quite possibly have influenced the results.

Last, the ANOVA used in hypothesis three did reveal statistical significance for a
negative change in healthy dietary habits following an improvement in cholesterol levels
pursuant to medication; however, the significance was small. A greater sample size may
help boost the power of this study and yield more favorable significance.

Implications for Clinical Practice and Future Research

Although many factors will influence an individual’s belief system about
medications, disease, and health-related behavior, the hypotheses for this study did
elucidate a number of implications regarding clinical practice. Initially, improvements in
the quantity and quality of physician education regarding the limitations of statin
medication can be adjusted accordingly, and simultaneous patient education regarding the
benefits of diet and exercise adherence can be further strengthened. Also, physicians can
further benefit from the knowledge revealed in this study by becoming familiar with the
limitations of patient compliance and adjust their educational strategies in a more clearly
focused and direct fashion when presenting information to patients.
Future researchers are encouraged to consider the methodological limitations of this study and replicate future studies in light of the results provided herein. Continuing to study overconfidence and the effects that it projects on health-related behaviors continues to be an important construct, because overconfidence has been a well-established phenomenon in other areas of psychology. Developing fewer and more direct statements to this population may yield favorable results. Also, expanding the sample size may prove to be a prudent measure for future studies.

Conclusion

There is statistical evidence available to support the hypothesis that when statin medicines improve cholesterol levels, and when improved levels are noticed, there is a statistically significant reduction in the adherence to healthy diet habits. Also, participants appear to understand that genetics is not the only reason for elevated cholesterol levels, with diet and exercise as reasonable ways to control for elevated cholesterol. However, they do not adjust their lifestyles.
REFERENCES


APPENDIX A

Dear Potential Participant:

Barbara Golden, Psy.D., ABPP and Stephen Timchack, M.S. both of the Philadelphia College of Osteopathic Medicine (PCOM) are conducting a research study on people’s thoughts regarding cholesterol-lowering medicines.

This study has been designed to maintain your privacy, and no one will be able to find out who you are, or identify you from the answers that you report. You will not be asked to provide any personal information. The questionnaires are completely anonymous, but will be numbered to keep order if the packet becomes unstapled. You will be asked to answer some basic questions and mark your level of agreement with several statements regarding your diet habits, health beliefs, and exercise frequency. It will take 15-20 minutes of your time. If you agree to participate in this study, we ask that you fill out all forms completely, and simply return them to the nurse or receptionist. You may freely refuse to be in this study with absolutely no consequences. You can decide to stop answering the survey at any time. Although, no personal information will be asked, all the forms and questionnaires that you complete will be kept secure and confidential. Only the researchers and members of the Institutional Review Board at PCOM will be able to look at these records.

You will not receive any financial reimbursements for being in this research study. You may not benefit directly from being in this research study. However, other people in the future may benefit from what researchers learn from this study. There is a possibility that you may, as a result of filling out the questionnaires, find something out about yourself that may be potentially distressing; however, this outcome is unlikely.

If you believe that you have suffered injury or illness during the course of this study, you should contact the PCOM Office of Research and Sponsored Programs at 215-871-6782.

If you have any questions about this research at any time, you can contact Dr. Golden at (215) 871-6495. If you want to know more about Dr. Golden’s background, or the rights of research participants, you should call PCOM Office of Research and Sponsored Programs at 215-871-6782.

Thank you very much for your time, help, and consideration in this study.

Sincerely,

Barbara A. Golden, Psy.D, ABPP   Stephen M. Timchack, M.S.
Associate Professor              Doctoral Candidate in Clinical
Psychology                       Psychology
(215) 871-6511                   (570) 466-7015
APPENDIX B

Demographic Survey

1. Has your physician diagnosed you with High Cholesterol?
   a. YES
   b. NO (if “NO” stop here and return survey)

2. If you are diagnosed with High Cholesterol, how long have you had this condition?
   a. Less than 1 year
   b. 1-3 years
   c. 4-6 years
   d. 7-9 years
   e. Over 10 years
   f. Not applicable/don’t know

3. Are you currently taking prescription medication(s) to help control High Cholesterol?
   a. Yes
   b. No

4. If you are not taking prescription medicine(s) for high cholesterol, do you follow a low-fat diet?
   a. Yes
   b. No
   c. Not applicable
5. What type of cholesterol medication are you taking?
   a. ZOCOR
   b. LIPITOR
   c. CRESTOR
   d. VYTORIN
   e. OTHER: __________________________
   f. I do not know the name of my cholesterol medicine
   g. I am not taking any medicines for high cholesterol

6. What is the dosage of your cholesterol medication?
   a. 10 mg.
   b. 20 mg
   c. 30 mg.
   d. 40 mg
   e. Other: __________________________
   f. I am not taking any medicines for high cholesterol
   g. I do not know the dose

7. How long have you been on this medicine?
   a. 1 year or less
   b. 2-4 years
   c. 5-7 years
   d. 8-10 years
   e. more than 10 years
   f. not applicable

8. Are you:
   a. MALE
   b. FEMALE
9. Are you:
   a. Black
   b. White
   c. Asian
   d. Hispanic
   e. Other: __________

10. How old are you?
    a. 18-25
    b. 26-35
    c. 36-45
    d. 46-55
    e. 56-65
    f. 66 or older

11. How often do you practice cardiovascular exercise (for example, brisk walking or running)?
    a. more than 3 times weekly
    b. 3 times weekly
    c. less than 3 times weekly
    d. I rarely practice cardiovascular training

12. What is your current weight? ________________

13. How tall are you (in feet and inches)? ________________

14. Do you follow a physician prescribed exercise program?
    a. Yes, I follow it very closely
    b. Yes, I follow it most of the time
    c. No, I rarely follow it
    d. No, I don’t have a physician prescribed exercise program
15. Do you follow a low-cholesterol (low fat) diet?
   a. Yes, I follow my diet daily and honestly
   b. Yes, I follow my diet, but sometimes I cheat
   c. No, I don’t usually follow a low fat diet
   d. No, I don’t know what a low fat diet is

16. High Cholesterol, that is untreated, may lead to which of the following:
   a. Heart attack and/or stroke
   b. Depression
   c. Anxiety
   d. Gout
   e. Stomach Ulcers

17. High Cholesterol can come from:
   a. The foods I eat
   b. My genetics (family history)
   c. Getting too little physical exercise
   d. All of the above

18. Since I have been taking cholesterol-lowering medicine, my physician has been
   ________ with my cholesterol level.
   a. very satisfied
   b. satisfied
   c. very concerned
   d. concerned

19. My physician has told me that my cholesterol levels have
   _______ since I have been on cholesterol-lowering medicine.
   a. improved
   b. worsened
   c. stayed the same
20. Since I began taking cholesterol-lowering medicine, my physician has __________ the dose of my cholesterol-lowering medicine.
   a. increased
   b. decreased
   c. not changed

21. Which level of education best describes you:
   a. Attended high school
   b. Graduated high school
   c. Some college
   d. Graduated college
   e. Attended graduate school
   f. Graduated from graduate school

22. Which occupational category best describes your current employment status:
   a. Retired
   b. Student
   c. Management, Business or Financial
   d. Science, Engineering or Computing
   e. Healthcare Practitioner/Professional
   f. Other Professional
   g. Technician
   h. Sales
   i. Administrative Support
   j. Construction or Trade Worker
   k. Installation, Maintenance or Repair Worker
   l. Production or Manufacturing
   m. Transportation
   n. Laborer
   o. Protective/Civil Service Worker
   p. Other
APPENDIX C

Survey of Health-Related Beliefs and Behaviors

DESCRIPTION: The following statements were designed to understand your eating and exercise behaviors, as well as your health-related beliefs. Please consider each statement carefully and answer honestly. If you are completely confused by a question or are completely unsure how you feel, please simply circle 3. **There are statements on both sides of the page, please do not skip any.**

Please use the following scale to indicate your level of agreement with each statement.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree</td>
<td>Somewhat Disagree</td>
<td>Neutral or Unsure</td>
<td>Somewhat Agree</td>
<td>Agree</td>
</tr>
</tbody>
</table>

1. Since I’ve been taking cholesterol-lowering medicine, I can eat anything I want.

1 2 3 4 5

2. Since I’ve been taking cholesterol-lowering medicine, I watch the portion size of my food servings.

1 2 3 4 5
3. I believe my cholesterol-lowering medicine, without diet and exercise, completely protects me from developing higher cholesterol levels.

4. Since I take cholesterol-lowering medicine, exercising is not that important.

5. Since I have been taking cholesterol-lowering medicine, I feel less worried about choosing what I eat.

6. Since I have been taking the cholesterol-lowering medicine, I eat “red” meat more than twice a week.

7. Since I have been taking cholesterol-lowering medicine, I eat more than three servings of dairy products daily.

8. Before I began taking cholesterol-lowering medicine, I ate “red” meat more than twice a week.
9. Taking cholesterol-lowering medicine regularly is more important than maintaining a healthy diet.

10. Taking cholesterol-lowering medicine regularly is more important than exercise.

11. Since I take cholesterol-lowering medicine I can eat “fast food” 2 or more times a week.

12. Since I have been taking cholesterol-lowering medicine, I practice cardiovascular exercise 3 times a week or more.

13. I believe my Doctor has prescribed a reasonable diet and exercise plan for me.

14. I am taking cholesterol-lowering medicine to prevent the possibility of a heart attack and/or stroke.

15. I trust the cholesterol-lowering medicine I am taking will effectively lower my cholesterol without diet and exercise.
16. If my cholesterol level continues to remain high while on cholesterol-lowering medicine, I can have my dosage increased and continue eating any of the foods I choose.

17. High Cholesterol comes entirely from genetics---diet and exercise are not effective ways to reduce it.

18. Before I began taking cholesterol-lowering medicine, I ate more than 3 servings of dairy product daily.

19. Currently, I eat five, or more, servings of fruits and vegetables daily.

20. My Doctor has done a good job at educating me about the dangers of High Cholesterol.

21. Taking cholesterol-lowering medicine allows me to occasionally eat fattening food and over indulge.
22. A healthy diet consists of plenty of fruits and vegetables, whole grains, fish, and limited use of fats, processed sugars, salt, and alcohol.

23. A healthy lifestyle consists of healthy eating, non-smoking, getting plenty of exercise, good sleep habits, good stress management skills, and managing a healthy weight.

24. As described above, I have a healthy diet.

25. As described above, I have a healthy lifestyle.

26. Before I began taking cholesterol-lowering medicine, I ate “fast food” 2 or more times a week.

27. Before I began taking cholesterol-lowering medicine, I ate more than 5 servings of fruits and vegetables daily.

28. Currently, I eat “red” meat more than twice a week.
29. Before I began taking cholesterol-lowering medicine, I was not worried about my diet.

1 2 3 4 5

30. Before I began taking cholesterol-lowering medicine, I practiced cardiovascular exercise 3 times a week (for at least 30 minutes) or more.

1 2 3 4 5

31. Before I began taking cholesterol-lowering medicine, I watched the portion size of my food servings.

1 2 3 4 5

32. If I take care of myself, I can avoid illness.

1 2 3 4 5

33. Whenever I get sick it is because of something I’ve done or not done.

1 2 3 4 5

34. Good health is largely a matter of good fortune.

1 2 3 4 5

35. No matter what I do, if I am going to get sick I will get sick.

1 2 3 4 5
36. Most people do not realize the extent to which their illnesses are controlled by accidental happenings.

1 2 3 4 5

37. I can only do what my doctor tells me to do.

1 2 3 4 5

38. There are so many strange diseases around that you can never know how or when you might pick one up.

1 2 3 4 5

39. When I feel ill, I know it’s because I have not been getting the proper exercise or eating right.

1 2 3 4 5

40. People who never get sick are just plain lucky.

1 2 3 4 5

41. People’s ill health results from their own carelessness.

1 2 3 4 5

42. I am directly responsible for my health.

1 2 3 4 5

43. I believe my high cholesterol is caused by genetics

1 2 3 4 5

44. I believe my cholesterol is caused by poor diet

1 2 3 4 5
45. I believe my high cholesterol is caused by the lack of exercise.

1 2 3 4 5