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Moderated Mediation Hypotheses in Regression Analytic Models: Method Illustrations Using Survey Data

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in Education

by

Kyusang Park

Committee in charge:

Professor Karen Nylund-Gibson, Chair

Professor Richard Duran

Professor Rebeca Mireles-Rios

September 2015

The dissertation of Kyusang Park is approved.

Richard Duran

Rebeca Mireles-Rios

Karen Nylund-Gibson, Committee Chair

August 2015

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Method Illustrations Using Survey Data

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by

Kyusang Park

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VITA OF KYUSANG PARK
Aug 2015

EDUCATION

Bachelor of Arts in Economics, and Management, Handong Global University, August 2001
Master of Arts in English as a Second Language, University of Arizona, May 2009
Doctor of Philosophy in Education, with Emphasis in Research Methodology, University of California, Santa Barbara, August 2015

RESEARCH INTEREST

Applied Statistics, Research Methodology for Behavioral, Social and Clinical Sciences, Quantitative Psychology, Psychological Measurement

PROFESSIONAL EMPLOYMENT

2012-2015: Graduate Assistant in Teaching, Graduate Student Researcher, Department of Psychological and Brain Sciences, Department of Education, University of California, Santa Barbara

2001-2004: Database Engineer, Edumedia Corporation, Seould, Rep of Korea

PUBLICATIONS

Nylund-Gibson, K, Ing, M., & Park, K. (2013) "A latent class analysis of student science attitudes, perceived teacher support and STEM career attainment". *The International Journal of Engineering and Science*, 2(12), 65-70. indexed in ANED (American National Engineering Database)

Park, K. (2015, doctoral dissertation) "Moderated mediation hypotheses in regression analytic models: Method illustrations using survey data"
Park, K. (2015, working paper) "Multidimensionality in mixture modeling"
Park, K. (2015, working paper) "Explaining latent differential item functioning using models for cognitive processes of item response"

INVITED CONFERENCES AND TRAINING SESSIONS

Kim, J., Park, K., & Wang, M. "Well-being of families of children with developmental disabilities: An application of latent class models with covariates". Poster Session, *Council for Exceptional Children 2015 Annual Convention and Expo*, San Diego, CA, April 2015

Park, K., & Kim, J., "Well-being of parents raising children with developmental

disabilities: classification using latent class modeling". Poster Session, *2014 Pacific Rim International Conference on Disability and Diversity*, Honolulu, Hi, May 2014
Kim, J., & Park, K., "Father's and mother's perception on family well-being in American families with young children with disabilities in the National Survey of Children's Health 2011-2012". Poster Session, *2014 Pacific Rim International Conference on Disability and Diversity*, Honolulu, Hi, May 2014

Victorino, C., Ing, M., Nylund-Gibson, K, & Park, K., "Applications and advancements in latent transition analysis". Symposium, *2013 American Psychological Association (APA) 121st Annual Convention*, Honolulu, HI, July 2013

Using NAEP (National Assessment of Education Progress) for Research and Policy Discussion Database Training Seminar, National Center for Educational Statistics (NCES), U.S. Department of Education, Arlington, VA, June 2013

NAEP (National Assessment of Education Progress) HSTS (High School Transcript Study) Database Training Seminar, National Center for Educational Statistics (NCES), U.S. Department of Education, Alexandria, VA, July 2012

Park, K, Gonzalez, A. M., and Victorino, C., "Application of latent transition analysis in psychological research". Symposium, *2012 Western Psychological Association (WPA) 92nd Annual Convention*, Burlingame, CA, April 2012

ABSTRACT

Moderated Mediation Hypotheses in Regression Analytic Models:

Method Illustrations Using Survey Data

by

Kyusang Park

This applied study presented method illustrations of the regression analytic models for moderated mediation hypotheses using data from a survey program. In spite of the theoretical and empirical importance of employing appropriate models for analyzing moderated mediation hypotheses, or conditional indirect effects in social and behavioral science research, there have been limited examples of formally testing those effects in the literature of applied psychology or education mainly due to the lack of clear methods for examining these effects.

Therefore formal methods that were initially introduced and organized by Preacher, Rucker, & Hayes (2007), Hayes (2011), and Hayes (2013) were illustrated with the use of commercially available statistical software packages of IBM *SPSS* Statistics Version 23 (IBM, 1989-2015) and M*plus* Version 6.11 (Muthen and Muthen, 1998-2011) using data from The Positive Body Image Survey (Romo, Mireles-Rios, & Nylund-Gibson, 2012). The focus population of the survey was a group of adolescent girls with the intentions to identify behavioral factors that contribute to their resilience in spite of

sociocultural pressures that tend to produce negative feeling about their bodies, and to examine whether positive body perceptions can lead to the practice of health-promoting lifestyle.

Results from this study will help applied researchers using models for moderated mediation hypotheses, or conditional indirect effects as to how social or behavioral phenomena in substantive areas of the study can be better understood. Results from this dissertation highlight the importance of framing research questions about positive body image development among Latino adolescent girls in terms of path analytic models with protective factors specified as a predictor variable, positive body image as a mediator variable, and engagement in health-promoting behaviors as an outcome variable. Findings of this study provide evidence that this mediation models can be affected by moderator variables of interest.

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Chapter 1: Introduction

This chapter provides an outline of the current study. We begin with an introduction of mediation, moderation, and moderated mediation effects focusing on the way conceptualization and methodological operationalization of those effects can be clarified. Next, the current study is described along with its purpose and significance with respect to their methodological applicability to the literature of positive body image development among adolescent female population. Finally, an overview of subsequent chapters is presented.

1.1 Problem Statement

Mediation is a methodological process in which the effect of an independent variable (*X*) on a dependent variable (*Y*) is mediated, or transmitted by a mediator (*M*). Also known as an *indirect effect*, mediation occurs when *X* predicts *M*, and *M*, in turn, predicts *Y*, and therefore *X* predicts *Y*. It is named a mediation because *M* mediates the effects of *X* on *Y* whereas it is also named an indirect effect because *X* indirectly exerts its effect on *Y* by means of *M*. Judd and Kenny (1981) and Baron and Kenny (1986) were the seminal studies which organized methods for assessing mediation hypotheses in psychology. Since then, mediational statistical methods have become popular in social and behavioral science research to propose and test mediation hypotheses. Particularly in the developmental psychology and body image literature, following studies were the examples that included mediation hypotheses as their main analyses. Cheng and Mallinckrodt (2009) demonstrated some mediation effects of adult attachment anxiety

and internalization of media images on the linear relationship between body image dissatisfaction in college women as an outcome variable and their memories of parents as cold or emotionally aloof as a predictor variable. That is, adult attachment anxiety and internalization of media images mediated the effect of college women's memories about their parents on body image dissatisfaction. Williams and Currie (2000) showed that body image mediated the relationship between pubertal timing and self-esteem for 11 to 13 year-old Scottish school girls. This study was meaningful because body image among adolescent girls was hypothesized to mediate the link between a predictor variable and an outcome variable. The same modeling structure can be applied to the research settings of the current dissertation. In the similar vein, Clay, Vignoles, and Dittmar (2005) confirmed the mediating role of body satisfaction in the effect of mass media exposure on self-esteem in a sample of U.K girls aged 11 to 16. In response to this ever increasing demand for appropriate techniques and methods for evaluating mediation effects, a large volume of methodology literature has been devoted to developing and refining methods.

Based on the ongoing interest in the mediation effects there has been an added qusestion to assess whether mediation effects may vary depending on different contexts, subgroups, types, or categories of individuals (Preacher, Rucker, & Hayes, 2007). For instance, *M* may mediate the effect of *X* on *Y* for one group of individuals, but not for the other group. In other words, the magnitude of indirect effects may rely on the values of a third variable, which is often called *moderator* (*W*). *Moderation* is a methodological process in which the relationship between two variables can be different depending on the values of other variables, and therefore hypotheses combining mediation and moderation are referred to as *moderated mediation*, or *mediated moderation* in the

literature (Baron & Kenny, 1986; Preacher, Rucker, & Hayes, 2007; Preacher & Hayes, 2008b). Although there are some technical differences between moderated mediation and mediated moderation in terms of patterns of the relationships each effect can display, such effects can be examined under the title of *conditional indirect effects*. Accoridng to Preacher, Rucker, and Hayes (2007), a conditional indirect effect can be defined as "the magnitude of an indirect effect at a particular value of a moderator, or at particular values of more than one moderators." In the current study, a conditional indirect effect will be used interchangeably with a moderated mediation effect, and the differences between a moderated mediation effect and a mediated moderation effect will be further delineated in Chapter 2.

Although there are many instances in social and behavioral science research in which hypotheses of conditional indirect effects seem to be the approapriate models that can explain many processes both theoretically and empirically, examples of formally testing conditional indirect effects were limited in the literature of applied psychology or education mainly due to the lack of clear methods for examining these effect. One example of testing hypothesis of conditional indirect effects in the literature of industrial and organizational psychology includes Ng, Ang, and Chan (2008) that showed an indirect effect of leadership personality types on leadership effectiveness through leadership self-efficacy would depend on the situational contexts in which leaders were located, such as job demands and job autonomy. Gutierrez-Dona, Lippke, Renner, Kwon, and Schwarzer (2009) provided another example from the literature of health and well-being in which there was a moderating role of self-efficacy in the mediation relationship among dietary intentions, dietary planning, and dietary behaviors. They

showed that although dietary planning was supposed to mediate between dietary intentions and behaviors, this mediation effect may fail when an individual lacks self-efficacy. Other example in applied social psychology literature was BarNir, Watson, and Hutchins (2011) that showed the effect of people's role models on their theentrepreneurial career intention through the mediating role of self-efficacy, and this indirect effect was contingent on gender.

These research examples relied on the methodological literature about modeling moderated mediation effects, however, the models used did not illustrate all different specifications of those effects. In addition, there is a growing need for developing and testing hypotheses by better understanding the relationships and interactions among multiple variables drawn from the studies of positive body image development among adolescent female group. Body image satisfaction or dissatisfaction in adolescent female population has gained a large amount of attention in the literature in terms of its hypothesized close relationship with the practice of health-promoting lifestyle behaviors. There is a general concensus among body image researchers which suggests that aspiration of many adolescent girls to have a slender body shape can be influenced by the media and societal pressure, and this can constitute a cause-and-effect relationship with the emergence of body dissatisfaction (Tiggemann, 2011; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999).

While the focus of many studies on body dissatisfaction is understandable given its prevalence in that population, the research has focused much less on the portion of the population who are able to develop and sustain a positive body image. There is a need to examine which factors affect the development of positive body image, and in turn the

patterns of healthy eating and physical activity among adolescent girls. In other words, we need to fill in the gap in the literature related to the empirical evidence of the protective benefits that can be gained through healthy eating and physical activity when adolescent girls have positive feelings about their bodily apprearance. One hypothesis that needs investigating is whether or not positive body image perceptions can contribute to the practice of health-promoting behaviors for adolescent girls. Further, it may be that this relationship is different for Latina, an understudied population in the body image literature.

In the current study, I will illustrate formal methods that were introduced and organized by Preacher, Rucker, & Hayes (2007), Hayes (2011), and Hayes (2013) with the use of commercially available statistical software packages of IBM *SPSS* Statistics Version 23 (IBM, 1989-2015) and M*plus* Version 6.11 (Muthen and Muthen, 1998-2011) using data from The Positive Body Image Survey (Romo, Mireles-Rios, & Nylund-Gibson, 2012). I will focus on a group of adolescent girls to identify behavioral factors that contribute to their resilience in spite of sociocultural pressures that tend to produce negative feeling about their bodies, and to examine whether positive body perceptions can lead to the practice of health-oriented lifestyle.

In particular, *SPSS* macro for a command PROCESS Version 2.l3 (Hayes, 2013) will be used because an *SPSS* command PROCESS is a stand-alone, comprehensive tool which integrates most of the functions of earlier macros (e.g., MODMED: Preacher, Rucker, & Hayes, 2007; INDIRECT: Preacher, & Hayes, 2008a; SOBEL: Preacher, & Hayes, 2004; MODPROBE: Hayes, & Matthes, 2009; MED3/C: Hayes, Preacher, & Myers, 2011) into one command. This command allows researchers to specify seventy

six different models of mediation, moderation, moderated mediation, or mediated moderation effects. Preacher, Rucker, & Hayes, (2007) list five different models for conditional indirect effects that may qualify as comprehensive examples of those effects. Those five different models for the conditional indirect effects were called, PRH Model 1, PRH Model 2, PRH Model 3, PRH Model 4 and PRH Model 5 (e.g., Preacher, Rucker, & Hayes, 2007). A part of those models will be used to illustrate examples of moderated mediation hypotheses to investigate positive body image development among Latina adolescent girls.

1.2 Purpose of Study

The main purpose of this dissertation is to revisit the modeling conceptualization of moderated mediation effects focusing on the methods that can be used to examine those effects, and to examine the benefits of using those methods for evaluating hypotheses on positive body image among Latina adolescent girls. Previous studies (Preacher, Rucker, & Hayes, 2007; Hayes, 2011; 2013) have shown that those methods can be carried out using commonly used statistical modeling software packages. Methods illustrations of a variety of different models of moderated mediation effects, or conditional indirect effects will conducted using data taken from the Positive Body Image Survey (Romo, Mireles-Rios, & Nylund-Gibson, 2012).

The statistical methods chosen for this method illustration have several key advantages: (1) they provide an enhanced understanding of the definitions and conceptualizations of moderated mediation effects; (2) they present intuitive approaches for hypotheses testing of conditional indirect effects by discussing the utility of

resampling approach and normal-theory approach; (3) they are accompanied by accessible programming code developed for the popular statistical software package, *SPSS* and M*plus* to facilitate the implementation of the suggested bootstrapping and asymptotic approaches. The methods are illustrated with examples for the purpose of bolstering substantive theories of positive body image for Latina adolescent girls.

All analytical procedures are demonstrated under the simple linear regression or path analytic framework. The findings will be able to be easily extended to include the structural equation modeling framework if there were a larger number of measurement items, a larger sample size and the conceptualization of latent variables. The ultimate objective and contribution of this study is to offer both applied researchers in the area of positive body image for the adolescent girls, and social and behavioral science methodologists an analytic guideline and practical examples to perform complicated analyses involving conditional indirect hypotheses in regression analytic models.

1.3 Overview of Chapters

The remainder of this dissertation is presented as follows: In Chapter 2, models involving mediation, moderation, and moderated mediation effects are reviewed. The review involves clarification over conflicting definitions of conditional indirect effects, and descriptions of approaches for estimating and testing various modeling specifications and hypotheses of conditional indirect effects. As an application of the methods to the substantive research areas, there is an introduction to the literature that involves developing and maintaining positive body images among adolescent girls in the context of healthy eating and physical activity patterns. To verify whether those methods can be

conveniently applied to the real world data obtained from survey programs, in Chapter 3, a number of illustrative analyses are presented using survey data to evaluate suggested hypotheses about adolescent girls' positive body image development and its relationship with behavioral factors. In Chapter 4, results of the illustrative analyses are presented along with initial discussion. Finally in Chapter 5, the study is concluded by presenting further discussion of results, its potential limitations, and suggestion for possible future research.

Chapter 2: Theoretical Background

The current study aims to show method illustrations of conditional indirect effects using survey data. In this chapter, a general overview of theoretical underpinnings of the methods and models is provided. It consists of statistical approaches for assessing effects of mediation, moderation, and moderated mediation. Afterwards, the literature about positive body image development among adolescent female population is introduced.

2.1 Mediation Effects

Data analyses in social or behavioral science mainly focus on examining whether a predictor variable, regardless of whether it is manipulated or measured, is associated with an outcome variable using a linear model such as linear regression or analysis of variance. In many areas of social science, such analyses, if they are based on strong research design, are sufficient to provide a causal inference in which variation in *X* causes variation in *Y*. However, it is sometimes more desirable to examine the process by which a given cause-and-effect relationship occurs. Researchers may need to pursue understanding of how a given effect is produced, i.e., the mechanism that generates and accounts for the relationship between variables of interest. That mechanism involves mediation in many instances, which refers to a process in which *X* has its effect on *Y* through one or more mediator variables. When a mediator variable *M* is located in a path between *X* and *Y*, *M* is construed as mediating the linear relationship between the two variables. It is also interpreted that *X* has an indirect effect on *Y* through *M*. Terms of mediation, or mediators were first identified in Rozeboom (1956). A mediator variable

M is also known as an *intervening variable*, or a *mechanism* (Hyman, 1955; Hoyle & Robinson, 2004) because it attempts to explain how a given effect or relationship arises.

It was not until there was behaviorism tradition which dominated up to 1960s, and the cognitive revolution swept through all the fields of psychology that psychological researchers became much more interested in mediation effects. Since that time they began examining inside "the blackbox" by posing how-to questions about the effects. Hyman (1955)'s earlier work which included the relevant terms of interpretation, test factors, and intervening variables, initiated the landmark contribution to this methodological concept, and it led to Judd and Kenny (1981) and Baron and Kenny (1986) which made mediation effects more approachable to applied researchers. There were many of further contributions thereafter which promoted the rigorous evaluation of mediation effects (e.g., MacKinnon & Dwyer, 1993; MacKinnon, Warsi, & Dwyer, 1995; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

The most basic model of mediation effects is a *simple mediation* model which can be described using a path model as seen in Figure 2.1. This is referred to as a simple mediation model because it includes only a single mediator variable. The top panel of Figure 2.1 describes a model in which *X*, the independent variable, predicts *Y*, the dependent variable. This is a similar linear regression model with one predictor, X, and does not include a mediator variable. Path *c* represents the effect of *X* on *Y*, which is referred to as the *total effect*. The quantification of path *c* usually remains unstandardized since most methods for testing mediation effects require unstandardized paths.

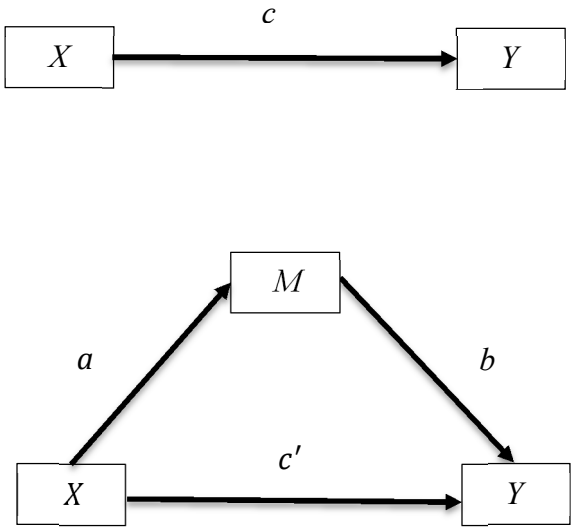


Figure 2.1: A Simple Mediation Model

The bottom panel of Figure 2.1 divides the total effect into its components. Path *a* represents the effect of the indepednet variable *X*, on the proposed mediator variable, *M*, while controlling for *Y*. The subsequent effect of the mediator *M* on the dependent variable *Y*, controlling for *X*, is described as a path *b*. Both paths of *a* and *b* represent a mediating effect of interest. Therefore, the coefficients of *a* and *b* are used to evaluate the indirect effects of *X* on *Y* through mediator, *M*. Path c' reflects the relationship between the independent variable *X* and the depedent variable *Y* controlling for the mediator variable *M*. Path c' of *X* on *Y* is also known as the *direct effect*, and this represents the part of the total effect that is unique to *X*, partialling out the effect of *M*. The indirect effect of *X* on *Y* can be represented by the two paths that link *X* with *Y* through *M*. In this regression analytic model, the indirect effect of *X* on *Y* through *M* is quantified as the product of both paths *a* and *b*. Then the total effect, path *c*, is equal to

the sum of the direct effect and indirect effect, which results in the following equation:

$$c = c' + ab \tag{2.1}$$

Coefficients of *a* and *b* are estimated using the following linear regression equations:

$$M = a_0 + aX + \varepsilon \tag{2.2}$$

$$Y = b_0 + c'X + bM + \varepsilon \tag{2.3}$$

where a_0 and b_0 are the intercept terms and ε is a regression residual.

There have been a number of statistical approaches developed to test this simple mediation model in terms of the presence, magnitude and statistical significance of the mediational effects. The *causal steps strategy* or *serial approach* (Judd & Kenny, 1981; Baron & Kenny, 1986; Hoyle & Robinson, 2004) is one of the most frequently used models. In this approach, some of the criteria first need to be checked to see whether they ensure that a pattern of effects constitutes mediation. Judd and Kenny (1981, p. 605) suggest that researchers must establish the following criteria for the mediation effect to be a true mediational process: (1) the treatment *X* affects the outcome variable *Y*; (2) Each variable in the causal chain affects the variable that follows it in the chain when all variables prior to it are controlled; (3) the treatment exerts no effect on the outcome when the mediating variable is controlled. Baron and Kenny (1986) added to the prior criteria an emphasis on establishing the statistical significance of each of the relationships listed above. The strengths of this approach is its methodological simplicity and intuitivity. However, the limitations also exist. The first and foremost one is that it is subject to both Type I and Type II error (Holmbeck, 2002) because each step is tested independently. In addition, the causal steps strategy has been found to show low statistical power (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Pituch, Whittaker, &

Stapleton, 2005) possibly due to the statistical significance requirements placed on the serial regression paths, which differentiates this approach from other approaches. Also this approach does not provide a direct estimate of the mediation effect, and therefore the construction of a confidence interval for the effect is not available.

The *product of coefficients strategy* is another method for testing mediation effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; MacKinnon, Lockwood, & Williams, 2004). This method has a logical appeal because mathematically the effect itself can be best represented by the product of the coefficients *a* and *b*, and can be easily calculated. The logic behind this idea is straightforward. For the mediation effect to be statistically significant, both paths of *a* and *b* must be non-zero. The product of paths *a* and *b* is non-zero only when each path is non-zero. Also the magnitude of the product of *a* and *b* increases when the magnitude of each path increases, which indicates the increase in the overall mediation effect. Furthermore, Equation 2.1 demonstrates that the indirect effect of *X* on *Y* through *M* can be quantified as the product of both paths *a* and *b*. Hence, it is a mathematically sound idea to use the point estimate of *ab* for conducting statistical significance testing and constructing confidence intervals. Thus, the mediational effect of interest in the application of mediation models is the point estimate ab, and its associated standard error, which is used to test its significance.

This strategy shares an advantage with another method, *bootstrapping*, the advantage of using the product of both paths, *ab*, to quantify a mediation effect. The methods of product of coefficients strategy and bootstrapping are the main focus in this dissertation for examining the mediation effects, but the methodological difference between the two lies in the way the sampling distribution of *ab* can be constructed and

implemented. This difference leads to the distinction between *resampling approach* and *normal-theory approach*, and this will be mentioned in more detail later in the section of moderated mediation effects.

Having established that the mediation effect can be best measured by the point estimate for *ab*, the purpose of statistical significance testing is to assess whether the estimate is significantly different from zero. Further, confidence intervals can be constructed to estimate the precision range of the mediational effect. The point estimation and interval estimations are often conducted separately, but confidence intervals may suffice both needs because the construction of confidence intervals implies the results from any hypothesis testing of point estimates, and gives additional information on the precision of estimates of indirect effects.

Under the assumption of the normality of the sampling distribution of *ab*, the key question becomes how the mean and the standard deviation of the sampling distribution of *ab* (i.e., standard error) can be derived. A number of approaches have been developed and used in the literature, and the multivariate delta method was one of them (Aroian, 1947; Goodman, 1960; Folmer, 1981; MacKinnon, Warsi, & Dwyer, 1995; Sobel, 1982, 1986, 1988; Preacher, Rucker, & Hayes, 2007). The statistical significance test using *z*-test of the point estimate, *ab*, is called *Sobel test* for an indirect effect (Sobel, 1982). Also the derived standard error can be used to build a confidence interval for the population indirect effect. There are many merits to this approach. It is methodologically sound and strong, and it is easy to be implemented in many commercial statistical software packages. One concern to this approach is the feasibility of its assumptions, specifically the assumption of the normality of the sampling distribution of

the product of paths, *ab*. An extremely large sample size is required to satisfy this assumption, which is likely not always available in applied work. Many theoretical studies point out that the sampling distribution of *ab*, is likely to demonstrate high degree of skewness and kurtosis in practice, which leads to the violation of the assumption of the normality distribution (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; MacKinnon, Lockwood, & Williams, 2004). Additionally, the product of coefficients strategy is susceptible to the decrease in Type I error and statistical power (Pituch, Whittaker, & Stapleton, 2005).

Bootstrapping has been developed as another method for testing the mediation effect. While the previously discussed methods, (e.g., the product of coefficients strategy) rely on the normality assumption of sampling distribution, bootstrapping is a non-parametric method that makes fewer assumptions and as a result can produce more accurate statistical inferences. Therefore the bootstrapping can be chosen as an alternative to the Sobel test which can only be justified with a very large sample. In fact, there is an ongoing trend in a methodology literature in which researchers are transitioning to computationally intensive methods using iterative resampling procedures, such as bootstrapping, moving away from the methods that depend on unrealistic distributional assumptions. Hence, resampling methods such as bootrapping have been advocated as one of the preferred methods for testing hypotheses about mediation effects (Bollen, & Stine, 1990; Lockwood, & MacKinnon, 1998; Shrout, & Bolger, 2002; Preacher, & Hayes, 2004, 2007, 2008a; Preacher, Rucker, & Hayes, 2007).

Bootstrapping is a non-parametric method which makes no assumptions about the shape of the sampling distribution of the variables of interest, and therefore no

mathematical formula are needed for the standard error. The procedures for bootstrapping for an indirect effect begin by repeatedly taking a sample of size *n* with replacement from the sample at hand and estimating a regression coefficient for each path *a* and *b*. If a sample is taken repeatedly *k* times, the distribution of the *k* values of the product of paths, *ab*, represents an empirical, nonparametric approximation of the sampling distribution of *ab*. This sampling distribution of *ab* taken from the resampling procedure has a mean, which serves as a point estimate of the indirect effect, and a standard deviation, which serves as a standard error of the sampling distribution. Because the sampling distribution does not require an assumption of symmetry, the confidence interval constructed using the mean and standard error tends to be asymmetric directly following the skewness of the sampling distribution of *ab*. Specifically when the confidence interval is created at the significance level of α%, the *k* values of *ab* are sorted from the lowest values to the highest values. Then the lower bound of the $100(1 - \alpha)$% confidence interval can be defined as

$$(\alpha/2)k \text{ th} \tag{2.4}$$

value in this sorted distribution, and the upper bound can be defined as

$$[1 + \{1 - (\alpha/2)\}k] \text{ th} \tag{2.5}$$

value in this distribution. This is a *percentile-based* confidence interval. Other methods are available to create accurate confidence intervals such as *bias correction* confidence interval, and *bias correction and acceleration* confidence interval (Stine, 1989; Efron & Tibshirani, 1998; MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2007, 2008a).

Significance testing can be indirectly performed using a confidence interval by examing whether zero falls inside of the confidence interval. If it does, the null hypothesis of no indirect effect fails to be rejected, concluding that the effect is not statistically different from zero and there is no mediation effect. Many of theoretical studies attest to this resampling procedure's enhanced performance compared with other methods such as causal steps strategy, and product of coefficients, in terms of statistical power and Type I error rates (MacKinnon, Lockwood, & Williams, 2004). The main strength of bootstrapping strategy is that it is free from the assumptions about the sampling distributions of path *a*, path *b*, or the product of both paths, *ab*. This is because this method exploits empirical approximation of the sampling distribution of *ab*. This also provides added advantage that the construction of confidence intervals becomes available, which is not the case with the product of coefficients strategy (Lockwood & MacKinnon, 1998).

As mentioned before, bootstrapping generates asymmetric confidence intervals in which the distances between the point estimate of the mean and lower or upper bounds do not need to be uniform, which is closer to the reality given that large sample size is rarely available. Bootstrapping requires much smaller samples compared with other methods that make distributional assumptions. There are a few points to consider before the execution of bootstrapping strategy. Firstly, the confidence intervals being constructed are accurate only to the extent that the number of resamples are large enough during the resampling procedure. Secondly, due to the nature of empirical approximation of the sampling distribution of *ab*, the confidence intervals obstained will never be the same across the implementions of the method. Thirdly, bootstrapping still prefers large

samples as the distributions of the variables in the original sample need to approach the population distribution. Overall, considering its improved performance nonparametric resampling techniques such as bootstrapping gain popularity in the methodological as well as applied research literature, and it is preferred and pursued strategy when evaluating hypotheses about mediation or indirect effects. Therefore, it is the primary method we will use in the current dissertation of method illustrations.

2.2 Moderation Effects

Moderation effects refer to the difference in the strength of the relationship between the two variables depending on a third variable. This third variable is called a *moderator variable* (*W*), and it interacts with the independent variable (*X*) in predicting the dependent variable (*Y*). In other words, the regression coefficient of *Y* on *X* varies as a function of *W*. A simple moderation effect can be depicted as Figure 2.2. In a linear regression, a moderation effects can be described using the following equation:

$$Y = a_0 + a_1X + a_2W + a_3XW + \varepsilon \tag{2.6}$$

where a_0 is an intercept and a_1, a_2 and a_3 are the regression coefficients for *X*, *W* and the interaction effect between *X* and *W*, respectively. Equation 2.6 can also be reexpressed as

$$Y = (a_0 + a_2W) + (a_1 + a_3W)\,X + \varepsilon \tag{2.7}$$

and this shows a new regression coefficient of *Y* on *X*, $(a_1 + a_3W)$, which is called a *simple slope* in the literature, and is a function of a moderator *W*. In the linear regression literature, moderation effects can be examined by determining whether the slope of *Y* on *X*, $(a_1 + a_3W)$, is statistically significant for arbitrarily selected values of *W* (Aiken, & West, 1991). If the moderator is a categorical variable, those values are coded values. If

it is a continuous variable, three values are typically selected, the mean and ±1 *SD* from the mean.

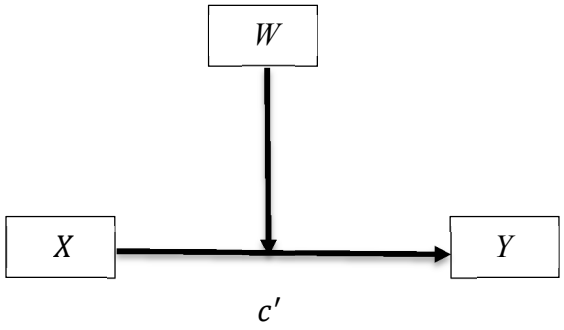


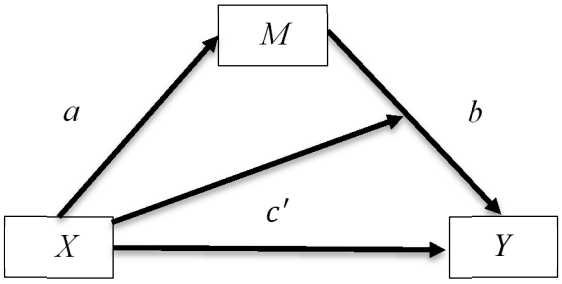
Figure 2.2: A Moderation Model

2.3 Moderated Mediation Effects

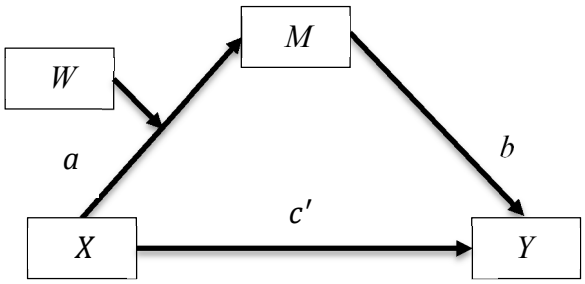
A moderated mediation effect is a model which incorporates both mediation and moderation into a single model. Moderated mediation can be defined as an effect in which the magnitude of an indirect effect varies as a function of a moderator variable. Thus, the linear relationship between *X* and *Y* via *M* is contingent on the values of the third variable *W*. Then *W* moderates the relationship between *X* and *Y*. Moderated mediation effects need to be distinguished from *mediated moderation effects*, which is related but different modeling process. Whereas the focus is placed on examining possible moderaton effects of a moderator variable on the strength of an indirect effect in moderated mediation effects, the focus is on examing whether the effect of an interaction between an independent variable *X* and a moderator variable *W* on the dependent variable *Y* is indirectly mediated by a mediation variable *M*. The topics of moderated mediation effects have been addressed by many researchers (e.g., James, & Brett, 1984; Baron, &

Kenny, 1986; Wegener, & Fabrigar, 2000; Preacher, Rucker, & Hayes, 2007). In particular, Preacher, Rucker, and Hayes (2007) suggested the use of a more comprehensive term, *conditional indirect effects*, which can be used interchangeably with moderated mediation effects since the effects are defined in the similar way as the indirect effects conditional on the values of one or more of the moderator variables. As discussed before, there are two general approaches to estimating and determining the significance of indirect effects in general, and conditional indirect effects in particular. They are resampling approach, the one using resampling procedure to construct asymmetric confidence intervals, and normal-theory or asymptotic approach, the one using 1st- and 2nd-order multivariate delta method to derive standard errors and to create confidence intervals. Bootstrapping strategy and product of coefficients strategy are the representative methods for each approach. Based on the mediation model described in Figure 2.1., Preacher, Rucker, and Hayes (2007) proposed five possible cases in which conditional indirect effects can be modeled as follows: (1) an independent variable *X* also serves as a moderator variable of the path *b*; (2) a moderator variable *W* is introduced into the model and it affects the path *a*; (3) another moderator variable *V* affects the path *b*; (4) a moderator variable *W* affects the path *a*, and other moderator variable *V* affects the path *b*; (5) a moderator variable *W* affect both paths of *a* and *b*. These five models are described in Figure 2.3. Each of these models is labeled in this dissertation PRH Model 1, PRH Model 2, PRH Model 3, PRH Model 4 and PRH Model 5, respectively.

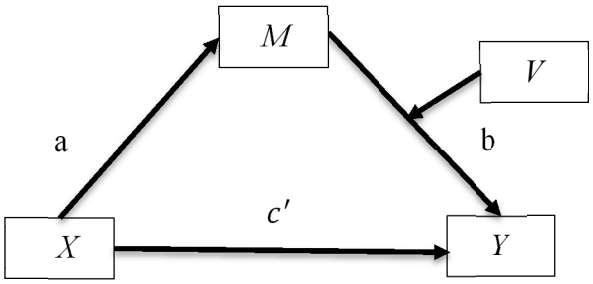
PRH Model 1



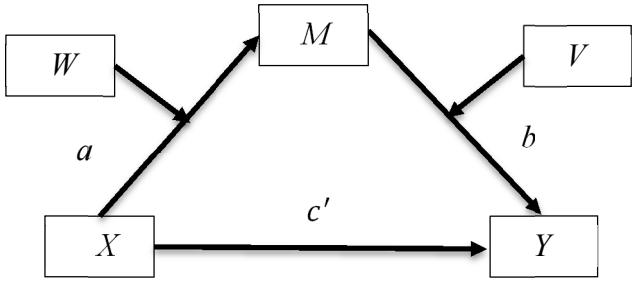
PRH Model 2



PRH Model 3



PRH Model 4



PRH Model 5

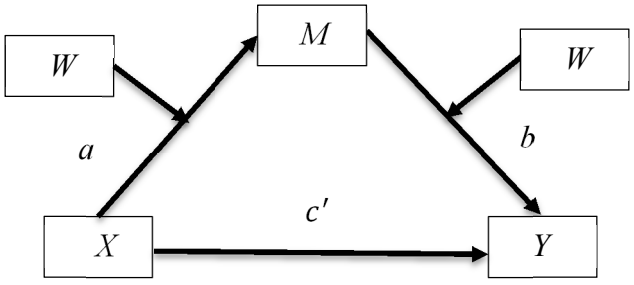


Figure 2.3: Models of Moderated Mediation Effects in Preacher, Rucker, & Hayes (2007)

Each of these conditional process models is a mediation model with moderation of the indirect effect of *X* on *Y* through *M*. For selected models, statistical breakdown of the models will be briefly introduced below.

In PRH Model 3, the indirect effect of *X* depends on the values of *V* through moderation effect of the *M* → *Y* by *V*. The statistical representations of this model are as follows using notations for paths and variables described in Figure 2.4:

$$M = a_0 + aX + \varepsilon \tag{2.8}$$

$$Y = b_0 + c'X + b_1M + b_2V + b_3MV + \varepsilon \tag{2.9}$$

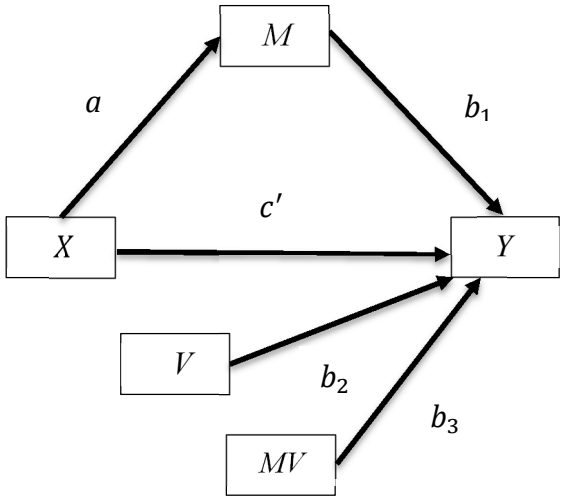


Figure 2.4: PRH Model 3 in a Statistical Diagram

The effect of *X* on *Y* through *M* is the product of paths connecting *X* with *Y* through *M*. While the path from *X* to *M* remains to be *a*, the path representing the effect of *M* on *Y* controlling for *X* is not b_1 any more in this conditional process model. Rather, the effect of *M* on *Y* is a function of *V* as can be verified by rewriting Equation 2.9 into an equivalent form as follows:

$$Y = b_0 + c'X + (b_1 + b_3V)M + b_2V + \varepsilon \quad (2.10)$$

Therefore, the effect of *M* on *Y* can be quantified as $(b_1 + b_3V)$, which is a conditional effect that is a function of *V*. Consequently, the indirect effect of *X* on *Y* through *M* is also a function of *V* because the indirect effect is created as the product of effects connecting *X* with *Y* through *M*. Finally, the conditional indirect effect of *X* on *Y* through *M* is quantified as $a(b_1 + b_3V)$, which measures how differences in *X* lead to differences in *Y* indirectly through *M* conditional on the values of *V*.

In PRH Model 5, the indirect effect of *X* on *Y* through *M* is conditional on *W* with moderation effect in both paths, *X* → *M*, and *M* → *Y*. Figure 2.9 depicts a statistical diagram of the model.

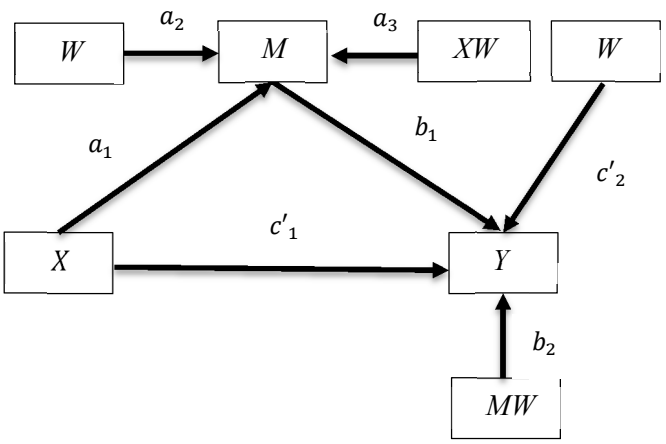


Figure 2.5: PRH Model 5 in a Statistical Diagram

The regression equations for this type of conditional indirect effect are:

$$M = a_0 + a_1X + a_2W + a_3XW + \varepsilon \quad (2.11)$$

$$Y = b_0 + b_1M + b_2MW + c'_1X + c'_2W + \varepsilon \quad (2.12)$$

Rewriting these equations into an equivalent form, we can verify that both the effect of *X* on *M*, and the effect of *M* on *Y* are a function of *W*:

$$M = a_0 + (a_1 + a_3 W)X + a_2 W + \varepsilon \quad (2.13)$$

$$Y = b_0 + (b_1 + b_2 W)M + c'_1 X + c'_2 W + \varepsilon \quad (2.14)$$

Therefore, the effect of X on M is $(a_1 + a_3 W)$, and the effect of M on Y is $(b_1 + b_2 W)$, both of which are conditional effects as a function of W. As a result, the indirect effect of X on Y through M is also a function of W as quantified as $(a_1 + a_3 W)(b_1 + b_2 W)$.

The main purpose of the current dissertation is to show the method illustrations of a selection of those five models of conditional indirect effects using hypotheses from studies of positive body image among adolescent girls. Hence in the next section, the literature about body image of adolescent female population needs to be discussed to inform the selection of variables that constitute different models of conditional indirect effects.

2.4 Research on Body Image

Satisfaction or dissatisfaction with their body image among adolescent girls has been a research topic that receives a great deal of attention in the literature of healthcare psychology or adolescent development due to its direct connection to diet and eating bahaviors (e.g., Stice, Presnell, & Spangler, 2002; Crow, Eisenberg, Story, & Neumark-Sztainer, 2006; Allen, Byrne, McClean, & Davis, 2008; Kluck, 2010). In this regard, the focus of many studies has been on examining the relationship between potential factors that affect body image creation and actual development of body image. According to the sociocultural theory framework, currently developed societal standards for the beauty of female population foster people's orientation toward thinness of body shapes, and *sociocultural agents* such as parents, peers or media play a role in disseminating these

ideals (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Tiggemann, 2011). The direct messages about these unrealistic standards which can be delivered by sociocultural agents may result in the emergence of body dissatisfaction. Adolescent girls's perception of themselves as someone with less than ideal body type may result in the unintended consequence of health condition development which influences their life well-being and health funcitioning (Crow, Eisenberg, Story, & Neumark-Sztainer, 2006; Hutchinson, Rapee, & Taylor, 2010; Stice, & Shaw, 2002; Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006).

Examples in the literature investigating parental influences as sociocultural agents included following studies. Using examples of adolescent Caucasian girls in Australia, Blowers, Loxton, Grady-Flesser, Occhipinti, & Dawe, (2003) and Paxton, Schutz, Wertheim, & Muir, (1999) demonstrated that there was a positive correlation between adolescents' perceived family pressure to be thin and discontent with their body image. There was another study by Stice and Whitenton (2002) using Caucasian girls in U.S. in their early adolescence in which perceived family pressure to be thin predicted the formation of negative body image. These studies presented empirical evidence that messages from parents would influence types of body image adolescent girls develop, and apprearance-focused messages also promote types of dietary practices they engage in via mediating paths through development of body image. Adolescent girls who report increased level of pressure from family to lose weight would report more negative attitude toward eating behaviors such as chronic dieting and extreme weight loss behaviors (Ata, Ludden, & Lally, 2007; Dixon, Adair, & O'connor, 1996; McCabe, & Ricciardelli, 2005; Schreiber, Robins, Striegel-Moore, Obarzanek, Morrison, & Wright,

1996). With all things taken together these studies show consistent findings that a family focus on physical appearance of adolescent girls may result in negative consequences. In this way the relationship between negative commentaries made by family, and their effect on adolescent girls' perceived body image is well-documented in the literature. However, there has been much less research on the positive side of family communications and their impact on self-esteem development of adolescent girls. In the study of Herbozo and Thompson (2006), there was a linear association between parental positive messages about body shape, and body satisfaction and self-esteem of female population in their college years. Gross and Nelson (2000) showed that eating disorder among female college students was predicted by smaller amount of positive maternal feedback. According to Tylka (2011)'s recently proposed argument that positive body image porivides "a cognitive schema to help individuals interpret incoming information in a body-protective manner whereby more positive information is internalized and most negative information is rejected" (p. 58). Positive parental messages may function as a buffer to sociocultural pressures and then lead to high self-esteem for adolescent girls, however, no studies yet have investigated the effect of parental or family compliments about weight or shape of adolescent girls. In addition, the link that connects appearance-oriented communication with parents to body image perceptions may depend on how the parental messages are interpreted and internalized by adolescent girls. Plausible hypotheses include that the relationship between family messages and body image relies on perceptions of family-connectedness or family-acceptance (Barker, & Galambos, 2003; Byely, Archibald, Graber, & Brooks-Gunn, 2000; Crespo, Kielpikowski, Jose, & Pryor, 2010), and that it is important to take into account the contexts in which those

apprearance-related communications occur and the way in which adolescent girls interpret those messages.

Peers can also serve as sociocultural agents in affecting adolescent girls' opinions about how a desirable body image can be defined (e.g., Halliwell & Harvey, 2006; Jones, 2004; Jones, Vigfusdottir, & Lee, 2004; Lawler & Nixon, 2011; Jones, 2001) because peers can influence their body image development through verbally or indirectly made communications about beauty norms. Negative input from peers, in such forms as critical remarks, or teasing, can produce adolescent girls' concerns about their body shapes and image (Hutchinson, Rapee, & Taylor, 2010; Paxton, Eisenberg, & Neumark-Sztainer, 2006). Peer pressure can also be developed through internal or unconscious body comparisons (Halliwell & Harvey, 2006; Jones, Vigfusdottir, & Lee, 2004). In the same way as with family influences, appearance-related communications with peers can lead to changes in adolescent girls' eating patterns and behaviors through the mediating role of body image creation. Although there is a strong support in the literature that peers convey the body ideal of thinness in a way that exerts a negative influence on the body image development, there is limited research that examines potentially positive ways in which adolescent girls affect one another in terms of body image formation and health-related diet behaviors or activities. There are two plausible hypotheses. The first one is that compliments from peers can influence types of body image adolescent girls develop. The second one is that having friends who are appearance-oriented, content with their bodies, and care about health-promoting lifestyles can have implications for supporting positive body image among adolescent girls. Healthy behaviors of friends can be a good predictor of adolescent girls' active engagement in healthy life practices. Kelly, Wall,

Eisenberg, Story, & Neumark-Sztainer (2005) demonstrated that girls with higher satisfaction about their body shape were more likely to report their friends were concerned about being fit and exercising than girls with lower satisfaction. This finding suggests that good and close relationship with friends or peers with the similar attitudes toward body perceptions and health-related habits can enhance resilience of adolescent girls against negative body image, and promote healthy behaviors. There is a need for further verifications about these positive peer influences in the context of Latina adolescent girls.

Media also influences adolescent girls' beauty assessment because they can easily learn about ideal body image or beauty standards prevalent in the culture. Media pressure to imitate the slender look that is promoted by models and actors has become a significant predictor of negative perceptions of their body among adolescent girls (Paxton, Schutz, Wertheim, & Muir, 1999; Rodgers, Faure, & Chabrol, 2009). By internalizing media ideals and images, adolescent girls become dissatisfied with their bodies (Jones, Vigfusdottir, & Lee, 2004; Shroff, & Thompson, 2006). There were a number of studies that showed evidence of adolescent girls who were affected by Westernized media culture that adores slender body shape ideals, and who identified themselves with poor body image (e.g., Duke, 2000; Lovejoy, 2001; Schooler & Trinh, 2010). On the other hand, it is a generally accepted idea that curvier body shapes are traditionally valued in Latino culture, and therefore, in theory meaningful difference should exist between Latina adolescent girls and European-American adolescent girls in terms of the influence of media on their ideal body image formation (Levine, & Chapman, 2011). However, there is little literature that illuminate the ideal body shape

and preferences for Latina youth. Therefore in the current study it is examined how differently the effect of media as a sociocultural agent functions among Latina adolescent. It may be that there can be substantial tensions or conflicts between Westernized culture, and traditional Latino culture in terms of body shape preferences. In addition, this study expands upon body image literature to investigate how the perceptions of adolescent girls about whether media ideals are unrealistic, unattainable and unhealthy, and their resistance to the internalization of the media ideals can be related to the formation of positive body image, healthy eating, and physical activities.

In light of *resilience theory* which is a framework for investigating healthy development relative to risk factors, the main focus of a large majority of the body image studies has been on finding empirical support for understanding how risk and protective factors affect adaptive functioning (Garmezy, & Masten, 1991; Fergus, & Zimmerman, 2005). However, one of the major limitations of body image research is that researchers are concerned more about identifying risk factors rather than protective factors, so it illuminates the process as to how those factors lead to body dissastisfaction. Still drawing on resilience theory, there is an increasing need to focus on identifying strengths rather than deficits. Therefore the current study examines protective factors that contribute to the development of positive body image by emphasizing their importance of messages about parental support, positive peer networks, and resilience to the beauty standards shaped by the popular culture that media creates. The main objective of this study is to identy and understand Latina adolescent girls who retain positive body image by examining factors that help maintain their resilience when confronted with a sociocultural difficulty that leads to having negative perception about their bodies.

Many research also indicated the possibility that there could be a close link between positive body image among adolescent girls and their active engagement in healthy eating practice and physical activities. Research on body image dissatisfaction has focused on the lifestyle that adolescent girls engage in to prevent body fat as body dissatisfaction is shown to impact unhealthy dieting practices (Crow, Eisenberg, Story, & Neumark-Sztainer, 2006; Hutchinson, Rapee, & Taylor, 2010; Stice, & Shaw, 2002; Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006). However, little is known about the protective effects of positive assessment of their body shapes on their participation in healthy eating and physical activities. One possible hypothesis is that higher level of body satisfaction can predict greater participation in healthy eating behaviors that can be fulfilled through fruit or vegetable intake (Sebastian, Cleveland, & Goldman, 2008), and higher level of physical activities, suggesting that it leads to improved self-care (Neumark-Sztainer, 2011; Haugen, Safvenbom, & Ommundsen, 2011). The rationale behind this prosed hypothesis is that adolescent girls who show positive evaluation about their body appearance should appreciate their good health condition and care for their bodies by providing health-promoting lifestyle behaviors (Tylka, 2011). This hypothesis is of more significance to Latina population because many studies show that this population engage in less healthy behaviors compared with European-American adolesgent girls for socioeconomic or sociocultural reasons (Bauer, Larson, Nelson, Story, & Neumark-Sztainer, 2009; Cutler, Flood, Hannan, & Neumark-Sztainer, 2011; Carvajal, Hanson, Romero, & Coyle, 2002; Perry, Rosenblatt, & Wang, 2004; Centers for Disease Control and Prevention, 2010). Therefore it is important to examine how positive assessment of their body image predicts healthy eating patterns and

physical activities in Latinas. They are also a relatively understudied group in the body image literature.

Chapter 3: Illustrative Analyses

This chapter consists of a single analytic study. Specifically it presents an empirical data analysis using data from a survey program to illustrate the use of the methods. The objective of this presentation is to illustrate how to fit different models for moderated mediation effects and how to interpret results. Data from the Positive Body Image Survey (Romo, Mireles-Rios, & Nylund-Gibson, 2012) were used for this purpose.

3.1 Overview of the Positive Body Image Survey

The Positive Body Image Survey (Romo, Mireles-Rios, & Nylund-Gibson, 2012) was created for the purpose of measuring (1) participants characteristics; (2) protective factors; (3) body image perceptions; and (4) engagement in health-promoting behaviors, with its focus on adolescent girls beginning at age 13.

3.2 Sample

Sample selection was performed according to the following criteria. Sample was included into the study if participants were (1) adolescent girls who self-identified themselves as European-American/White; (2) adolescent girls who self-identified themselves as Latina (both immigrant and non-immigrant); (3) adolescent girls of age 13 to 19 years; and (4) adolescent girls in middle schools (8^{th} grade), or high schools (9^{th} grade or above). Participants were excluded if they were (1) adolescent girls who were pregnant, or have had babies at the time of recruitment; (2) adolescent girls who had serious mental disabilities. Followings were the recruitment procedures.

The sample was composed of 148 girls enrolled in the high schools in Santa Barbara County in California. A substantial number of those who recruited were Latina and European-American adolescents. Recruitment took place in the physical education classes at the end of the academic school year. A week prior to data collection, researchers made a presentation in the classes describing the nature of the study. Ample time was provided for girls to ask questions. A parental consent form was distributed, and researchers asked the students to return the signed form to their teachers in case there were interested in participating in the study. It was emphasized that participation is voluntary.

Data collection was conducted as follows. On the day of data collection, a 30-minute pencil and paper survey was administered to the girls in a private location at the school during their physical education class period. Only students who returned the signed parental consent form was allowed to take the survey. Prior to comleting the survey, researchers described the assent form, and had the students read and sign it. The girls were given a gift card to a local store as a way of compensation regardless of whether they finished the survey.

Of 148 participants who completed the survey, the sample was predominantly Latina (66.9%). The sample included 14.9% European-American/White, 7.4% Asian-American, 2.7% African-American, 7.4% other ethnicities, and 0.7% unidentified. They were adolescent girls between the ages of 13 to 19 (M = 14.90, SD = 1.023). The majority of the participants were born in the U.S. (n = 122) and the rest were born in Mexico (n = 17), and others (n = 9). There were 64 freshmen, 63 sophomore, 15 junior, and 6 senior. The participants reported that 52.7% of their mothers were born in Mexico, 33% were

born in the U.S., and 14.3% were born in other countries. Of those mothers who were born outside of the U.S., the number of years living in the U.S. showed the range of 1 to more than 20 years, with 2.7% reporting that they had lived in the U.S. for less than 5 years, 5.4% reporting 6 to 10 years, 12.8% reporting 11 to 15 years, 18.9% reporting 15 to 20 years, and 27.7% reporting more than 20 years.

For use in this particular study, the final sample size was 99 adolescent girls (N = 99) who self-reported the identification of their ethnicity as Latina.

3.3 Measures

The survey consisted of items classified by following four categories, participant characteristics, protective factors, body image perceptions, and engagement in health-promoting behaviors.

3.3.1 Participant Characteristics

Items related to participant characteristics included questions asking about either participants' or their parents' age, national origin, school years, academic-related status and perceptions, English language proficiency, immigration status, education level, occupation, ethnicity, height, weight, perceptions of weight status. Items were in a mixed format including open-ended questions, fill-in-a-blank, check box, Likert-scale with four response options: not at all, a little, a lot, very much.

3.3.2 Protective Factors

Items related to protective factors included peers' feelings about their bodies, messages from mothers and peers about weight and body shape, conversations with mothers and peers, relationship with their mothers, peers' health habits, media messages,

personal values on ideal body shape and weight, mothers' health recommendations. These question items can be reclassified into following four sub-categories which represent hypothesized protective factors. The first sub-category was *maternal influences* which included items about compliments about weight and shape, mother-teen relationship quality (*alpha*=.93; Sorensen, Stoddard, & Macario, 1998), positive interpretation of maternal messages about weight and shape, positive interpretation of maternal encourangement to diet, maternal criticism of daughters' weight and shape, support for healthy eating and physical activity (*alpha*=.82; Barnes, & Olson, 1985), receptiveness to messages about healthy eating and physical activity, and frequency of communication about healthy eating and physical activity. The second sub-category was *peer influences*, and it was comprised of items asking about peers' compliments about weight and shape, peers' satisfaction with their own weight and shape, peers' criticism of girls' weight and shape, importance peers place on healthy eating and physical activity (*alpha*=.93; Tylka, 2011), and frequency of communication with peers about healthy eating and physical activity. Lastly, *media influences* were the third sub-category which included the items that represented perceptions that media standards are realistic and attainable, resistance to internalization of media ideals (*alpha*=.80; Kelly, Wall, Eisenberg, Story, & Neumark-Sztainer, 2005), resistance to negative impact of media images. The fourth sub-category was *valued body standards*, and followings items belonged to this, personal beliefs about body attractiveness, and culturally sanctioned standards of attractiveness (*alpha*=.86; Heinberg, Thompson, & Stormer, 1995).

3.3.3 Body Image Perceptions

Items related to body image perceptions were classified into body self-esteem (*alpha*=.87; Mendelson, White, & Mendelson, 1996), body appreciation (*alpha*=.94; Avalos, Tylka, & Wood-Barcalow, 2005), and body shape satisfaction (Pingitore, Spring, & Garfield, 1997). For example, two items related to body self-esteem were: "I am happy about the way my body looks." and "My body looks as nice as I would like it to be." The response options were: strongly disagree, somewhat disagree, somewhat agree, strongly agree. These response options were coded in a way that a higher value indicated stronger agreement or more positive assessment of their body image, and a lower value indicated less agreement or less positive assessment.

3.3.4 Engagement in Health-promoting Behaviors

Items associated with engagement in health-promoting behaviors were arranged into the sub-categories of healthy food intake such things as fruit and vegetable intake, and avoidance of fastfood, physical activity habits, and enjoyment of physical activity (*alpha*=.85; Motl, Dishman, Saunders, Dowda, Felton, & Pate, 2001). Examples of items in this category included such items as: "In the past week how many hours outside of physical education were spent in moderate activity that was not exhausting like walking?", and "When I am physically active or exercise, I enjoy it." The former was measured on a continuous scale (e.g. the number of hours spent) while the latter was answered on a Likert scale using response options of strongly disagree, somewhat disagree, somewhat agree, and strongly agree.

3.3.5 Creation of Composite Variables

Relevant items were selected to create composite variables that constitute different models for moderated mediation effects. These items were chosen based on the

prior literature on positive body image to represent the constructs of protective factors, positive body image, and adolescent girls' engagement in the health-promoting behaviors.

In particular, the frameworks of sociocultural model and resilience theory indicate that protective factors are expected to include such sub-categories as maternal influences, peer influences, and media influences. Table 3.1 through Table 3.6 list the entire items included in the survey by presenting hierarchical natures of specific items, composite variables, sub-categories, and constructs. To begin with, composite variables were created to measure different aspects of maternal influence as presented in Table 3.1. Maternal influences include Composite 8, 13, 14, 15, 17, 33, and 34. All of these composite variables were created by recoding response options as necessary with a higher value indicating stronger amount of influences, and then calculating an arithmetic mean of relevant items. Table 3.2 shows composite variables that indicate peer influences. They were Composite 7, 9, 10, 16, and 18. Table 3.3 includes composite variables of media influences which are Composite 27 and 28. All these composite variables were created in the identical manner as maternal influences.

Composite variables that represent the construct of positive body image include Composite 1, 2, 3, 4, 5 and 6. Composite 1, 2, 3, 4 and 5 reflect slightly different aspects of positive body image development, and Composite 6 is a composite variable of the whole items used for Composite 1, 2, 3 and 4. Some items were reverse-coded such that a higher value indicated a greater deal of possessing positive body image. All composite scores were created by taking a mean of item responses. Table 3.4 describes these items.

The engagement of adolescent girls in the health-promoting behaviors involves such composite variables as Composite 19, 20, 21, 22, 23, 24, 25, and 26. Healthy eating habits such as an intake of vegetables or fruits and maintenance of good dietary habits, and active participation in physical activity were considered a proxy for health-promoting behaviors. All composite variables in this construct were created by recoding response options and taking a mean of the Likert-scale scores, except for Composite 25 which represented current physical activity level measured on continuous scale, and were computed as an arithmetic mean of the amount hours spent on each designated physical activity. All items in this construct were depicted in Table 3.5

In addition to the composite variables related to the constructs of protective factors, positive body image, and adolescent girls' engagement in the health-promoting behaviors, a few other composite variables were created. Two of them were Composite 29 and 30, which were intended to measure personal values on ideal body shape and weight. Other composite variables aimed to measure participants' characteristics or current status. They were Composite 12 and 32, and all these composite variables were demonstrated in Table 3.6.

3.4 The Present Study

Due to the lack of studies mainly examining protective factors rather than risk factors which were suggested to predict the development of positive body image, and in turn the engagement in the health-promoting behaviors as an outcome in the path analytic models for the population of Latina adolescent girls, the current study was designed to expand previous literature by analyzing data obtained from adolescent girls'

Table 3.1

List of Items for "Maternal Influences" for Construct "Protective Factor"

Item 63R*	Mother gives you messages that it would be better for you to be thinner	
Item 60	Give you messages that it would be better for you to be larger	
Item 62	Give you messages that you are the right shape and weight	
Item 61R	Give you messages that you are over-weight	Composite 8
Item 64	Give you messages that you are under-weight	
Item 59	Give you compliments about your shape and weight	Mom's compliments about weight and shape
Item 74R	Criticize your body shape and weight	
Item 73	Tell you that you should accept your body for what it is	
Item 76	Tell you that your body has some good qualities	
Item 75	Tell you that you should feel good about your body	
Item 78	Mother's comments about weight and shape make me feel like she cares about me	
Item 79R	Her comments make me feel like she is criticizing me	Composite 13
Item 82	Her comments make me feel like she is looking out for my health	
Item 80R	Her comments make me feel like she disapproves of me	Positive interpretations of maternal messages about weight and shape
Item 83R	Her comments make me feel uncomfortable	
Item 77	Her comments do not bother me	
Item 81	Her comments make me want to take better care of myself	
Item 86	Mother's comments about you dieting make me feel like she care about me	
Item 87R	Her comments make me feel like she is criticizing me	Composite 14
Item 90	Her comments make me feel like she is looking out for my health	
Item 88R	Her comments make me feel like she disapproves of me	Positive interpretations of maternal encouragement to diet
Item 91R	Her comments make me feel uncomfortable	
Item 85	Her comments do not bother me	
Item 89	Her comments make me want to take better care of myself	

**Note*. Items with an "R" at the end of their name have been reverse-coded.

Table 3.1 (Continued)

List of Items for "Maternal Influences"for Construct "Protective Factor"

Item 103	Conversation with mother about how important it is to be healthy	Composite 15 Frequency of communication with mom about health-promoting behaviors
Item 102	Conversation with mother about how important it is to be physically fit	
Item 101	Conversation with mother about how important it is to be physically active	
Item 100	I feel that I can tell my mother about my problems	Composite 17 Mother-teen relationship quality
Item 105	I feel that my mother understands me	
Item 104	I feel that my mother cares about me	
Item 106	I am satisfied with my relationship with my mother	
Item 207	Mother encourages you to eat fruits and vegetables everyday	Composite 33 Maternal support for health-promoting behaviors
Item 205	Encourage you to eat breakfast everyday	
Item 202	Discourage you from skipping meals	
Item 204	Discourage you from eating too many sweets	
Item 203	Discourage you from drinking soda	
Item 201	Discourage you from eating fast food	
Item 208	Encourage you to be physically active	
Item 206	Encourage you to exercise	
Item 210	How often do you follow your mother's recommendation to eat healthy?	Composite 34 Receptiveness to maternal messages about health-promoting behaviors
Item 211	How often do you follow your mother's recommendation to physically active?	
Item 209	How often do you follow your mother's recommendation to exercise?	

Table 3.2

List of Items for "Peer Influences" for Construct "Protective Factor"

Item 58R	Many of my close friends hope to become slimmer	Composite 7 Peers' satisfaction with their weight and shape
Item 55	Many of my close friends hope to become larger	
Item 57	Many of my close friends hope to become more shapely and curvy	
Item 56	Many of my close friends are happy with their weight and shape	
Item 54	Many of my close friends feel good about their bodies	
Item 53R	Many of my close friends complain about their weight and shape	
Item 70R	Your close friends give you messages that it would be better for you to be thinner	Composite 9 Peers' compliments about weight and shape
Item 67	Give you messages that it would be better for you to be larger	
Item 69	Give you messages that you are the right shape and weight	
Item 68R	Give you messages that you are over-weight	
Item 71	Give you messages that you are under-weight	
Item 65	Give you compliments about your shape and weight	
Item 66R	Criticize your body shape and weight	
Item 72	My friends' opinion about my weight and shape influences how I feel about myself	Composite 10 Influence of peers on my body image
Item 95	Communication with friends about how important it is to be healthy	Composite 16 Frequency of communication with peers about health-promoting behaviors
Item 94	Communication with friends about how important it is to be physically fit	
Item 93	Communication with friends about how important it is to be physically active	
Item 97	Many of my close friends care about eating healthy food	Composite 18 Importance peers place on health-promoting behaviors
Item 96	Many of my close friends diet to lose weight or keep from gaining weight	
Item 99	Many of my close friends care about staying fit and exercising	
Item 98	Many of my close friends care about being physically active	

Table 3.3

List of Items for "Media Influences" for Construct "Protective Factor"

Item 169R	I try to look like models or performers on TV	Composite 27 Resistance to internalization of media ideals
Item 165R	I compare my body to models or performers on TV	
Item 175R	I would like my body to look like thin models or performers on TV	
Item 174	I would like my body to look like shapely models or performers on TV	
Item 173R	Seeing thin models or performers on TV makes me want to diet	
Item 170R	Seeing thin models or performers on TV makes me feel like my body is not perfect	
Item 166R	Seeing thin models or performers on TV makes me feel dissatisfied with my body	
Item 167	Seeing thin models or performers on TV makes me feel good about my body	
Item 168	Seeing thin models or performers on TV does not influence how I feel about my body	
Item 172	It is unrealistic for most teenage girls to look like thin models or performers on TV	Composite 28 Perception that media ideals are unrealistic, unattainable, and unhealthy
Item 171	It is unhealthy for most teenage girls to try to have a thin body like models on TV	
Item 164R	Most teenage girls who try hard enough can look like thin models on TV	
Item 47R	I hope to become slimmer	Composite 5 Disinterest in slimmer body shape
Item 45	I hope to become larger (more filled out all over)	
Item 46	I hope to become more shapely (more fat around my breast or butt, less fat on Stomach)	
Item 52	I would like my body shape to stay the way it is	

Table 3.4

List of Items for Construct "Positive Body Image"

Item 33	I really like what I weigh	Composite 1	Weight self-esteem
Item 30	My weight makes me happy		
Item 38	Gaining or losing weight is not important to me		
Item 29	I am pretty happy about the way my body looks	Composite 2	Body self-esteem (absolutely)
Item 34	My body looks as nice as I would like it to		
Item 39R	I worry about the way my body looks		
Item 40R	I wish my body looked better		
Item 31	I like what my body looks like in pictures		
Item 36R	The way that my body looks upsets me		
Item 43	I feel good about my body		
Item 50	I am proud of my body		
Item 49R	My feelings toward my body are mostly negative		
Item 41R	I often wish my body looking like someone else's	Composite 3	Body self-esteem (comparatively)
Item 32	My body is as nice looking as most girls		
Item 51	I respect my body	Composite 4	Body embracement and appreciation
Item 42	Despite my flaws, I accept my body for what it is		
Item 44	I feel that my body has some good qualities		
Item 48	My body is not perfect, but I still like my body		

Note. Composite 6, positive body image, was additionally created by calculating a mean of all items used for Composite 1, 2, 3, and 4.

Table 3.5

List of Items for Construct "Engagement in Health-promoting Behaviors"

Item 116	How often do you eat fruits?	
Item 110	How often do you eat dark green vegetables?	
Item 118	How often do you eat orange vegetables?	
Item 108	How often do you eat beef trimmed of fat?	
Item 109	How often do you eat chicken and fish?	
Item 107	How often do you eat beans, peas, or lentils?	Composite 19
Item 124	How often do you eat unsweentened cereal?	Healthy eating habits (intake of fruits and vegetables)
Item 125	How often do you eat wheat bread?	
Item 122R	How often do you eat sweets and snakcs?	
Item 119	How often do you drink reduced-fat milk?	
Item 120R	How often do you drink soda?	
Item 114R	How often do you eat fastfood?	
Item 113	Do you intentionally try not to eat between meals?	
Item 111	Do you intentionally try not to eat after evening meals?	
Item 123	Do you intentionally eat three meals a day?	Composite 20
Item 121	Do you intentionally stop eating when you feel full?	Healthy eating habits (maintenance of good dietary habits)
Item 112	Do you intentionally eat breakfast everyday?	
Item 117	Do you intentionally eat fruits or drink 100% fruit juices?	
Item 115	Do you intentionally eat fruits and vegetables?	
Item 145	In the past year how many times have you gone on a diet?	Composite 21 Frequency of going on a diet in the past year

Table 3.5 (continued)

List of Items for Construct "Engagement in Health-promoting Behaviors"

Item 134	You included more fruits in your diet	Composite 22 Healthy strategies for losing weight
Item 140	You ate less healthy snacks	
Item 139	You ate less high-fat food	
Item 137	You increased physical activity	
Item 142	Yoy engaged in regular exercise	
Item 141	You did other behaviors	
Item 146R	You vomited	
Item 138R	You took lexatives	
Item 127R	You took diet pills	
Item 133R	You fasted	
Item 143R	You skipped meals frequently	
Item 136	Have you told by a health professional it would improve your health to go on a diet?	Composite 23 Advice from health professionals on dieting
Item 131R	How often do you eat food uncontrollably?	Composite 24 Avoidance of emotional eating
Item 130R	How often do you eat more food when you are sad?	
Item 126R	How often do you start eating and cannot stop?	
Item 144	How often do you stop eating when you feel full?	
Item 128R	How often do you prefer to eat food alone?	
Item 135R	How often do you hide food so that you can eat it later?	
Item 129	How often do you eat less food when you are sad?	

Table 3.5 (continued)

List of Items for Construct "Engagement in Health-promoting Behaviors"

Item 156	Hours spent in moderate activiy not exhausting	
Item 163	Hours spent in physical activity that made you sweat	Composite 25 Current physical activity level
Item 159	Hours spent in exercising	
Item 162R	Hours spent in watching TV	
Item 149R	Hours spent in sitting at computer	
Item 152	When physically active, I enjoy it	Composite 26 Enjoyment of physical activity
Item 148R	When physically active, I feel bored	
Item 150R	When physically active, I dislike it	
Item 161	When physically active, I find it pleasurable	
Item 157R	When physically active, it is no fun at all	
Item 151	When physically active, it gives me energy	
Item 147	When physically active, my body feels good	
Item 160	When physically active, it is very pleasant	
Item 155	When physically active, I get something out of it	
Item 153	When physically active, it is very exciting	
Item 154R	When physically active, it frustrates me	
Item 158R	When physically active, it is not at all interesting	

Table 3.6

List of Items for Construct "Personal Values on Ideal Body Shape and Weight" and Others

Item 188R	Thin girls are better-looking than average-sized girls	Composite 29 Personal belief about body attractiveness
Item 186	Girls with a shapely body are better-looking than thin girls	
Item 183	Girls with a large body shape are as good-looking as average-sized girls	
Item 182R	Girls with a large body shape are mostly unattractive	
Item 187	Girls who are thin are mostly unattractive	
Item 185	Over-weight girls are as good-looking as average-weight girls	
Item 184R	Over-weight girls are mostly unattractive	
Item 189	Under-weight girls are mostly unattractive	
Item 176R	In my culture, people believe attractiveness is important if you want to get ahead	Composite 30 Culturally sanctioned standards of body attractiveness
Item 177R	People believe they should work hard on their figures if you want to succeed	
Item 178	It is not important to always look attractive	
Item 180R	Most overweight people are considered unattractive	
Item 179	Most people do not believe that the thinner the better	
Item 190R	People think the thinner the better in clothes	
Item 27	I am currently trying to gain weight	Composite 12 Currently gaining weight
Item 199R	I am sad all the time	Composite 32 Current mental status
Item 200	Things work out for me right	
Item 198R	I do everything wrong	
Item 195	I like myself	
Item 193	I feel like crying not very often	
Item 192	Things bother me not very often	
Item 196R	I look ugly	
Item 191R	I feel alone all the time	
Item 194R	I have no friends	
Item 197	I am sure that somebody loves me	

body image survey to support the complex regression analytic models that link protective factors, development of positive body image, and participation in healthy diet and physical activity. Specifically, those models were specified in a way that promoted five different models of moderated mediation effects or conditional indirect effects which were introduced in Preacher, Rucker, and Hayes (2007), and Hayes (2011).

As a working hypothesis to test, we propose a single overarching mediation hypothesis that is expected to be consistent with the literature of body image among Latina adolescent girls. The hypothesis posits that protective factors that are created and transmitted by proposed sociocultural agents of moms, peers, and media predicts the emergence of positive body image among Latina adolescent girls, and positive body image in turn predicts adolescent girls' active engagement in the health-promoting behaviors as a promixal outcome. In this path, we propose that the creation of positive body image serves as a mediator that interconnects between protective factors and engagement in the health-promoting behaviors. In other words, the effect of protective factors as an independent variable on the engagement in healthy eating and physical activity as a dependent variable, is mediated by a mediator, positive body image. Therefore as an indirect effect, mediation occurs when protective factors predicts positive body image and it, in turn, predicts adolescent girls' participation in the health-oriented behaviors, and in the end protective factors transmitted by sociocultural agents influence health-promoting behaviors among Latina adolescent girls. This model is depicted in Figure 3.1. Protective factors can be decomposed into three different group of variables

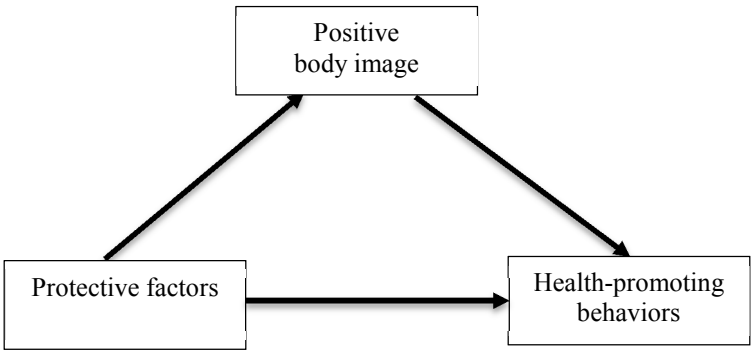


Figure 3.1: Mediation Model as a Modeling Framework

depending on the different types of sociocultural agents that exert their influence. The first type of sociocultural agent is a family, specifically moms of adolescent girls. Variables in this group include maternal input, interpretations of maternal messages, receptiveness of maternal messages, and quality of relationship between moms and adolescent girls. The second type of sociocultural agent is a peer. Variables in this group include peers' care about becoming fit and exercising, peers' input, peers' body self-esteem, peers' attitude toward or modeling of health-promoting behaviors. The third type of sociocultural agent is media. Variables of this group include adolescent girls' perception that media ideals are unrealistic, unattainable and undesirable, and resistance to the internalization of media ideals. An an outcome variable, engagement in the health-promoting behaviors can be realized through frequency of eating healthy foods, healthy eating habits, emotional eating, whether adolescent girls have gone on a diet, healthy strategies for losing weight, attitude toward physical activity, and the amount of physical activity they engage in. Based on this basic mediation model, an array of moderator

variables are added in a way that is consistent with five different models of moderated mediation effects or conditional indirect effects which were introduced in Preacher, Rucker, and Hayes (2007), and Hayes (2011), and described as in Figure 2.3 of the current dissertation.

3.5 Analysis

Data was analyzed using path-analytic models of moderated mediation effects or conditional indirect effects of Preacher, Rucker, and Hayes (2007). As described in Figure 2.3, there are five different specifications of the models are available as follows: (1) an independent variable *X* also serves as a moderator variable of the path *b*; (2) a moderator variable *W* is introduced into the model and it affects the path *a*; (3) other moderator variable *V* affects the path *b*; (4) a moderator variable *W* affects the path *a*, and another moderator variable *V* affects the path *b*; (5) a moderator variable *W* affect both paths of *a* and *b*. As noted before, each of these models are labeld PRH Models. For the purpose of method illustration in this dissertation, a selection of those five models, for example, PRH Model 2, PRH Model 3, PRH Model 4, PRH Model 5, and an unconditional indirect effect model will be used.

SPSS macro and M*plus* codes developed by Preacher, Rucker, and Hayes (2007), and Hayes (2013) were utilized for the modeling purpose. This programming code was intended to facilitate complex computations involved in the methods as previously described, and to make them available to researchers. An *SPSS* macro is a sequence of commands that produce a new function researchers can control to perform custom analyses. Once executed in *SPSS* Version 23 (IBM 1989-2015), the macro creates a new

command in *SPSS* called PROCESS. Using this new command, researchers provide information on which variables to be estimated as independent variables, dependent variables, mediator variables, and moderator variables in the analyses. Also depending on the specific model number we wish to estimate among seventy six different models, *SPSS* produces coefficient estimates and their statistical significance for one of the five different moderated mediation models, and a simple mediation model as introduced in the current study. If no options are added in the PROCESS command, the macro defaults to producing the estimates of the models for moderated mediation effects along with significance tests conditioned on the proposed moderator variables being set to the sample mean and ±1 *SD*. Regression coefficients and confidence intervals are based on the significance test using *t*-test from a normal-theory approach. The confidence intervals for the conditional indirect effects are produced from a bootstrapped resampling approach. Moderated mediation effect standard errors are second-order estimated by default. An option allows researchers to use first-order *SE*s if desired. Researchers can control whether bootstrapping is desired, and the number of bootstrap samples used in increments of 1000. It can also control whether generated confidence intervals are created using the percentile-based, bias corrected, and bias corrected and accelerated methods. Estimates of all paths are computed using ordinary least squares (OLS) regression, and are in the unstandardized form. Sample *SPSS* macro and M*plus* command syntaxes used for statistical modeling in this dissertation, and resultant outputs were included in the appendices.

Chapter 4: Results

The results will be divided into three parts given different sociocultural agents that are involved with protective factors, and different types of health-promoting behaviors: (1) identifying variables of maternal influences as protective factors that contribute to Latina adolescent girls' resilience in the face of sociocultural pressures that lead many of them to feel negative about their bodies; (2) identifying variables of peer influences as protective factors; and (3) identifying variables of media influences as protective factors. Because a large number of models have been fit, Table 4.1 summarizes all the models. It needs to be emphasized that all the models for moderated mediation hypotheses introduced in Preacher, Rucker, & Hayes, (2007) were attempted for the method illustration purpose. Howerver, with the current data set there were no statistically significant results for PRH Model 1, and therefore that specific model was not included in this dissertation.

4.1 Maternal Influences

The hypotheses being tested in this section describe a conceptual model in which variables of maternal influences affect development of positive body image among Latina adolescent girls, which in turn predicts their engagement in the health-promoting behaviors after controlling for relevant background variables of protective factors, i.e., maternal influences. The effect of positive body image on health-promoting behaviors was hypothesized to be moderated by a variety of other variables. We show how this

Table 4.1

Summary of Dissertation Models

Sociocultural Agent	Predictor Variable	Mediator Variable	Outcome Variable	Conditional Variable (a)	Conditional Variable (b)	Model Label	Model Figure	Result Table
Maternal influences	Mother's compliments about weight and shape (8)	Positive body image (6)	Healthy eating habits/intake of fruits and vegetables (19)	—	Frequency of communication with mothers about health-promoting behaviors (15)	PRH Model 3	4.2	4.2
		Positive body image (6)	Healthy eating habits/intake of fruits and vegetables (19)	Frequency of communication with mothers about health-promoting behaviors	Frequency of communication with mothers about health-promoting behaviors (15)	PRH Model 5	4.4	4.3
	Positive interpretation of maternal messages about weight and shape (13)	Positive body image (6)	Healthy eating habits/intake of fruits and vegetables (19)	—	Healthy eating habits/maintenance of good dietary habits (20)	PRH Model 3	4.7	4.4
Peer influences	Peers' satisfaction with their own body (7)	Positive body image (6)	Current physical activity level (25)	—	—	Unconditional Model	4.9	4.5
		Positive body image (6)	Current physical activity level (25)	Frequency of communication with peers about health-promoting behaviors (16)	—	PRH Model 2	4.10	4.6

	Peers' compliments about weight and shape	Positive body image (6)	Current physical activity level (25)	Healthy eating habits/maintenance of good dietary habits (20)	Advice from health professionals about dieting (23)	PRH Model 4	4.13	4.7
Media influences	Perception that media ideals are unrealistic, unattainable, and unhealthy (28)	Positive body image (6)	Healthy eating habits/maintenance of good dietary habits (20)	Enjoyment of physical activity (26)	Healthy eating habits/intake of fruits and vegetables (19)	PRH Model 4	4.15	4.8
	Disinterest in slimmer body shape (5)	Positive body image (6)	Healthy eating habits/maintenance of good dietary habits (20)	Currently gaining weight (12)	Healthy eating habits/intake of fruits and vegetables (19)	PRH Model 4	4.17	4.9

task can be approached within our proposed framework using five different models of moderated mediation effects.

4.1.1 Mother's Compliments about Weight and Shape

The first predictor variable of interest is mother's compliments about weight and shape (Composite 8). The unconditional indirect effect model describes the indirect effect of mom's compliments about weight and shape (Composite 8) on healthy eating habits/intake of fruits and vegetables (Composite 19) through positive body image (Composite 6) as depicted in Figure 4.1. This indirect effect model contains two components. The first component is the effect of mom's compliments about weight and shape (Composite 8) on positive body image (Composite 6). The second component is the effect of positive body image (Composite 6) on healthy eating habits/intake of fruits and vegetables (Composite 19). The quantification of the indirect effect is the multiplication of those two component effects, i.e., the effect of X on M multiplied by the effect of M on Y controlling for X. Based on this model, other variables for moderation effects will be added to constitute the conditional indirect effect models. A part of those models will be examined in this section.

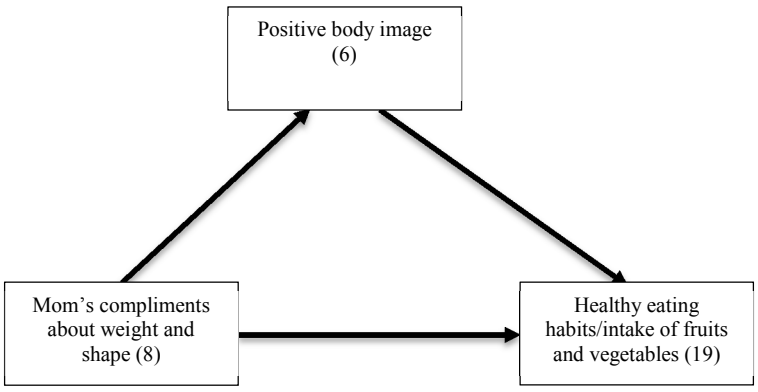


Figure 4.1: A Conceptual Diagram for Unconditional Model of Maternal Influences

4.1.1.1 PRH Model 3. As described before, there are numerous ways that mediation and moderation effects can be combined in a single conceptual model. Among them, PRH Model 3 of Preacher, Rucker, & Hayes, (2007) (e.g., Figure 2.3) refers to the model in which the effect of *M* on *Y* is moderated by *V*. Thus, in this configuration of the conditional indirect effect model, the indirect effect of mom's compliment about weight and shape (Composite 8) on healthy eating habits/intake of fruits and vegetables (Composite 19) through positive body image (Composite 6) was hypothesized to be moderated by frequency of communication with mother about health-promoting behaviors (Composite 15). The fact that the effect of positive body image on healthy eating habits/intake of fruits and vegetables is moderated by frequency of communication with mother about health-promoting behaviors indicates that there is no longer a single quantity that can be used to examine the effect of positive body image on healthy eating habits/intake of fruits and vegetables. Rather, the effect is a function of a moderator variable. Conceptually, this means that the relationship between mothers' compliments about body shape, and fruits and vengetables intake, mediated by positive body image, may differ based on the girls' communication with their mothers. Thus, girls that have higher communication may have different mediational coefficients than girls who have lower communication. A conceptual diagram for this model was described in Figure 4.2.

PRH Model 3 was estimated using *SPSS* macro for a command PROCESS and M*plus*. The resulting model summary information can be seen in Table 4.2. As can be found, the best fitting OLS regression models were,

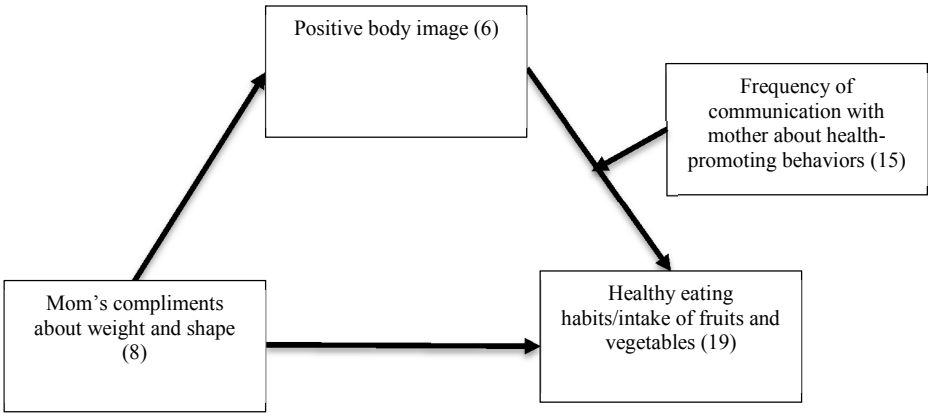


Figure 4.2: A Conceptual Diagram for PRH Model 3

$$\widehat{M} = 0.926 + 0.297X \quad (4.1)$$

$$\widehat{Y} = 2.259 - 0.005X - 0.381M - 0.002V + 0.127MV \quad (4.2)$$

The model indicates that the more mothers compliments about shape and weight of their daughters, the more adolescent girls develop positive body image ($a = 0.297$, $p < 0.01$). Moreover, the effect of positive body image on healthy eating habits/intake of fruits and vegetables is conditional on frequency of communication with mother about health-promoting behaviors ($b_3 = 0.127$, $p < 0.05$).

The path b_1 estimates the effect of positive body image on healthy eating habits/intake of fruits and vegetables at the zero value of frequency of communication with mother about health-promoting behaviors, holding constant mom's compliment about weight and shape. This effect is negative and statistically significant ($b_1 = -0.381$, $p < 0.05$). Therefore holding constant mothers' compliments among adolescent girls whose mothers never talks about how important it is to be physically active, fit and healthy, those having more positive body image consume less amount of vegetables and fruits.

Table 4.2

Summary Information for PRH Model 3

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	*a*	0.297	0.074	< 0.01	c'	-0.005	0.065	0.935
M		—	—	—	b_1	-0.381	0.176	< 0.05
V		—	—	—	b_2	-0.002	0.105	0.987
MV		—	—	—	b_3	0.127	0.064	< 0.05
Constant	a_0	0.926	0.159	< 0.01	b_0	2.260	0.285	< 0.01
		R squared = 0.14 *F*(1,97) = 16.26, *p* < 0.01				*R* squared = 0.19 *F*(4,94) = 5.66, *p* < 0.01		

Conditional Indirect Effect of *X* on *Y* at Values of *V*			
V	Effect	Lower Bound CI	Upper Bound CI
1.327	-0.063	-0.146	-0.006
2.381	-0.023	-0.077	0.023
3.434	0.017	-0.044	0.092

This is substantively meaningful because adolescent girls with more of positive body image tend to be those who are already curvier and shapely, not interested in any efforts to be physically fit and active, so they tend not to be engaged in healthy eating habits.

The statistically significant interaction (b_3 = 0.127, p < 0.05) between frequency of communication with mother about health-promoting behaviors (Composite 15) and positive body image (Composite 6) in the model for healthy eating habits/intake of fruits and vegetables (Composite 19) indicates that the indirect effect of mom's compliment about weight and shape (Composite 8) on healthy eating habits/intake of fruits and vegetables (Composite 19) through positive body image (Composite 6) is moderated by the frequency of communication with mother about health-promoting behaviors (Composite 15). The positive sign of the interaction effect (b_3 = 0.1273) supports the interpretation that the indirect effect through the development of positive body image is larger for adolescent girls who communicate more frequently with their mothers about

health-promoting behaviors. This finding fills in the gap in the positive body image literature since no studies have yet examined the effect of parental compliments about weight or shape of Latina adolescent girls. In addition, it is a new empirical finding that the link connecting maternal compliments about adolescent girls' body shape to healthy eating behaviors through the mediating role of positive body image depends on how often appearance-related communication occurs between mothers and teens.

The statistically significant interaction effect between positive body image and frequency of communication with mother about health-promoting behaviors can be better understood if the conditional effect of positive body image (*M*) on healthy eating habits/intake of fruits and vegetables (*Y*) for various values of frequency of communication with mother about health-promoting behaviors (*V*) is generated. As depicted in Figure 4.3, the conditional indirect effect quantified as ($b_1 + b_3 V$) was estimated to be -0.381 + 0.127*V*. *SPSS* macro for a command PROCESS defaults to providing the estimated conditional indirect effect at three values for *V*, sample mean and ±1 *SD*. Bootstrapped estimates of confidence intervals were shown as follows: at the mean of 2.381 a 95% CI was [-0.077, 0.023], at 1.327 a 95% CI was [-0.146, -0.006], and at 3.434 a 95% CI was [-0.044, 0.092]. Figure 4.3 presents the conditional indirect effects at the values of the moderator variable. The conditional indirect effect at the value of 1.327 for the frequency of communication with mother about health-promoting behaviors (Composite 15) was found significantly different from zero at $\alpha = 0.05$ because the interval did not contain zero. The sign of significant conditional indirect effect was negative, which led to the interpretation that an increase in positive body image predicted a decrease in healthy eating habits/intake of fruits and vegetables at the value of 1 *SD*

below the sample mean for frequency of communication with mother about health-promoting behaviors. When frequency with which adolescent girls communicate with their mothers about health-promoting behaviors was lower (e.g., 1 *SD* below the sample mean, and the sample mean), adolescent girls with increased level of positive body image are less likely to be engaged in the healthy eating habits such as intake of vegetables and fruits, as the conditional effects at those two values in the distribution of frequency of communication with mother about health-promoting behaviors were all negative. However, as the frequency increased to 3.434 (e.g.,1 *SD* above the sample mean), the

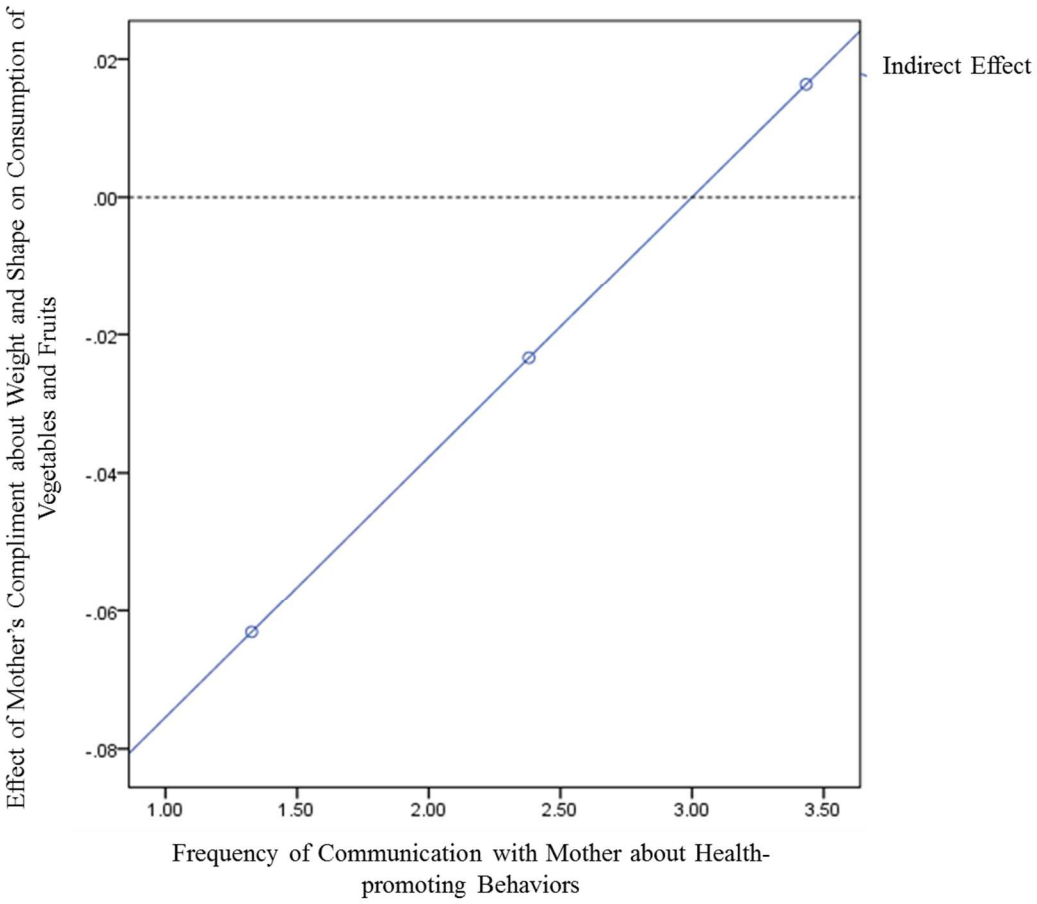


Figure 4.3: A Visual Representation of Conditional Indirect Effect

conditional indirect effect turned to be positive. Therefore the interpretation is that as adolescent girls communicate more with their mothers about body shape and weight, an increase positive body image predicts an increase in the participation in the healthy eating habits. The communications between adolescent girls and their mothers exert a positive influence on the engagement in the health-promoting behaviors among Latina adolescent girls.

Taken together, adolescent girls whose mothers talk more about the positive aspects of body shape and weight tend to develop positive body image. This positive body image is associated with less likely engagement in the healthy eating habits as represented by less amount of vegetables and fruits intake. However, this negative relationship becomes positive as adolescent girls communicate more frequently with their mothers about health-promoting behaviors.

4.1.1.2 PRH Model 5. This is another type of model for conditional indirect effect introduced in Preacher, Rucker, & Hayes, (2007), in which the effect of *X* on *M*, and the effect of *M* on *Y* are moderated by the identical moderator variable, *W*. In this model, the indirect effect of mom's compliment about weight and shape (Composite 8) on healthy eating habits/intake of fruits and vegetables (Composite 19) through positive body image (Composite 6) is conditional on frequency of communication with mother about health-promoting behaviors (Composite 15) with moderation effect in both paths, *X* → *M*, and *M* → *Y*. Figure 4.4 depicts a conceptual diagram for the model.

The model was estimated using *SPSS* macro for a command PROCESS and M*plus*. The resulting model summary information is presented in Table 4.3.

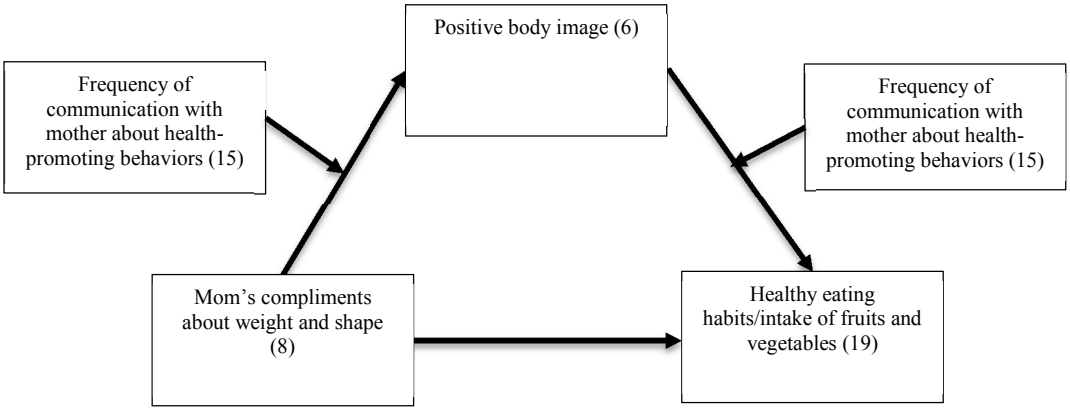


Figure 4.4: A Conceptual Diagram for PRH Model 5

Table 4.3

Summary Information for PRH Model 5

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	a_1	0.019	0.152	0.901	c_1'	-0.005	0.065	0.935
W	a_2	-0.176	0.117	0.137	c_2'	-0.002	0.105	0.987
XW	a_3	0.115	0.057	< 0.05	c_3'	—	—	—
M		—	—	—	b_1	-0.381	0.176	< 0.05
MW		—	—	—	b_2	0.127	0.064	< 0.05
Constant	a_0	1.318	0.278	< 0.01	b_0	2.259	0.285	< 0.01
		R squared = 0.18				*R* squared = 0.19		
		$F(3,95) = 7.01$, $p < 0.01$				$F(4,94) = 5.66$, $p < 0.01$		

Conditional Indirect Effect of *X* on *Y* at Values of *W*

W	Effect	Lower Bound CI	Upper Bound CI
1.327	-0.036	-0.117	0.004
2.381	-0.023	-0.075	0.020
3.434	0.023	-0.057	0.128

As can be found, the best fitting OLS regression models were,

$$\widehat{M} = 1.318 + 0.019X - 0.176W + 0.115XW \quad (4.3)$$

$$\widehat{Y} = 2.259 - 0.381M + 0.127MW - 0.005X - 0.002W \quad (4.4)$$

In the model for *M*, the effect of mothers' compliment about weight and shape on positive body image is contingent on frequency of communication with mother about health-promoting behaviors ($a_3 = 0.115$, $p < 0.05$). Furthermore, in the model for *Y*, the effect of positive body image on healthy eating habits/intake of fruits and vegetables is conditional on frequency of communication with mother about health-promoting behaviors ($b_2 = 0.127$, $p < 0.05$) given the two statistically significant interaction effects identified. Positive and significant moderating effects of frequency of communication with mother about health-promoting behaviors on both mediation paths indicate the importance of active communication between family members to maximize maternal influences as a protective factor that results in the development of positive body image.

Given significant and negative regression coefficient for path b_1 as in the previous model, PRH Model 3, we still rely on the interpretation that controlling for mothers' compliments, among adolescent girls whose mothers never talks about how important it is to be physically active, fit and healthy, those with increased level of positive body image are less likely to consume vegetables and fruits. Again the plausible scenario is that Latina adolescent girls with positive body image may consist of those who do not pursue thin body shape ideals, and therefore they tend not to participate in healthy eating habits with regard to the consumption of vegetables and fruits.

The *SPSS* macro provided the estimated conditional indirect effect at three values for *W*. Using 5000 resamples bootstrapped confidence intervals were produced as follows: at the mean of 2.381 a 95% CI was [-0.075, 0.020], at 1.327 a 95% CI was [-0.117, 0.004], and at 3.434 a 95% CI was [-0.057, 0.128]. Figure 4.5 describes the conditional indirect effects at the values of the moderator variable. Given all the intervals

containing zero, the conditional indirect effect was considered not statistically different from zero at three different values of the moderator variable. The sign of the conditional indirect effect was negative at the first two lower values for *W*, however, the sign became positive when it increased to 3.434. This is consistent with the finding from the previous model, leading to the conclusion that for the adolescent girls who communicate more with their mothers about body shape and weight, an increase positive body image predicts an increase in the participation in the healthy eating habits.

Overall, adolescent girls who receive more of compliments about their body shape and weight are more likely to develop positive body image. In turn the positive body image is negatively related to the amount of consumption of vegetables and fruits. However, this negative relationship becomes positive as adolescent girls are engaged in the communication with their mothers about health-promoting behaviors. The indirect relationship between mothers' compliments about weight and shape, and adolescent girls' healthy eating habits through positive body image is stronger for those with more frequent family communications.

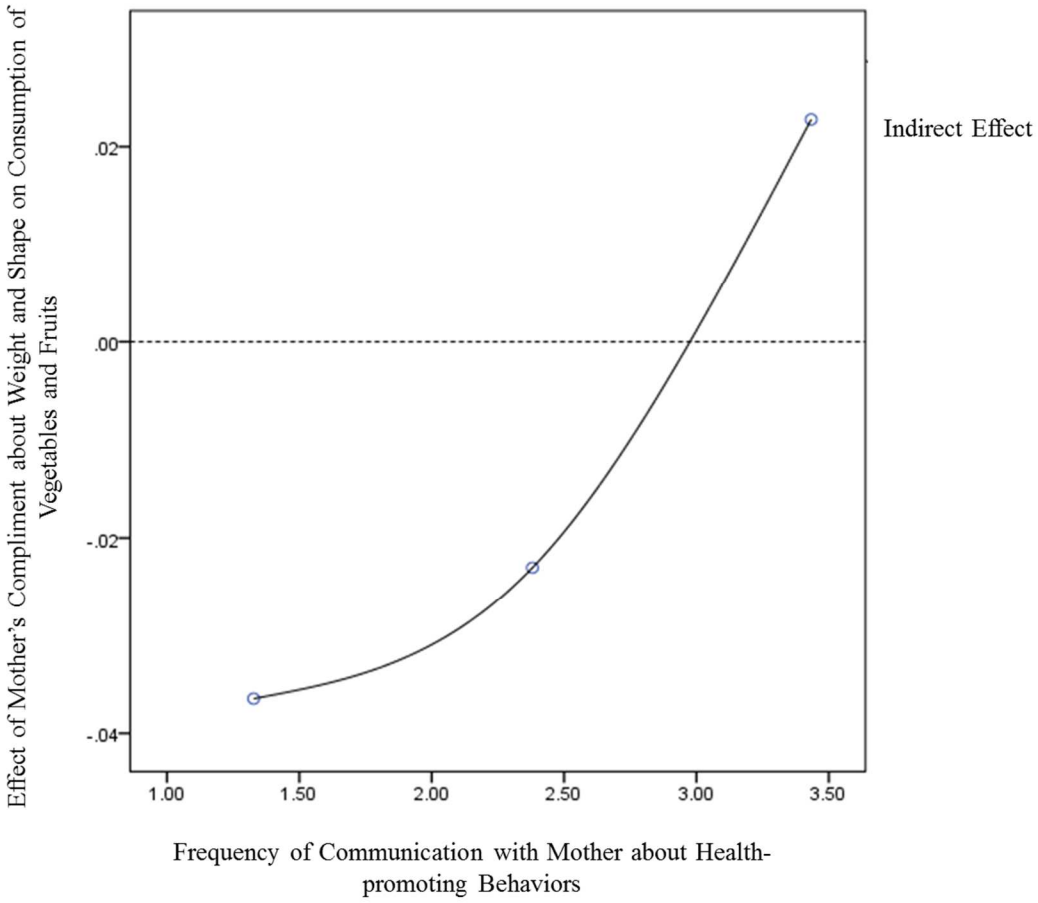


Figure 4.5: A Visual Representation of Conditional Indirect Effect

4.1.2 Positive Interpretation of Maternal Messages about Weight and Shape

The next predictor variable under consideration is positive interpretation of maternal messages about weight and shape (Composite 13). Before examining conditional process models with added moderation effects, an unconditional indirect effect model was firstly described. This model illustrates the indirect effect of positive interpretation of maternal messages about weight and shape (Composite 13) on healthy eating habits/intake of fruits and vegetables (Composite 19) through positive body image (Composite 6) as presented in Figure 4.6.

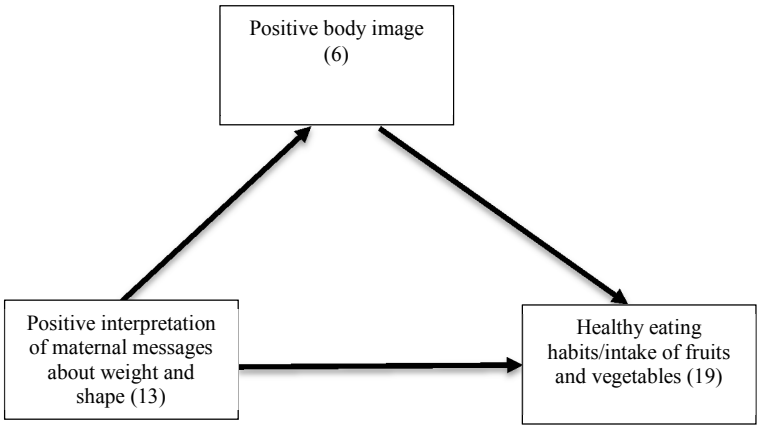


Figure 4.6: A Conceptual Diagram for Unconditional Model of Maternal Influences

This model for a mediation effect is substantively interesting in that how maternal messages about body size can be accepted by adolescent girls may serve as a pivotal determinant to the formation of positive body image. Based on this modeling framework a conditional effect will be examined next.

4.1.2.1 PRH Model 3. In this conditional indirect effect model, the indirect effect of positive interpretation of maternal messages about weight and shape (Composite 13) on healthy eating habits/intake of fruits and vegetables (Composite 19) through positive body image (Composite 6) was hypothesized to be moderated by healthy eating habits/maintenance of good dietary habits (Composite 20). The effect of *M* on *Y* moderated by *V* implies that the effect is a function of *V*. Figure 4.7 presents a conceptual diagram for this model.

The model was fit using *SPSS* macro for a command PROCESS and M*plus*. The resulting model summary information can be seen in Table 4.4. The best fitting OLS regression models produced were:

$$\widehat{M} = 0.818 + 0.288X \qquad (4.5)$$

$$\hat{Y} = 2.512 + 0.216X - 0.951M - 0.315V + 0.420MV \quad (4.6)$$

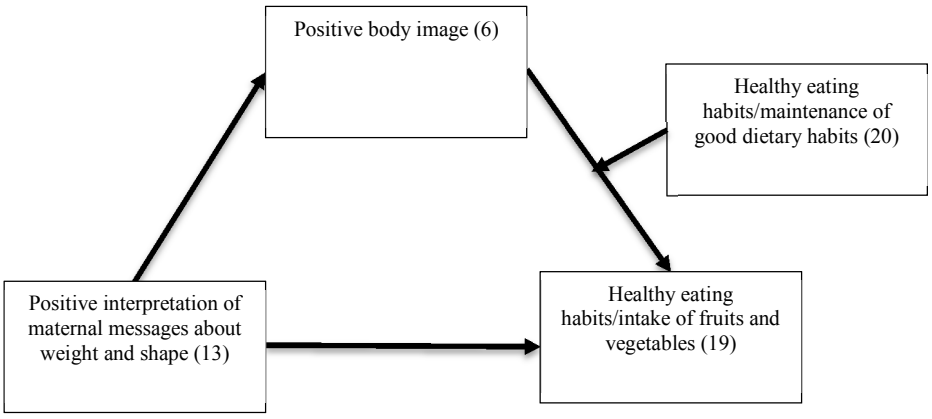


Figure 4.7: A Conceptual Diagram for PRH Model 3

The model shows that as adolescent girls interpret more positively mothers' comments about their body shape, they tend to form a positive self image with respect to their body ($a = 0.288$, $p < 0.01$). It also demonstrates following three substantively meaningful results. Given positive and statistically significant regression coefficient for $X \rightarrow Y$ path ($c' = 0.216$, $p < .01$), adolescent girls' positive interpretation of mothers' comments about their body shape would predict increased level of health-promoting dietary patterns. This can also be supported by a statistically significant direct effect of X on Y (i.e., the magnitude of the direct effect = 0.216, $t(73) = 2.667$, $p < .01$). A significant and negative $M \rightarrow Y$ path indicates that as adolescent girls develop more positive body image, they tend to consume less vegetables and fruits ($b_1 = -0.951$, $p < 0.05$). In addition, the indirect effect of positive interpretation of maternal messages on healthy eating habits/intake of fruits and vegetables through positive body image is conditional on healthy eating habits/maintenance of good dietary habits ($b_3 = 0.420$, $p < 0.05$). The positive sign of the interaction effect ($b_3 = 0.420$) supports the interpretation

that the indirect effect through the development of positive body image is larger for adolescent girls who maintain a good dietary habits, for example, not eating between meals, not eating anything after dinner, stopping eating when feeling full, regularly eating three meals a day and so forth.

Table 4.4

Summary Information for PRH Model 3

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	*a*	0.288	0.098	< 0.01	c'	0.216	0.081	< 0.01
M		—	—	—	b_1	-0.951	0.409	< 0.05
V		—	—	—	b_2	-0.315	0.335	0.351
MV		—	—	—	b_3	0.420	0.209	< 0.05
Constant	a_0	0.818	0.215	< 0.01	b_0	2.512	0.665	< 0.01
		R squared = 0.11				*R* squared = 0.23		
		$F(1,72) = 8.72$, $p < 0.01$				$F(4,69) = 5.25$, $p < 0.01$		

Conditional Indirect Effect of *X* on *Y* at Values of *V*

V	Effect	Lower Bound CI	Upper Bound CI
1.390	-0.106	-0.324	-0.007
1.872	-0.048	-0.160	0.001
2.354	0.011	-0.057	0.096

The conditional indirect effect was estimated at three values for *V*, sample mean and ±1 *SD*. Bootstrapped estimates of confidence intervals were shown as follows: at the mean of 1.872 a 95% CI was [-0.160, 0.001], at 1.390 a 95% CI was [-0.324, -0.007], and at 2.354 a 95% CI was [-0.057, 0.096]. Figure 4.8 presents the conditional indirect effects at the values of the moderator variable. The conditional indirect effect at the value of 1.390 for healthy eating habits/maintenance of good dietary habits (Composite 20) was found to significantly differ from zero at $\alpha = 0.05$ because the interval did not include zero. The sign of significant conditional indirect effect was negative. This

implies that an increase in positive body image predicts a decrease in healthy eating habits/intake of fruits and vegetables at the value of 1 *SD* below the sample mean for healthy eating habits/maintenance of good dietary habits (Composite 20). At the lower values (e.g., 1 *SD* below the sample mean, and the sample mean) for healthy eating habits/maintenance of good dietary habits, the conditional indirect effect were negative. Therefore, adolescent girls with increased level of positive body image are less likely to be engaged in the healthy eating habits such as intake of vegetables and fruits. However, when the value increased to 2.354 (e.g.,1 *SD* above the sample mean), the conditional indirect effect became positive. It may be that as adolescent girls maintain good dietary habits, an increase in positive body image predicts adolescent girls' increased level of vegetables and fruits consumption. To facilitate eating of vegetables and fruits among Latina adolescent girls who develop positive body image, it is important for them to maintain good dietary habits.

Taken together, these results support the following conclusions. Adolescent girls who can interpret mothers' comments on shape and weight more positively tend to create positive body image. This positive body image is related to less likely engagement in the consumptions of vegetables and fruits. However, this negative relationship reverses as adolescent girls maintain good dietary habits with respect to keeping regular and sound eating habits.

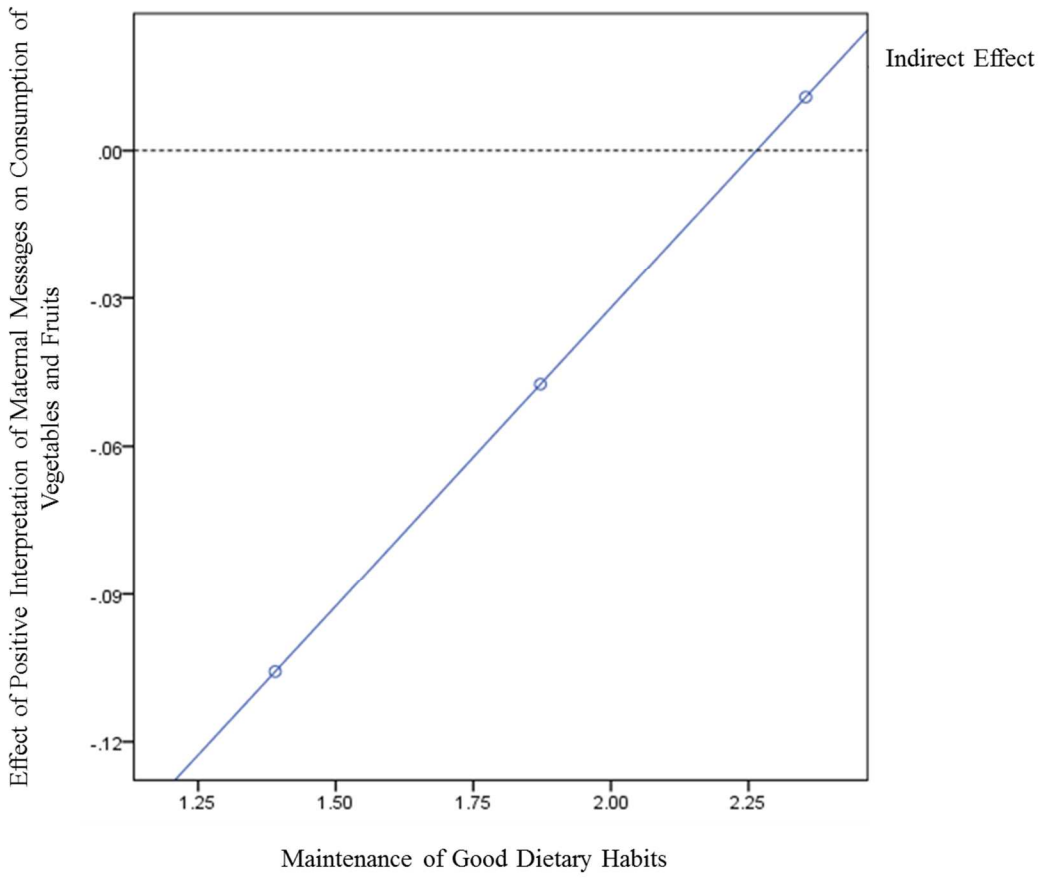


Figure 4.8: A Visual Representation of Conditional Indirect Effect

4.2 Peer Influences

Peer influences were considered as the second set of variables to predict a positive body image among Latina adolescent girls, and in the end the engagement in the health-promoting behaviors. The effect of positive body image on health-promoting behaviors was hypothesized to be moderated by a set of other variables to constitute a conditional indirect effect.

4.2.1 Peers' Satisfaction with Their Own Body

Peers' satisfaction with their own body was the first predictor under consideration. Specifically the model describes the indirect effect of peers' satisfaction with their own body shape and weight (Composite 7) on the current physical activity level (Composite 25) through positive body image (Composite 6). The rationale for the selection of this variable is that having friends who are appearance-oriented, satisfied with their own bodies, and concerned about health-promoting behaviors may have strong influence on the development of positive body image among adolescent girls. Health-promoting behaviors of friends can be a good predictor of adolescent girls' active engagement in the healthy life practices (e.g., Kelly, Wall, Eisenberg, Story, & Neumark-Sztainer, 2005) because many research findings suggest that close relationship with peers who share similar perspectives about body image and health-related lifestyle can help increase adolescent girls' resilience against negative body image caused by popular media ideals. The hypothesized impact of this variable was tested in the context of Latina adolescent girls.

4.2.1.1 Unconditional Model. An unconditional indirect effect model was examined without any moderator variables incorporated in the model. This model is decribed in Figure 4.9.

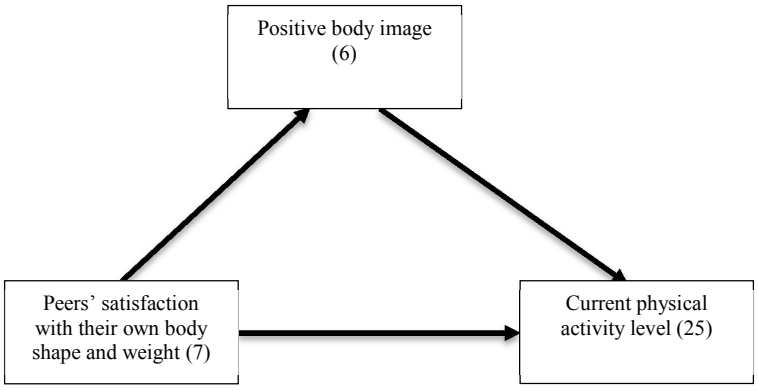


Figure 4.9: A Conceptual Diagram for Unconditional Model of Peer Influences

Based on the model estimated using *SPSS* macro for a command PROCESS, the resulting model summary information can be seen in Table 4.5.

Table 4.5

Summary Information for Unconditional Model

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	*a*	0.260	0.138	0.063	c'	0.297	0.699	0.671
M		—	—	—	*b*	0.717	0.517	0.169
Constant	a_0	1.139	0.203	< 0.01	b_0	1.498	1.168	0.203
	R squared = 0.04 *F*(1,92) = 3.54, *p* = 0.063				*R* squared = 0.03 *F*(2,91) = 1.21, *p* = 0.303			

Indirect Effect of *X* on *Y*		
Effect	Lower Bound CI	Upper Bound CI
0.186	0.006	0.584

Therefore, the best fitting OLS regression models were created as follows:

$$\widehat{M} = 1.139 + 0.260X \quad (4.7)$$

$$\widehat{Y} = 1.498 + 0.297X + 0.717M \quad (4.8)$$

This model indicates that the more peers are satisfied with their own body shape and weight, the more adolescent girls possess positive body image ($a = 0.260$, $p = 0.063$). In addition, the more adolescent girls become positive about their body, the more physical activity they are involved in ($b = 0.717$, $p = 0.169$). The results also showed that the direct effect was found not to be significant (direct effect = 0.297, $t = 0.426$, $p = 0.671$) while the indirect effect was found to be significant (indirect effect = 0.186). In particular, statistical significance of the indirect effect was found through the bootstrapped confidence interval (95% CI for the indirect effect: [0.006, 0.584] with 5000 resamples). The sign of the path coefficients for the indirect effect was positive,

implying that having peers who show higher satisfaction with their own body shape and weight would predict higher level of positive body image among adolescent girls, and in turn predict higher level of the engagement in the physical activity. The direct path linking peers' satisfaction with their body to teens' engagement in the physical activity was not statistically significant. This implies that peers' satisfaction with their bodies is meaningful only to the extent that it has relationship with positive body image as a mediating variable.

4.2.1.2 PRH Model 2. PRH Model 2 refers to the model in which the effect of *X* on *M* is moderated by *W*. In this type of the conditional indirect effect model, the indirect effect of peers' satisfaction with their own body shape and weight (Composite 7) on the current physical activity level (Composite 25) through positive body image (Composite 6) was hypothesized to be moderated by frequency of communication with peers about health-promoting behaviors (Composite 16). A conceptual diagram for this model was described in Figure 4.10.

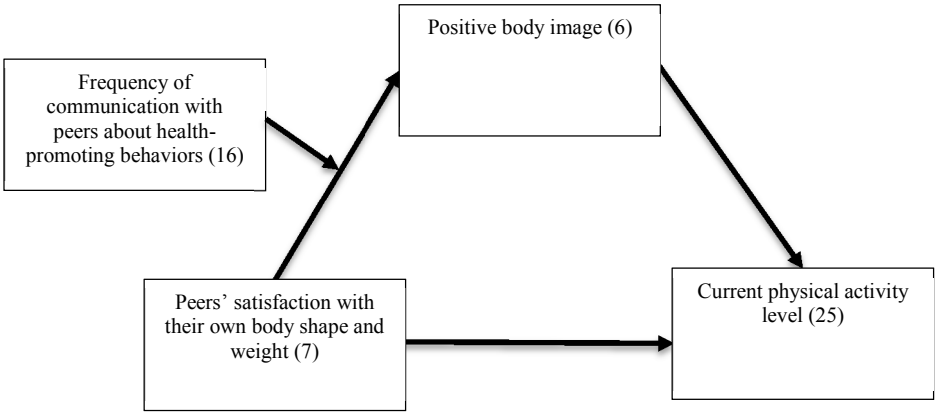


Figure 4.10: A Conceptual Diagram for PRH Model 2

This model was estimated using *SPSS* macro for a command PROCESS and M*plus*. The resulting model summary information can be found in Table 4.6.

Table 4.6

Summary Information for PRH Model 2

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	a_1	-0.098	0.205	0.633	c_1'	0.297	0.699	0.671
W	a_2	-0.316	0.171	0.068		—	—	—
XW	c_2'	0.258	0.112	< 0.05		—	—	—
M		—	—	—	a_3	0.717	0.517	0.169
Constant	c_2'	1.567	0.307	< 0.01	b_1	1.498	1.168	0.203
		R squares = 0.10 $F(3,90) = 3.31$, $p < 0.05$				*R* Squares = 0.03 $F(2,91) = 1.21$, $p = 0.303$		

Conditional Indirect Effect of *X* on *Y* at Values of *W*			
W	Effect	Lower CI	Upper CI
0.393	0.002	-0.259	0.243
1.536	0.213	0.03	0.568
2.678	0.425	0.043	1.053

As seen in the table, the best fitting OLS regression models were,

$$\widehat{M} = 1.567 - 0.098X - 0.316W + 0.258XW \quad (4.9)$$

$$\widehat{Y} = 1.498 + 0.297X + 0.717M \quad (4.10)$$

The model showed that the sign of the relationship between peers' satisfaction with their own body shape and weight (Composite 7) and positive body image (Composite 6) changed from positive to negative compared with the previous unconditional model (a_1 = -0.098, $p = 0.633$). However, it was not statistically significant. On the other hand, the effect of peers' satisfaction with their own body shape and weight on positive body image depends on the values of frequency of communication with peers about health-promoting behaviors ($a_3 = 0.258$, $p < 0.05$). This statistically significant interaction between peers' satisfaction with their own body shape and weight (Composite 7) and frequency of communication with peers about health-promoting behaviors (Composite 16) in the

model for positive body image (Composite 6) indicates that the indirect effect of peers' satisfaction with their own body shape and weight (Composite 7) on current physical activity level (Composite 25) through positive body image (Composite 6) is moderated by frequency of communication with peers about health-promoting behaviors (Composite 16). The positive sign of the interaction effect ($a_3 = 0.258$, $p < 0.05$) is consistent with the interpretation that the indirect effect through the development of positive body image is larger for adolescent girls who communicate more frequently with their peers about health-promoting behaviors. This is another research implication in that the connection between how much peers are satisfied with their body, and how much adolescent girls are engaged in physical activity through the mediating role of positive body image differ in size depending on how often appearance-related communication occurs among adolescent girls. The speculation is that adolescent girls tend to be more likely to form a positive body image if they are more frequently engaged in talks with their peers who are content with their body shape.

Bootstrapped estimates of confidence intervals were produced to evaluate the conditional indirect effect at the different values of a moderator variable. At the mean of 1.536 a 95% CI was [0.030, 0.568], at 0.393 a 95% CI was [-0.259, 0.243], and at 2.678 a 95% CI was [0.043, 1.053]. Figure 4.11 depicts the conditional indirect effects at the values of the moderator variable. The conditional indirect effect at the sample mean, and 1 *SD* above the mean for the frequency of communication with peers about health-promoting behaviors (Composite 16) was found significantly different from zero at $\alpha = 0.05$. The sign of significant conditional indirect effect was all positive regardless of moderator values, and this supported the interpretation that an increase in peers'

satisfaction with their body predicted an increase in the development of positive body image. As the frequency with which adolescent girls communicate with peers increases, the magnitude of the conditional indirect effect also increases. Therefore, as adolescent girls communicate more with their peers about body shape and weight, adolescent girls whose peers are more satisfied with their body are more likely to form positive body image. The communications among adolescent girls promote the degree to which peers' contentness about their body is positively connected with Latina adolescent girls' positive perception of their body.

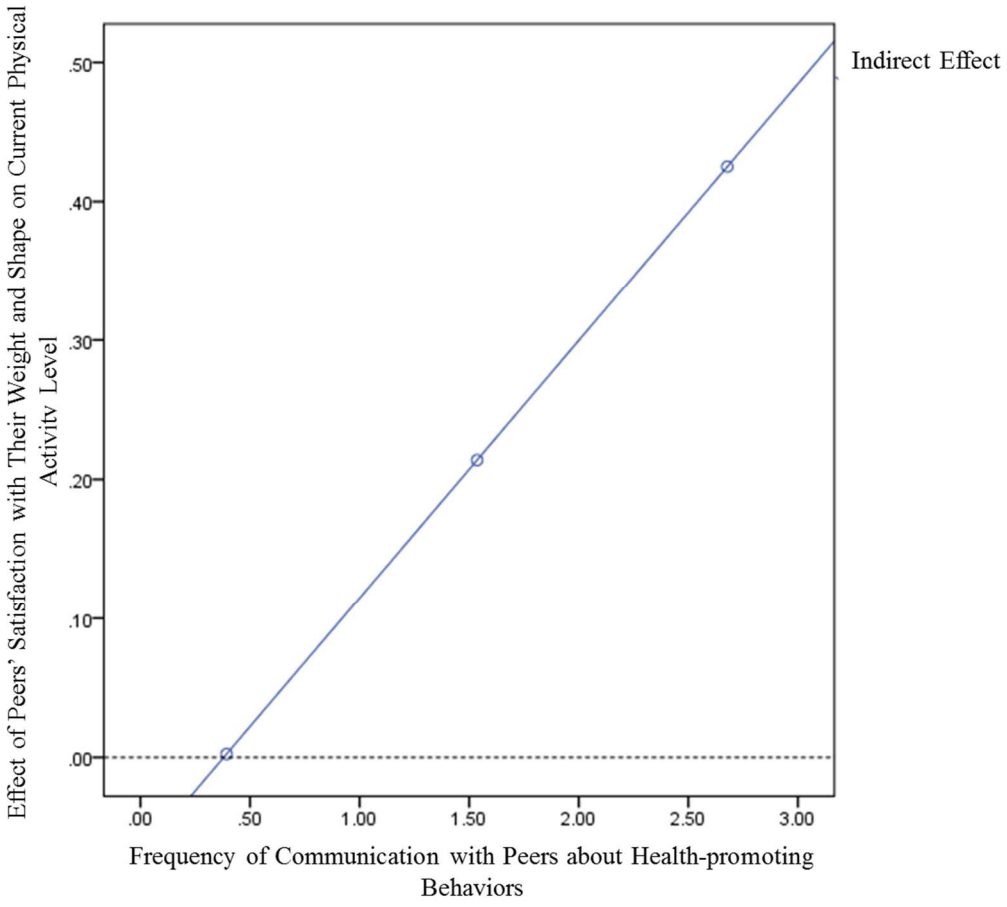


Figure 4.11: A Visual Representation of Conditional Indirect Effect

4.2.2 Peers' Compliments about Weight and Shape

Peers' compliments about weight and shape was the next predictor variable as peer influences of a protective factor. With this variable placed in the spot for *X*, the unconditional model describes the indirect effect of Peers' compliments about weight and shape (Composite 9) on the current physical activity level (Composite 25) through positive body image (Composite 6) as drawn in Figure 4.12. In the same manner as mothers' compliments about weight shape examined before as maternal influences, peers' compliments were hypothesized to predict positive body image, and health-promoting behaviors.

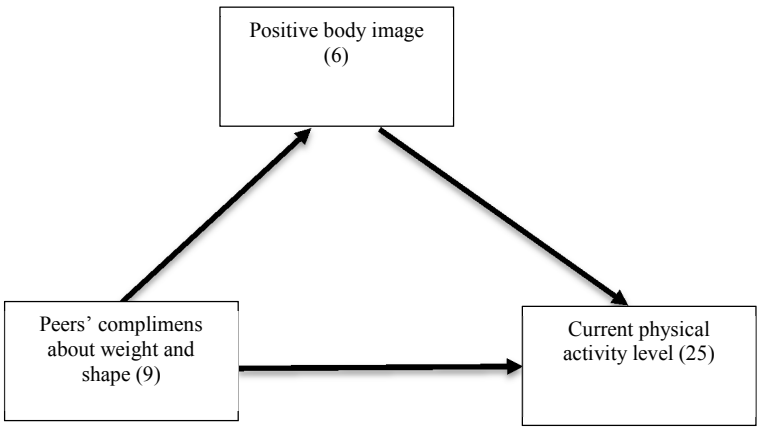


Figure 4.12: A Conceptual Diagram for Unconditional Model of Peer Influences

4.2.2.1 PRH Model 4. In this new type of conditional indirect effect model, the indirect effect of peers' compliments about weight ans shape (Composite 9) on the current physical activity level (Composite 25) through positive body image (Composite 6) was tested to see whether it may be moderated by two distinct moderator variables in the two different paths. Specifically, it was examined whether healthy eating behaviors/maintenance of good dietary habits (Composite 20) affects $X \rightarrow M$ path, and

advice from health professionals on dieting (Composite 23) influences $M \rightarrow Y$ path. Figure 4.13 describes a conceptual diagram for this model.

The model was estimated using *SPSS* macro for a command PROCESS and M*plus*. The resulting model summary information is presented in Table 4.7. The best fitting OLS regression models were:

$$\widehat{M} = 2.442 - 0.468X - 1.221W + 0.564XW \quad (4.11)$$

$$\widehat{Y} = 0.365 + 0.752X + 0.196M - 1.170V + 2.458MV \quad (4.12)$$

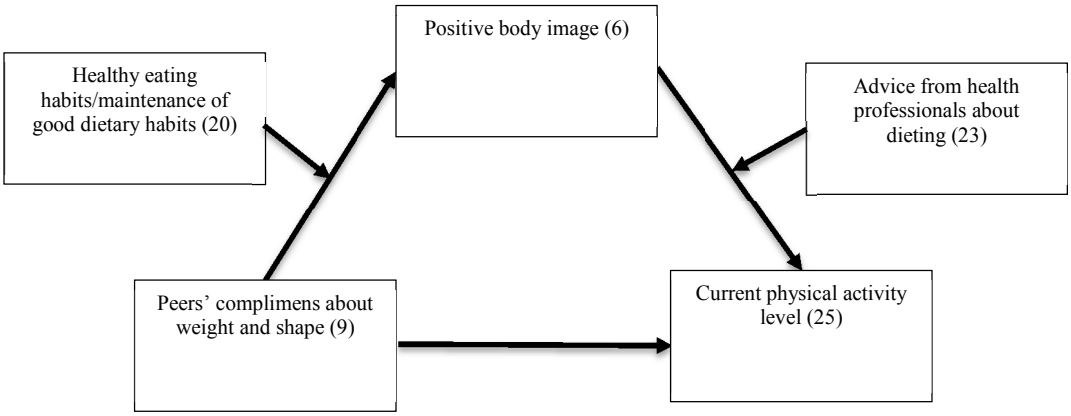


Figure 4.13: A Conceptual Diagram for PRH Model 4

In this modeling, there were two separate significant interaction effects (a_3= 0.564, $p < 0.05$; b_3= 2.458, $p < 0.05$). This indicates that the indirect effect of peers' compliments about weight and shape on the adolescent girls' current physical activity level through positive body image is contingent on healthy eating habits/maintenance of good dietary habits (a_3= 0.564, $p < 0.05$), and advice from health professional on dieting (b_3= 2.458, $p < 0.05$), respectively. The positive signs of those interaction effects suggest that the indirect effect through the development of positive body image is greater for

adolescent girls who maintain a good dietary habits, and who receive advice from health professionals about dieting.

Table 4.7

Summary Information for PRH Model 4

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	a_1	-0.468	0.461	0.312	c_1'	0.752	0.769	0.331
W	a_2	-1.221	0.576	< 0.05	c_2'	—	—	—
XW	a_3	0.564	0.245	< 0.05	c_3'	—	—	—
M		—	—	—	b_1	0.196	0.627	0.756
V		—	—	—	b_2	-1.17	1.661	0.483
MV		—	—	—	b_3	2.458	1.111	< 0.05
Constant	a_0	2.442	1.084	< 0.05	b_0	0.365	1.844	0.844
		R squares = 0.19				*R* Squares = 0.17		
		$F(3,83) = 6.64$, $p < 0.01$				$F(4,82) = 4.09$, $p < 0.01$		

Conditional Indirect Effect of *X* on *Y* at Values of *W* and *V*				
W	*V*	Effect	Lower CI	Upper CI
1.32	0	0.054	-0.095	0.491
1.32	1	0.732	-0.051	2.566
1.858	0	0.113	-0.268	0.578
1.858	1	1.537	0.38	3.831
2.396	0	0.173	-0.428	0.808
2.396	1	2.342	0.547	5.81

To see how specifically those conditional indirect effects can change depending on the values of the moderator variables, estimates of the conditional indirect effects and its ranges computed through bootstrapping approach were examined. Because one moderator variable was on a continuous scale while another moderator variable was dichotomous, there were six different combinations of the values at which the conditional indirect effects were evaluated. There were two incidences of significant conditional indirect effects: at 1.858 for *W*, and at 1 for *V* a 95% CI was [0.380, 3.831]; at 2.396 for *W*, and at 1 for *V* a 95% CI was [0.547, 5.810]. Also the signs of the conditional indirect

effect were all positive, and the magnitude of the effect increased as the values of moderator variables increased. This means that as long as Latina adolescent girls maintain good dietary habits, and they are in regular contact with health professionals about their health issues, an increase in peers' compliments about their body predicts an increase in the perception of positive body, and it in turn predicts an increase in the current physical activity for the girls.

4.3 Media Influences

Media influences were considered as the third set of variables to predict a positive body image among Latina adolescent girls. To measure media influences, there were two variables available that represent the degree to which Latina adolescent girls resist the prevalent media ideals and popular culture. In the sections below, those variables will be hypothesized to predict positive body image development and engagement in the health-promoting behaviors using the modeling framework for the conditional indirect effects.

4.3.1 Perception that Media Ideals are Unrealistic, Unattainable, and Unhealthy

A variable that measures adolescent girls' perception that media ideals are unrealistic, unattainable and unhealthy is firstly examined. It captures how much adolescent girls can avoid the effect of the prevailing cultural idea that thin body is ideal. Using it as a predictor variable, the model describes the indirect effect of perception that media ideals are unrealistic, unattainable and unhealthy (Composite 28) on healthy eating habits/maintenance of good dietary habits (Composite 20) through positive body image (Composite 6) as depicted in Figure 4.14

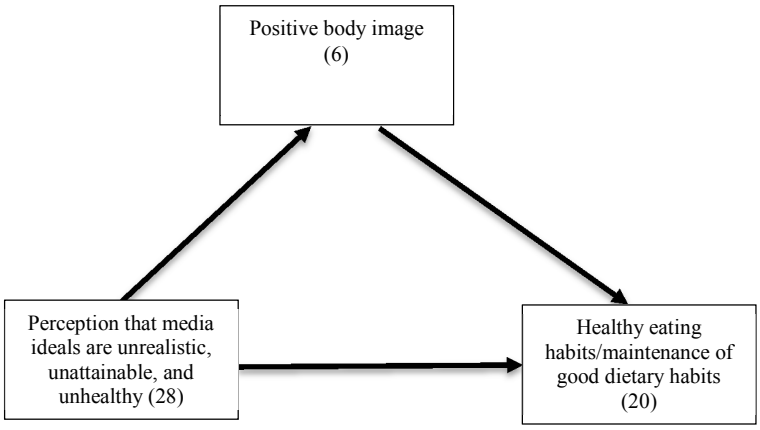


Figure 4.14: A Conceptual Diagram for Unconditional Model of Media Influences

4.3.1.1 PRH Model 4. In this model with two separate moderator variables, the indirect effect of perception that media ideals are unrealistic, unattainable and unhealthy (Composite 28) on healthy eating habits/maintenance of good dietary habits (Composite 20) through positive body image (Composite 6) was hypothesized to be moderated by enjoyment of physical activity (Composite 26), and healthy eating habits/intake of fruits and vegetables (Composite 19). Specifically, the focus was whether $X \rightarrow M$ path is conditional on enjoyment of physical activity (Composite 26), and $M \rightarrow Y$ path is conditional on healthy eating habits/intake of fruits and vegetables (Composite 19). Figure 4.15 describes a conceptual diagram for this model.

The model was estimated using *SPSS* macro for a command PROCESS and M*plus*. The resulting model summary information is presented in Table 4.8. The best fitting OLS regression models were:

$$\widehat{M} = -0.537 + 1.079X + 0.843W - 0.425XW \quad (4.11)$$

$$\widehat{Y} = 1.949 + 0.036X - 0.614M - 0.109V + 0.324MV \quad (4.12)$$

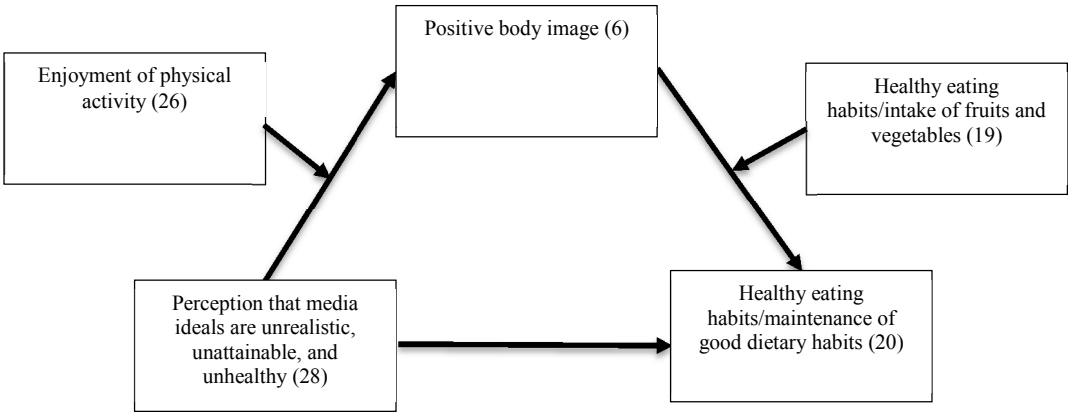


Figure 4.15: A Conceptual Diagram for PRH Model 4

The model indicates that the more adolescent girls perceive media ideals as unrealistic, unattainable, and unhealthy, the more adolescent girls develop positive body image (a_1 = 1.079, $p < 0.01$). Also it is shown that the effect of perception that media ideals are unrealistic, unattainable and unhealthy on the development of positive body image is conditional on the enjoyment of physical activity (a_3 = -0.425, $p < 0.05$).

On the other hand, in the model for *Y*, the more girls become positive about their body, the less likely they maintain good dietary habits although this effect is not significant (b_1= -0.614, p = 0.076). Moreover, the relationship between positive body image, and healthy eating habits/maintenance of good dietary habits is contingent on the values of healthy eating habits (b_3= 0.324, $p < 0.05$).

Table 4.8

Summary Information for PRH Model 4

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	a_1	1.079	0.349	< 0.01	c_1'	0.036	0.082	0.665
W	a_2	0.843	0.289	< 0.01	c_2'	—	—	—
XW	a_3	-0.425	0.168	< 0.05	c_3'	—	—	—
M		—	—	—	b_1	-0.614	0.342	0.076
V		—	—	—	b_2	-0.109	0.273	0.691
MV		—	—	—	b_3	0.324	0.158	< 0.05
Constant	a_0	-0.537	0.607	0.378	b_0	1.949	0.614	< 0.01
		R squares = 0.13				*R* Squares = 0.18		
		$F(3,95) = 4.72$, $p < 0.01$				$F(4,94) = 5.13$, $p < 0.01$		

Conditional Indirect Effect of *X* on *Y* at Values of *W* and *V*				
W	*V*	Effect	Lower CI	Upper CI
1.472	1.653	-0.036	-0.141	0.027
1.472	2.142	0.036	-0.027	0.12
1.472	2.631	0.108	0.013	0.247
2.014	1.653	-0.018	-0.083	0.012
2.014	2.142	0.018	-0.011	0.072
2.014	2.631	0.053	0.003	0.147
2.556	1.653	0.001	-0.025	0.036
2.556	2.142	-0.001	-0.041	0.026
2.556	2.631	-0.002	-0.085	0.066

We need to be cautious in the interpretations of those interaction effects. Since both pairs of the regression coefficients have different signs (e.g., a_1 = 1.079 and a_3 = -0.425; b_1= -0.614 and b_3= 0.324), the indirect effects are greater for those with low in the moderator variables. In other words, the effect of girls' perception that media ideals are unrealistic on positive body image is greater for those who do not enjoy physical activity. It may be that Latina girls who consider thin body media ideals as less desirable tend to be those who do not enjoy physical activity. It may be that they do not follow popular media ideals because they do not wish to have thin body shape. Presumably they are

people who abandon making efforts to pursue the media ideals, and therefore they do not enjoy physical activity.

In addition, the effect of positive body image on healthy eating habits/maintenance of good dietary habits is greater for those who do not consume vegetables and fruits. The similar interpretations can apply in this conditional relationship. As girls develop positive body image, they are less likely to maintain good dietary habits (b_1= -0.614). This negative relationship becomes stronger as they consume more vegetables and fruits. Thus, it may be that Latina adolescent girls who develop positive body image tend not to maintain good dietary habits, and tend not to consume vegetables and fruits.

The conditional indirect effects were also examined at different values of the moderator variables. There were two incidences of significant conditional indirect effects: at 1.472 for *W*, and at 2.631 for *V* a 95% CI was [0.013, 0.247]; at 2.014 for *W*, and at 2.631 for *V* a 95% CI was [0.003, 0.147]. For these two incidences, the signs of the conditional indirect effect were all positive. The magnitude of the effect increased as *V* increased. However, the magnitude of the effect decreased as *W* increased.

4.3.2 Disinterest in Slimmer Body Shape

The effect of adolescent girls' disinterest in slimmer body shape was examined. This variable measures the extent to which adolescent girls are resistant to the internalization of thin body media ideals by showing their disinterest in the ideal slimmer body shape, and therefore it represents media influences on adolescent girls. The unconditional model describes the indirect effect of disinterest in slimmer body shape

(Composite 5) on healthy eating habits/maintenance of good dietary habits (Composite 20) through positive body image (Composite 6) as in Figure 4.16

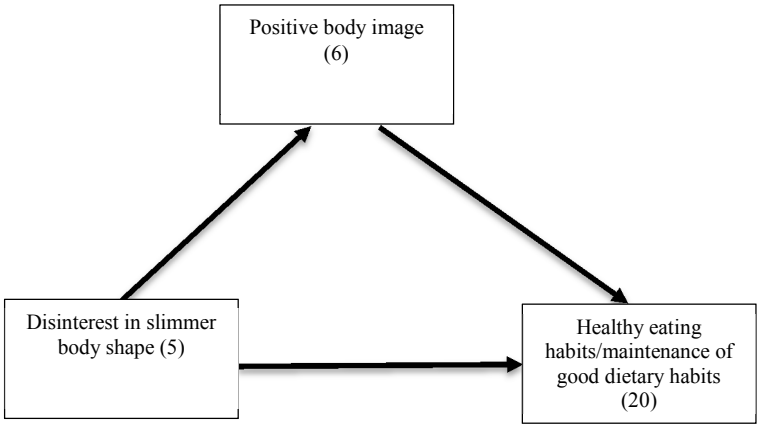


Figure 4.16: A Conceptual Diagram for Unconditional Model of Media Influences

4.3.2.1 PRH Model 4. In this model with two separate moderator variables, the indirect effect of disinterest in slimmer body shape (Composite 5) on healthy eating habits/maintenance of good dietary habits (Composite 20) through positive body image (Composite 6) was hypothesized to be moderated by currently gaining weight (Composite 12), and healthy eating habits/intake of fruits and vegetables (Composite 19). Specifically, $X \rightarrow M$ path was hypothesized to be contingent on currently gaining weight (Composite 12), and $M \rightarrow Y$ path was hypothesized to be contingent on healthy eating habits/intake of fruits and vegetables (Composite 19). Figure 4.17 describes a conceptual diagram for this model.

The model was estimated using *SPSS* macro for a command PROCESS and M*plus*. The resulting model summary information is presented in Table 4.9. The best fitting OLS regression models were:

$$\widehat{M} = 0.619 + 0.664X + 1.078W - 0.503XW \qquad (4.13)$$

$$\hat{Y} = 2.245 - 0.209X - 0.592M - 0.180V + 0.362MV \quad (4.14)$$

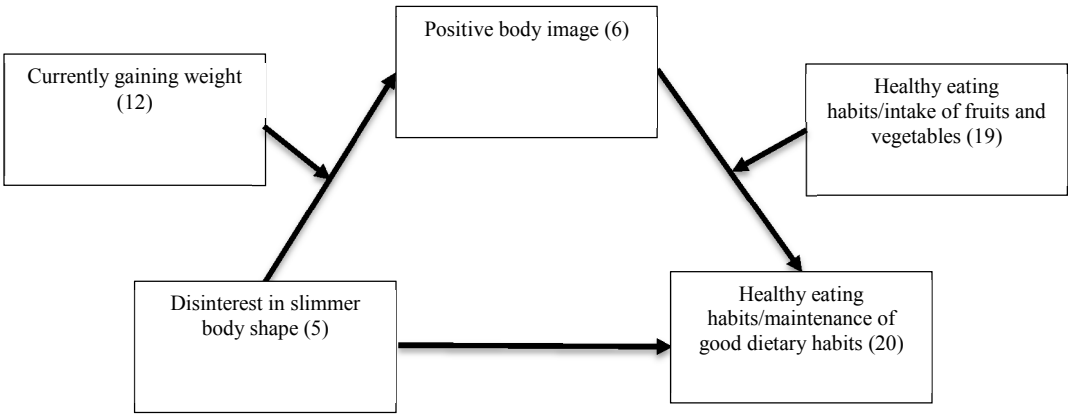


Figure 4.17: A Conceptual Diagram for PRH Model 4

The model demonstrates that the more adolescent girls are disinterest in slimmer body shape, the more adolescent girls develop positive body image (a_1 = 0.664, p < 0.01). It also shows that the effect of disinterest in slimmer body shape on the development of positive body image is conditional on whether girls are currently gaining weight or not (a_3 = -0.503, p < 0.01).

On the other hand, in the model for *Y*, the more adolescent girls become positive about their body, the less likely they maintain good dietary habits although this effect is not significant (b_1= -0.592, p = 0.083). Moreover, the relationship between positive body image, and healthy eating habits/maintenance of good dietary habits depends on the values of healthy eating habits in terms of vegetables and fruits consumption (b_3= 0.362, p < 0.05).

Table 4.9

Summary Information for PRH Model 4

	Outcome							
	M				*Y*			
Predictor	Path	Coeff.	*SE*	*p*	Path	Coeff.	*SE*	*p*
X	a_1	0.664	0.116	< 0.01	c_1'	-0.209	0.115	0.071
W	a_2	1.078	0.315	< 0.01	c_2'	—	—	—
XW	a_3	-0.503	0.194	< 0.01	c_3'	—	—	—
M		—	—	—	b_1	-0.592	0.338	0.083
V		—	—	—	b_2	-0.18	0.27	0.507
MV		—	—	—	b_3	0.362	0.156	< 0.05
Constant	a_0	0.619	0.136	< 0.01	b_0	2.245	0.597	< 0.01
		R Squares = 0.43				*R* Squares = 0.21		
		$F(3,93) = 23.01$, $p < 0.01$				$F(4,92) = 5.98$, $p < 0.01$		

Conditional Indirect Effect of *X* on *Y* at Values of *W* and *V*

W	*V*	Effect	Lower CI	Upper CI
0	1.651	0.003	-0.125	0.133
0	2.144	0.122	0.006	0.299
0	2.637	0.24	0.067	0.504
0.34	1.651	0.002	-0.096	0.103
0.34	2.144	0.09	0.003	0.233
0.34	2.637	0.178	0.047	0.396
0.897	1.651	0.001	-0.059	0.066
0.897	2.144	0.039	-0.007	0.179
0.897	2.637	0.077	-0.015	0.288

The interpretations of those interaction effects are consistent with those of the previously examined PRH Model 4 of media influences. Since the signs of the regression coefficients pairs differ (e.g., a_1 = 0.664 and a_3 = -0.503; b_1= -0.592 and b_3= 0.362), the indirect effects are greater as the moderator variables become smaller. In other words, the effect of disinterest in slimmer body shape on positive body image is greater for those who are not currently gaining weight. It may be that Latina girls become positive about their body when they are not interested in pursuing slimmer body shape, however, they do not intentionally gain weight. That is to say, although they are not interested in slimmer body shape, they attempt to lose weight, or at least stay with the current weight.

It may be that Latina adolescent girls are in confusion between Westernized media culture that adores slender body shape ideals, and traditional Latino culture that values curvier body shapes (e.g., Levine, & Chapman, 2011).

In addition, the effect of positive body image on healthy eating habits/maintenance of good dietary habits is greater for those who do not consume vegetables and fruits. Plausible interpretation of this effect was presented in the previous model, PRH Model 4 of media influences.

The conditional indirect effects were also examined at different values of the moderator variables. There were four incidences of significant conditional indirect effects: at 0 for *W*, and at 2.144 for *V* a 95% CI was [0.006, 0.299]; at 0 for *W*, and at 2.637 for *V* a 95% CI was [0.067, 0.504]; at 0.340 for *W*, and at 2.144 for *V* a 95% CI was [0.003, 0.233]; and at 0.340 for *W*, and at 2.637 for *V* a 95% CI was [0.047, 0.396]. For all these incidences, the signs of the conditional indirect effect were positive. The magnitude of the effect was smaller for greater values of *W*. However, the magnitude of the effect was greater for greater values of *V*.

Chapter 5: Conclusion and Discussion

This study investigated the importance of considering moderated mediation hypotheses in regression analytic models, and illustrated their use with a data set on positive body image for Latina youth. Based on the methodological possibilities of the models for moderated mediation effects, a selection of the models developed in the literature were applied to the data from survey measuring positive body image of adolescent girls. This chapter will first revisit the models for conditional process. Next, this chapter will summarize empirical data analysis results related to maternal influences, peers influences, and media influences as a protective factor that help Latina adolescent girls achieve positive body image, and finally health-promoting behaviors and lifestyles. Finally, limitations of the current study will be discussed along with suggested future directions.

5.1 Models for Conditional Process Analysis

There have been numerous examples of mediation and moderation effect in the empirical literature. There also have been numerous articles and book chapters that emphasize the value of analyzing each effect for further understanding processes of interest. However, there are much less studies that use methods for analyzing the combination of those effects in an integrated analytical framework. This lack of attention to an integrated analytical framework may be attributed in part to the fact that analytical procedures for the combined effects were introduced to the research community only in recent years (e.g., Muller, Judd, & Yzerbyt, 2005; Edwards, & Lambert. 2007; Morgan-

Lopez, & MacKinnon, 2006; Fairchild, & MacKinnon, 2009; Preacher, Rucker, & Hayes; Hayes, 2013). Although researchers in applied work became interested in using integrated analyses, actual implementations of analytical methods were still limited due to a lack of statistical software package syntax or code, and a comprehensive methodological guidance as to how to properly implement the methods. Therefore, a number of recent studies were dedicated to providing analytical integration of mediation and moderation effects in a systematic manner. Examples include Preacher, Rucker, & Hayes (2007) which introduce the concept of the conditional indirect effect, and Hayes (2013) which introduce the term, conditional process analysis.

Conditional process analysis is used when the research objective is to depict the conditional nature of the process by which variables affect other variables. Conditional process analysis handles mediation analysis and moderation analysis in a combined fashion, and focuses on the estimation and interpretation of the parameters, and testing hypotheses of contingent effects. Specifically, in this integrated analysis we are interested in examining moderation components of the indirect or direct effects of X on Y in a regression analytic system. However, there can be an unlimited number of model specifications for this phenomenon, labeled in many ways, such as moderated moderation effect, conditional indirect effect, or conditional process. Among those, the main focus was five different models introduced in Preacher, Rucker, & Hayes (2007) along with an unconditional mediation effect model.

5.2 Illustrative Analyses on Positive Body Image

To evaluate the usefulness and performance of the models for conditional indirect effects when used in applied work, method illustrations were presented using data from The Positive Body Image Survey (2012). Based on the results from empirical study, the following conclusions can be drawn.

5.2.1 Maternal Influences

The first predictor variable of interest was mother's compliments about weight and shape. The effect of this variable on the development of positive body image, and consequently the consumption of vegetables and fruits was evaluated with the addition of moderation effect of girls' communications with their mothers. There were two different models for the conditional indirect effect, PRH Model 3, and PRH Model 5.

Results from this study for PRH Model 3 indicated that the more mothers discuss positive aspects of the body shape and weight with their teenage daughters, the more adolescent girls develop positive body image. In addition, holding constant mothers' compliments, adolescent girls with increased level of positive body image consume less amount of vegetables and fruits. It may be that Latina adolescent girls with the increased level of positive body image tend to be those who are already curvier and shapely, not interested in any efforts to be physically fit and active, so they tend not to be engaged in healthy eating habits. The indirect effect of mom's compliment about weight and shape on healthy eating habits/intake of fruits and vegetables through positive body image is moderated by the frequency of communication with mother about health-promoting behaviors. Specifically the indirect effect through the development of positive body image is larger for adolescent girls who communicate more frequently with their mothers about health-promoting behaviors. When looking at the conditional indirect effects at the

different values of a moderator variable, as adolescent girls communicate more with their mothers about body shape and weight, an increase positive body image predicts an increase in the participation in the healthy eating habits. Therefore the conclusion is that the communications between adolescent girls and their mothers exert a positive influence on the engagement in the health-promoting behaviors among Latina adolescent girls.

Results from the study for PRH Model 5 indicated that the effect of mothers' compliment about weight and shape on positive body image is contingent on frequency of communication with mother about health-promoting behaviors. Also the effect of positive body image on healthy eating habits/intake of fruits and vegetables is conditional on frequency of communication with mother about health-promoting behaviors. The positive signs of those two interaction effects indicate the importance of active communication between family members to maximize maternal influences as a protective factor that results in the development of positive body image. When examining the conditional indirect effect at different values of a moderator variable, the main finding is that for the adolescent girls who communicate more with their mothers about body shape and weight, an increase positive body image predicts an increase in the participation in the healthy eating habits.

The second predictor variable in the maternal influences was positive interpretation of maternal messages about weight and shape. PRH Model 3 was used to examine conditional effect. Results from this study for PRH Model 3 suggested that as adolescent girls interpret more positively mothers' comments about their body shape, they tend to develop positive body image. Also the direct of adolescent girls' positive interpretation of mothers' comments about their body shape on the health-promoting

dietary patterns was found significant, indicating that adolescent girls' positive interpretation of mothers' comments about their body shape would predict increased level of health-promoting behaviors. In addition, as adolescent girls develop more positive body image, they tend to consume less vegetables and fruits. Given the significant and positive interaction effect, the indirect effect through the development of positive body image is larger for adolescent girls who maintain a good dietary habits, for example, not eating between meals, not eating anything after dinner, stopping eating when feeling full, regularly eating three meals a day and so forth. Considering the magnitude of the conditional indirect effects depending on the values of the moderator variable, we found that the conditional indirect effects increased as the moderator variable increased.

5.2.2 Peer Influences

The first predictor variable of interest in this second category of a protective factor was peers' satisfaction with their body shape. Two models were considered.

An unconditional model was fit to the data, and results indicated that the more peers are satisfied with their own body shape and weight, the more adolescent girls develop positive body image. In addition, the more adolescent girls become positive about their body, the more physical activity they are involved in. The results also showed that the direct effect was found not to be significant while the indirect effect was found to be significant. This implies that peers' satisfaction with their bodies is meaningful only to the extent that it has relationship with positive body image as a mediating variable.

Next, PRH Model 2 was examined. Given statistically significant and positive interaction effect, it was shown that the effect of peers' satisfaction with their own body shape and weight on positive body image is conditional on the values of frequency of

communication with peers about health-promoting behaviors with the interpretation that the indirect effect through the development of positive body image is greater for adolescent girls who communicate more frequently with their peers about health-promoting behaviors. When evaluating conditional indirect effects as a function of a moderator variable, we found that as the frequency with which adolescent girls communicate with peers increases, the magnitude of the conditional indirect effect also increases. Therefore, as adolescent girls communicate more with their peers about body shape and weight, adolescent girls whose peers are more satisfied with their body are more likely to develop positive body image.

Another variable of peers' compliments about weight and shape was considered as a predictor in the models. PRH Model 4 which included two separate moderator variables was examined.

Results yielded two significant interaction effects, suggesting that the indirect effect of peers' compliments about weight and shape on the adolescent girls' current physical activity level through positive body image is contingent on both healthy eating habits/maintenance of good dietary habits, and advice from health professional on dieting. The positive signs of those interaction effects indicated that the indirect effect through the development of positive body image is greater for adolescent girls who maintain good dietary habits, and who receive advice from health professionals about dieting. In the analysis of the conditional indirect effects, the results showed that the effect increased for larger values of moderator variables. This means that as long as Latina adolescent girls maintain good dietary habits, and they are in regular contact with health professionals about their health issues, an increase in peers' compliments about

their body predicts an increase in the perception of positive body, and it in turn predicts an increase in the current physical activity for the girls.

5.2.3 Media Influences

Lastly a set of variables were represented by the category of media influences. The first predictor variable of interest was adolescent girls' perception that media ideals are unrealistic, unattainable, and unhealthy. PRH Model 4 was specified to assess conditional effects.

The results showed that the more adolescent girls perceive media ideals as unrealistic, unattainable, and unhealthy, the more adolescent girls develop positive body image. Results also showed that the effect of perception that media ideals are unrealistic, unattainable and unhealthy on the development of positive body image is conditional on the enjoyment of physical activity. On the other hand, in the model for the outcome variable, the more girls become positive about their body, the less likely they maintain good dietary habits although this effect is not significant. Furthermore, the relationship between positive body image, and healthy eating habits/maintenance of good dietary habits is contingent on the values of healthy eating habits. The signs of the interaction effects indicated that the indirect effects are greater for those with low in the moderator variables. In other words, the effect of girls' perception that media ideals are unrealistic on positive body image is greater for those who do not enjoy physical activity. In addition, the effect of positive body image on healthy eating habits/maintenance of good dietary habits is greater for those who do not consume vegetables and fruits. The results of the conditional indirect effects showed that the magnitude of the effect increased as

girls more likely enjoy physical activity. However, the magnitude of the effect decreased as those girls consume less amount of vegetables and fruits.

The second predictor variable of interest was adolescent girls' disinterest in slimmer body shape. Also PRH Model 4 was examined. The results showed that the more adolescent girls are disinterest in slimmer body shape, the more adolescent girls develop positive body image. It was also shown that the effect of disinterest in slimmer body shape on the development of positive body image is conditional on whether girls are currently gaining weight or not. Moreover, the relationship between positive body image, and healthy eating habits/maintenance of good dietary habits depends on the values of healthy eating habits in terms of vegetables and fruits consumption. The signs of the interaction effects indicated that the indirect effects are greater as the moderator variables become smaller. In other words, the effect of disinterest in slimmer body shape on positive body image is greater for those who are not currently gaining weight. In addition, the effect of positive body image on healthy eating habits/maintenance of good dietary habits is greater for those who do not consume vegetables and fruits. Next, the conditional indirect effects were examined. The results showed that the magnitude of the effect was smaller for adolescent girls who were trying to gain weight. However, the magnitude of the effect was greater for those who consume greater amount of vegetables and fruits.

5.3 Limitations and Future Directions

In this dissertation, I have attempted to extend the use of the analytical procedures for the combined effects of mediation and moderation within an integrated analytical

framework in the literature of positive body image among Latina adolescent girls. In estimating and determining statistical significance of conditional indirect effects, two general methodological approaches were considered, one using resampling techniques for constructing asymmetric CIs, and one using normal-theory approach to derive *SE*s and construct CIs. When using these methods, model assumptions should be carefully noted. Since the tests of direct effects, indirect effects, and conditional effects are all applications in the context of multiple linear regression, all relevant assumptions for multiple linear regression should apply for the normal-theory approach of the conditional indirect effects modeling. In the *SPSS* macro for a command PROCESS, most of the analyses were conducted using normal-theory approach, with a few exceptions of analyses for bootstrapped CIs of conditional indirect effects at the numerous values of the moderator variables. Therefore, to be more certain about estimation of the parameters, and determination of their statistical significance, in theory each assumption for the regression analyses (e.g., linear relationships among variables, normally distributed error terms, homogeneity of varianaces, homoscedasticity and independency, and so forth) could have been checked more rigorously. In the case of resampling approach for constructing bootstrapped CIs for the conditional indirect effects, the only assumptions that need to be tested include linearity of relationships among variables, and independency of observations.

All this discussion about model assumptions is also of relevance to causality in any mediation effect. It is strongly stressed in the literature that mediation is a causal process (e.g., Preacher, & Hayes, 2008). Therefore, all constructed models in this dissertation are in theory interpreted using causal inferences, and subsequently any

conclusions drawn from this study rely on the necessary preconditions for causality. Causal inferences about relationships among variables should have such characteristics as temporal precedence (i.e., variables of causes must occur before variables of their effects), concomitant variations (i.e., changes in the effect are associated with changes in a given factor, so that all variables covary in expected patterns), and elimination of spurious correlations (i.e., all other potential causes of covariation have been removed). One important fact to note is that establishing those assumptions for causality is a matter of research design, rather than of specific statistical techniques we use. Given that mediation hypotheses are usually tested using correlational data obtained from observational research design, the best that can be claimed is that data we used in this dissertation do not contradict mediational hypotheses. Things we could have done may be more carefully considering means by which research designs are improved from the very initial stage of the study, for example, ensuring variables are measured in the proper order so that the constructs occur in the proper order, predictor variables are experimentally manipulated rather than merely observed, including covariates in the study to remove potential sources of spurious correlations between mediator variables and outcome variables. However, in this dissertation I was cautious about using causal language in the interpretations of the models since the data used in this dissertation did not originate from experimental research design in a true sense.

Another potential limitations of the current dissertation is the lack of discussion about practical significance, in addition to statistical significance of the estimates of the conditional indirect effects. The conditional indirect effects could have also been characterized by practical significance using the measures of effect size. This discussion

also has some relevance to the issue of the distinction between partial mediation and full mediation. Using the notations from Figure 2.1, the mediator variable *M* is said to partially mediate the effect of *X* on *Y* if c' is smaller in size than *c* although c' is statistically significant (Judd, & Kenny, 1981). If c' is not statistically significant, full mediation is considered to have occurred (Baron, & Kenny, 1986). Since each one of partial mediation and full mediation depends on the size of the total effect and sample size, and the distinction between the two is made based only on the statistical significance, it has limited utility.

Another area of the potential improvement of the study would be the use of standardized regression coefficients in addition to unstandardized ones. While unstandardized measures are interpretable only in the units of the original scales of the variables of interest, standardized measures could have advantages that they do not rest on the scales of the variables, and therefore they can be interpreted without information on the scales. In particular, indirect effects are quantified as the product terms of the regression coefficients, and thus indirect effects could be interpreted more conveniently without the original metrics of each variable when standardized measures are used.

As a limitation from the perspective of the substantive area, we could have drawn richer conclusions if there were more of contextual variable question items in the survey which can measure "acculturation" of adolescent girls, specifically those who are the first generation of the immigrant, for example, languages mainly spoken at home, or a more variety of background questions about the adolescent girls and their family.

To most inferential statistical methods, statistical power (i.e., the probability of detecting true significant non-zero effect) can be an important methodological issue to

consider, and mediational analysis is not an exception. For future directions, power studies should be useful in determining the minimum number of the sample size needed in this type of complex regression analytic models. Since methods for normal-theory approach and resampling approach likely differ in statistical power, specifically the investigation of the power to detect significance of conditional indirect effects using bootstrapping approach should be necessary direction for future research.

Last but not least, a set of systematically conducted psychometric techniques, such as reliability measures of alphas, and internal consistency, vality study, the use of exploratory factor analytic techniques when constructing composite variables and etc., should be needed to reinforce the conclusions derived.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression*. Beverly Hills, CA: Sage Publishing.

Allen, K. L., Byrne, S. M., McLean, N. J., & Davis, E. A. (2008). Overconcern with weight and shape is not the same as body dissatisfaction: Evidence from a prospective study of pre-adolescent boys and girls, *5*(3), 261–270.

Aroian, L. A. (1947). The probability function of the product of two normally distributed variables, 265–271.

Ata, R. N., Ludden, A. B., & Lally, M. M. (2007). The effects of gender and family, friend, and media influences on eating behaviors and body image during adolescence, *36*(8), 1024–1037.

Avalos, L., Tylka, T. L., & Wood-Barcalow, N. (2005). The Body Appreciation Scale: development and psychometric evaluation, *2*(3), 285–297.

Barker, E. T., & Galambos, N. L. (2003). Body dissatisfaction of adolescent girls and boys: Risk and resource factors, *23*(2), 141–165.

Barnes, H. L., & Olson, D. H. (1985). Parent-adolescent communication and the circumplex model, 438–447.

BarNir, A., Watson, W. E., & Hutchins, H. M. (2011). Mediation and moderated mediation in the relationship among role models, self-efficacy, entrepreneurial career intention, and gender, *41*(2), 270–297.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations, *51*(6), 1173.

Bauer, K. W., Larson, N. I., Nelson, M. C., Story, M., & Neumark-Sztainer, D. (2009). Fast food intake among adolescents: secular and longitudinal trends from 1999 to 2004, *48*(3), 284–287.

Blowers, L. C., Loxton, N. J., Grady-Flesser, M., Occhipinti, S., & Dawe, S. (2003). The relationship between sociocultural pressure to be thin and body dissatisfaction in preadolescent girls, *4*(3), 229–244.

Bollen, K. A., & Stine, R. (1990). Direct and indirect effects: Classical and bootstrap estimates of variability, *20*(1), 15–140.

Byely, L., Archibald, A. B., Graber, J., & Brooks-Gunn, J. (2000). A prospective study of familial and social influences on girls' body image and dieting, *28*(2), 155–164.

Carvajal, S. C., Hanson, C. E., Romero, A. J., & Coyle, K. K. (2002). Behavioural risk factors and protective factors in adolescents: a comparison of Latinos and non-Latino whites, *7*(3), 181–193.

Centers for Disease Control and Prevention (CDC). (2010). *National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2007*. Atlanta, GA.

Cheng, H. L., & Mallinckrodt, B. (2009). Parental bonds, anxious attachment, media internalization, and body image dissatisfaction: Exploring a mediation model, *56*(3), 365.

Clay, D., Vignoles, V. L., & Dittmar, H. (2005). Body image and self-esteem among adolescent girls: testing the influence of sociocultural factors, *15*(4), 451–477.

Crespo, C., Kielpikowski, M., Jose, P. E., & Pryor, J. (2010). Relationships between family connectedness and body satisfaction: A longitudinal study of adolescent

girls and boys, *39*(12), 1392–1401.

Crow, S., Eisenberg, M. E., Story, M., & Neumark-Sztainer, D. (2006). Psychosocial and behavioral correlates of dieting among overweight and non-overweight adolescents, *38*(5), 569–574.

Cutler, G. J., Flood, A., Hannan, P., & Neumark-Sztainer, D. (2011). Multiple sociodemographic and socioenvironmental characteristics are correlated with major patterns of dietary intake in adolescents, *111*(2), 230–240.

Dixon, R., Adair, V., & O'Connor, S. (1996). Parental influences on the dieting beliefs and behaviors of adolescent females in New Zealand, *19*(4), 303–307.

Duke, L. (2000). Black in a blonde world: Race and girls' interpretations of the feminine ideal in teen magazines, *77*(2), 367–392.

Edwards, J., & Lambert, L. (2007). Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychological Methods*, *12*(1), 1.

Efron, B., & Tibshirani, R. (1998). The problem of regions, 1687–1718.

Fairchild, A., & MacKinnon, D. (2009). A general model for testing mediation and moderation effects. *Prevention Science*, *10*(2), 87–99.

Fergus, S., & Zimmerman, M. A. (2005). Adolescent resilience: A framework for understanding healthy development in the face of risk, *26*, 399–419.

Folmer, H. (1981). Measurement of the effects of regional policy instruments by means of linear structural equation models and panel data, *13*(11), 1435–1448.

Garmezy, N., & Masten, A. S. (1991). The protective role of competence indicators in children at risk. In *Life-span developmental psychology: Perspectives on stress*

and coping (Cummings, E. M., Greene, A. L., Karraker, K. H., pp. 151–174). Hillsdale, NJ: Lawrence Erlbaum Associates.

Goodman, L. A. (1960). On the exact variance of products, *55*(292), 708–713.

Gross, R. M., & Nelson, E. S. (2000). Perceptions of parental messages regarding eating and weight and their impact on disordered eating, *15*(2), 57–78.

Gutiérrez-Doña, B., Lippke, S., Renner, B., Kwon, S., & Schwarzer, R. (2009). Self-Efficacy and Planning Predict Dietary Behaviors in Costa Rican and South Korean Women: Two Moderated Mediation Analyses, *1*(1), 91–104.

Halliwell, E., & Harvey, M. (2006). Examination of a sociocultural model of disordered eating among male and female adolescents, *11*(2), 235–248.

Haugen, T., Säfvenbom, R., & Ommundsen, Y. (2011). Physical activity and global self-worth: The role of physical self-esteem indices and gender, *4*(2), 49–56.

Hayes, A. F. (2004). *SPSS macro SOBEL*.

Hayes, A. F. (2007). *SPSS macro MODMED*.

Hayes, A. F. (2008). *SPSS macro INDIRECT*.

Hayes, A. F. (2009). *SPSS macro MODPROBE*.

Hayes, A. F. (2011a). *SPSS macro MED3/C*.

Hayes, A. F. (2011b, September 27). My macros and code for SPSS and SAS. Retrieved from http://afhayes.com/spss-sas-and-mplus-macros-and-code.html

Hayes, A. F. (2013a). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Hayes, A. F. (2013b). SPSS macro PROCESS (Version 2.13).

Hayes, A. F., & Matthes, J. (2009). Computational procedures for probing interactions in

OLS and logistic regression: SPSS and SAS implementations, *41*(3), 924–936.

Hayes, A. F., Preacher, K. J., & Myers, T. A. (n.d.). Mediation and the estimation of indirect effects in political communication research. In *Sourcebook for political communication research: Methods, measures, and analytical techniques* (pp. 434–465).

Heinberg, L. J., Thompson, J. K., & Stormer, S. (1995). Development and validation of the sociocultural attitudes towards appearance questionnaire, *17*(1), 81–89.

Herbozo, S., & Thompson, J. K. (2006). Appearance-related commentary, body image, and self-esteem: Does the distress associated with the commentary matter?, *3*(3), 255–262.

Holmbeck, G. N. (2002). Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations, *27*(1), 87–96.

Hoyle, R. H., & Robinson, J. C. (2004). Mediated and moderated effects in social psychological research. In *Handbook of methods in social psychology* (pp. 213–233).

Hutchinson, D. M., Rapee, R. M., & Taylor, A. (2010). Body dissatisfaction and eating disturbances in early adolescence: A structural modeling investigation examining negative affect and peer factors, *30*(4), 489–517.

Hyman, H. H. (1955). *Survey design and analysis: principles, cases, and procedures*. Free Press.

IBM SPSS Statistics. (1989). (Version 23). IBM.

James, L. R., & Brett, J. M. (1984). Mediators, moderators, and tests for mediation, *69*(2), 307.

Jones, D. C. (2001). Social comparison and body image: Attractiveness comparisons to models and peers among adolescent girls and boys, *45*(9), 645–664.

Jones, D. C. (2004). Body image among adolescent girls and boys: a longitudinal study, *40*(5), 823.

Jones, D. C., Vigfusdottir, T. H., & Lee, Y. (2004). Body image and the appearance culture among adolescent girls and boys an examination of friend conversations, peer criticism, appearance magazines, and the internalization of appearance ideals, *19*(3), 323–339.

Judd, C. M., & Kenny, D. A. (1981). Process analysis estimating mediation in treatment evaluations, *5*(5), 602–619.

Kelly, A. M., Wall, M., Eisenberg, M. E., Story, M., & Neumark-Sztainer, D. (2005). Adolescent girls with high body satisfaction: who are they and what can they teach us?, *37*(5), 391–396.

Kluck, A. S. (2010). Family influence on disordered eating: The role of body image dissatisfaction, *7*(1), 8–14.

Lawler, M., & Nixon, E. (2011). Body dissatisfaction among adolescent boys and girls: the effects of body mass, peer appearance culture and internalization of appearance ideals, *40*(1), 59–71.

Levine, M. P., & Chapman, K. (2011). Media influences on body image, 101–109.

Lockwood, C. M., & MacKinnon, D. P. (1998). Bootstrapping the standard error of the mediated effect. In *the 23rd annual meeting of SAS Users Group International* (pp. 997–1002).

Lovejoy, M. (2001). Disturbances in the social body differences in body image and eating

problems among African American and White women, *15*(2), 239–261.

MacKinnon, D. P., & Dwyer, J. H. (1993). Estimating mediated effects in prevention studies, *17*(2), 144–158.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects, *7*(1), 83.

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods, *39*(1), 99–128.

MacKinnon, D. P., Warsi, G., & Dwyer, J. H. (1995). A simulation study of mediated effect measures, *30*(1), 41–62.

McCabe, M. P., & Ricciardelli, L. A. (2005). A prospective study of pressures from parents, peers, and the media on extreme weight change behaviors among adolescent boys and girls, *43*(5), 653–668.

Mendelson, B. K., White, D. R., & Mendelson, M. J. (1996). Self-esteem and body esteem: Effects of gender, age, and weight, *17*(3), 321–346.

Morgan-Lopez, A., & MacKinnon, D. (2006). Demonstration and evaluation of a method for assessing mediated moderation. *Behavior Research Methods*, *38*(1), 77–87.

Motl, R. W., Dishman, R. K., Saunders, R., Dowda, M., Felton, G., & Pate, R. R. (2001). Measuring enjoyment of physical activity in adolescent girls, *21*(2), 110–117.

Muller, D., Judd, C., & Yzerbyt, V. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, *89*(6), 852.

Muthen, B., & Muthen, L. (2011). M*plus* (Version 6.11).

Neumark-Sztainer, D. (2011). Obesity and body image in youth, 180–188.

Neumark-Sztainer, D., Paxton, S. J., Hannan, P. J., Haines, J., & Story, M. (2006). Does body satisfaction matter? Five-year longitudinal associations between body satisfaction and health behaviors in adolescent females and males, *39*(2), 244–251.

Ng, K. Y., Ang, S., & Chan, K. Y. (2008). Personality and leader effectiveness: a moderated mediation model of leadership self-efficacy, job demands, and job autonomy, *93*(4), 733.

Paxton, S. J., Eisenberg, M. E., & Neumark-Sztainer, D. (2006). Prospective predictors of body dissatisfaction in adolescent girls and boys: a five-year longitudinal study, *42*(5), 888.

Paxton, S. J., Schutz, S. J., Wertheim, E. H., & Muir, S. L. (1999). Friendship clique and peer influences on body image concerns, dietary restraint, extreme weight-loss behaviors, and binge eating in adolescent girls, *108*(2), 255.

Perry, A. C., Rosenblatt, E. B., & Wang, X. (2004). Physical, Behavioral, and Body Image Characteristics in a Tri-Racial Group of Adolescent Girls, *12*(10), 1670–1679.

Pingitore, R., Spring, B., & Garfield, D. (1997). Gender differences in body satisfaction, *5*(5), 402–409.

Pituch, K. A., Whittaker, T. A., & Stapleton, L. M. (2005). A comparison of methods to test for mediation in multisite experiments, *40*(1), 1–23.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models, *36*(4), 717–731.

Preacher, K. J., & Hayes, A. F. (2008a). Assessing mediation in communication research. In *The Sage sourcebook of advanced data analysis methods for communication research* (pp. 13–54).

Preacher, K. J., & Hayes, A. F. (2008b). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models, *40*(3), 879–891.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions, *42*(1), 185–227.

Rodgers, R. F., Faure, K., & Chabrol, H. (2009). Gender differences in parental influences on adolescent body dissatisfaction and disordered eating, *61*(11), 837–849.

Romo, L., Mireles-Rios, R., & Nylund-Gibson, K. (2012). *The Positive Body Image Survey*.

Rozeboom, W. W. (1956). Mediation variables in scientific theory, *63*(4), 249.

Schooler, D., & Trinh, S. (2011). Longitudinal associations between television viewing patterns and adolescent body satisfaction, *8*(1), 34–42.

Schreiber, G. B., Robins, M., Striegel-Moore, R., Obarzanek, E., Morrison, J. A., & Wright, D. J. (1996). Weight modication efforts reported by black and white preadolescent girls: National Heart, Lung, and Blood Institute Growth and Health Study, *98*, 63–70.

Sebastian, R. S., Cleveland, L. E., & Goldman, J. D. (2008). Effect of snacking frequency on adolescents' dietary intakes and meeting national recommendations, *42*(5), 503–511.

Shroff, H., & Thompson, J. K. (2006). Peer influences, body-image dissatisfaction, eating dysfunction and self-esteem in adolescent girls, *11*(4), 533–551.

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: new procedures and recommendations, *7*(4), 422.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models, *13*, 290–312.

Sobel, M. E. (1986). Some new results on indirect effects and their standard errors in covariance structure models, 159–186.

Sobel, M. E. (1988). Direct and indirect effects in linear structural equation models. In *Common problems / proper solutions: Avoiding error in quantitative research* (J. S. Long, pp. 46–64). Newbury Park, CA: Sage.

Sorensen, G., Stoddard, A., & Macario, E. (1998). Social support and readiness to make dietary changes, *25*(5), 586–598.

Stice, E., Presnell, K., & Spangler, D. (2002). Risk factors for binge eating onset in adolescent girls: a 2-year prospective investigation, *21*(2), 131.

Stice, E., & Shaw, H. E. (2002). Role of body dissatisfaction in the onset and maintenance of eating pathology: A synthesis of research findings, *53*(5), 985–993.

Stice, E., & Whitenton, K. (2002). Risk factors for body dissatisfaction in adolescent girls: a longitudinal investigation, *38*(5), 669.

Stine, R. (1989). An introduction to bootstrap methods examples and ideas, *18*(2), 243–291.

Thompson, J. K., Heinberg, L. J., Altabe, M., & Tantleff-Dunn, S. (1999). *Exacting*

beauty: Theory, assessment, and treatment of body image disturbance. Washington, D.C., U.S.: American Psychological Association.

Tiggemann, M. (2011). Sociocultural perspectives on human appearance and body image. In *Body image: A handbook of science, practice, and prevention* (pp. 12–19).

Tylka, T. L. (2011). Positive psychology perspectives on body image, *2*, 56–64.

Wegener, D. T., & Fabrigar, L. R. (2000). Analysis and design of nonexperimental data: Addressing causal and noncausal hypotheses. In *Handbook of research methods in social and personality psychology* (H. T. Reis & C. M. Judd, pp. 412–450). Cambridge, U.K.: Cambridge University Press.

Williams, J. M., & Currie, C. (2000). Self-esteem and physical development in early adolescence: Pubertal timing and body image, *20*(2), 129–149.

Appendix A: Sample *SPSS* macro for a command PROCESS input and output file for PRH Model 2.

Process vars= FrqComP peersat PhAct psbdimg /y = PhAct /x = peersat /m =psbdimg /w= FrqComP /model=7 /boot=5000.

Run MATRIX procedure:

********** PROCESS Procedure for SPSS Release 2.13 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2013). www.guilford.com/p/hayes3

****
Model = 7
Y = PhAct
X = peersat
M = psbdimg
W = FrqComP

Sample size 94

****
Outcome: psbdimg

Model Summary

R	R-sq	MSE	F	df1	df2	p
.3154	.0995	.3748	3.3141	3.0000	90.0000	.0235

Model

	coeff	se	t	p	LLCI	ULCI
constant	1.5666	.3072	5.1001	.0000	.9564	2.1769
peersat	-.0983	.2050	-.4794	.6328	-.5056	.3090
FrqComP	-.3156	.1708	-1.8481	.0679	-.6548	.0237
int_1	.2578	.1123	2.2947	.0241	.0346	.4810

Interactions:

int_1 peersat X FrqComP

****
Outcome: PhAct

Model Summary

R	R-sq	MSE	F	df1	df2	p
.1609	.0259	9.6563	1.2098	2.0000	91.0000	.3030

Model

	coeff	se	t	p	LLCI	ULCI
constant	1.4980	1.1675	1.2831	.2027	-.8211	3.8170
psbdimg	.7173	.5174	1.3863	.1690	-.3105	1.7451

peersat .2973 .6986 .4256 .6714 -1.0904 1.6850

********** DIRECT AND INDIRECT EFFECTS **********

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.2973	.6986	.4256	.6714	-1.0904	1.6850

Conditional indirect effect(s) of X on Y at values of the moderator(s):

Mediator

	FrqComP	Effect	Boot SE	BootLLCI	BootULCI
psbdimg	.3930	.0022	.1234	-.2591	.2426
psbdimg	1.5355	.2134	.1277	.0298	.5681
psbdimg	2.6779	.4247	.2466	.0426	1.0532

Values for quantitative moderators are the mean and plus/minus one SD from mean.
Values for dichotomous moderators are the two values of the moderator.

********** INDEX OF MODERATED MEDIATION **********

Mediator

	Index	SE(Boot)	BootLLCI	BootULCI
psbdimg	.1849	.1290	.0072	.5380

********** ANALYSIS NOTES AND WARNINGS **********

Number of bootstrap samples for bias corrected bootstrap confidence intervals: 5000

Level of confidence for all confidence intervals in output: 95.00

NOTE: Some cases were deleted due to missing data. The number of such cases was: 5

------ END MATRIX -----

Appendix B: Sample *SPSS* macro for a command PROCESS input and output file for PRH Model 3.

Process vars= FrqComM momcomp VegFrt psbdimg /y = VegFrt /x = momcomp/m = psbdimg/v= FrqComM /model=14/boot=5000.

Run MATRIX procedure:

********** PROCESS Procedure for SPSS Release 2.13 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2013). www.guilford.com/p/hayes3

****
Model = 14
Y = VegFrt
X = momcomp
M = psbdimg
V = FrqComM

Sample size 99

****
Outcome: psbdimg

Model Summary

R	R-sq	MSE	F	df1	df2	p
.3788	.1435	.3458	16.2532	1.0000	97.0000	.0001

Model

	coeff	se	t	p	LLCI	ULCI
constant	.9258	.1585	5.8416	.0000	.6112	1.2403
momcomp	.2973	.0737	4.0315	.0001	.1509	.4437

****
Outcome: VegFrt

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4407	.1942	.2008	5.6642	4.0000	94.0000	.0004

Model

	coeff	se	t	p	LLCI	ULCI
constant	2.2595	.2854	7.9168	.0000	1.6928	2.8262
psbdimg	-.3807	.1755	-2.1687	.0326	-.7292	-.0322
momcomp	-.0053	.0648	-.0817	.9351	-.1339	.1233
FrqComM	-.0017	.1049	-.0166	.9868	-.2100	.2065
int_1	.1273	.0637	1.9983	.0486	.0008	.2538

Interactions:

int_1 psbdimg X FrqComM

********** DIRECT AND INDIRECT EFFECTS **********

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
-.0053	.0648	-.0817	.9351	-.1339	.1233

Conditional indirect effect(s) of X on Y at values of the moderator(s):

Mediator

	FrqComM	Effect	Boot SE	BootLLCI	BootULCI
psbdimg	1.3274	-.0629	.0354	-.1457	-.0063
psbdimg	2.3805	-.0231	.0246	-.0767	.0226
psbdimg	3.4335	.0168	.0348	-.0442	.0915

Values for quantitative moderators are the mean and plus/minus one SD from mean.
Values for dichotomous moderators are the two values of the moderator.

********** INDEX OF MODERATED MEDIATION **********

Mediator

	Index	SE(Boot)	BootLLCI	BootULCI
psbdimg	.0378	.0238	-.0011	.0912

********** ANALYSIS NOTES AND WARNINGS **********

Number of bootstrap samples for bias corrected bootstrap confidence intervals: 5000

Level of confidence for all confidence intervals in output: 95.00

------ END MATRIX -----

Appendix C: Sample *SPSS* macro for a command PROCESS input and output file for PRH Model 4.

Process vars= MealHbt Prof peerCom PhAct psbdimg /y = PhAct /x = peerCom /m =psbdimg /w=MealHbt /v=Prof /model=21 /boot=5000.

Run MATRIX procedure:

********** PROCESS Procedure for SPSS Release 2.13 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2013). www.guilford.com/p/hayes3

****
Model = 21
Y = PhAct
X = peerCom
M = psbdimg
W = MealHbt
V = Prof

Sample size 87

****
Outcome: psbdimg

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4398	.1935	.3619	6.6360	3.0000	83.0000	.0005

Model

	coeff	se	t	p	LLCI	ULCI
constant	2.4419	1.0840	2.2528	.0269	.2860	4.5979
peerCom	-.4682	.4606	-1.0165	.3123	-1.3843	.4479
MealHbt	-1.2208	.5756	-2.1210	.0369	-2.3656	-.0760
int_1	.5637	.2450	2.3012	.0239	.0765	1.0510

Interactions:

int_1 peerCom X MealHbt

****
Outcome: PhAct

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4076	.1662	8.8514	4.0854	4.0000	82.0000	.0045

Model

	coeff	se	t	p	LLCI	ULCI

constant	.3647	1.8438	.1978	.8437	-3.3031	4.0326
psbdimg	.1956	.6266	.3122	.7557	-1.0508	1.4421
peerCom	.7522	.7687	.9786	.3307	-.7769	2.2813
Prof	-1.1696	1.6611	-.7041	.4833	-4.4740	2.1347
int_2	2.4583	1.1105	2.2137	.0296	.2492	4.6673

Interactions:

int_2 psbdimg X Prof

********** DIRECT AND INDIRECT EFFECTS **********

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.7522	.7687	.9786	.3307	-.7769	2.2813

Conditional indirect effect(s) of X on Y at values of the moderator(s):

Mediator

	MealHbt	Prof	Effect	Boot SE	BootLLCI	BootULCI
psbdimg	1.3200	.0000	.0540	.1281	-.0953	.4912
psbdimg	1.3200	1.0000	.7323	.6230	-.0513	2.5655
psbdimg	1.8580	.0000	.1133	.2096	-.2679	.5784
psbdimg	1.8580	1.0000	1.5371	.8457	.3799	3.8312
psbdimg	2.3959	.0000	.1726	.3088	-.4275	.8075
psbdimg	2.3959	1.0000	2.3420	1.2869	.5472	5.8098

Values for quantitative moderators are the mean and plus/minus one SD from mean.
Values for dichotomous moderators are the two values of the moderator.

********** ANALYSIS NOTES AND WARNINGS **********

Number of bootstrap samples for bias corrected bootstrap confidence intervals: 5000

Level of confidence for all confidence intervals in output: 95.00

NOTE: Some cases were deleted due to missing data. The number of such cases was: 12

------ END MATRIX -----

Appendix D: Sample *SPSS* macro for a command PROCESS input and output file for PRH Model 5.

Process vars= FrqComM momcomp VegFrt psbdimg /y = VegFrt /x = momcomp/m = psbdimg /w=FrqComM /model=58/boot=5000.

Run MATRIX procedure:

********** PROCESS Procedure for SPSS Release 2.13 **********

Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2013). www.guilford.com/p/hayes3

****
Model = 58
Y = VegFrt
X = momcomp
M = psbdimg
W = FrqComM

Sample size 99

****
Outcome: psbdimg

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4254	.1810	.3376	6.9986	3.0000	95.0000	.0003

Model

	coeff	se	t	p	LLCI	ULCI
constant	1.3178	.2778	4.7439	.0000	.7663	1.8693
momcomp	.0190	.1521	.1252	.9007	-.2828	.3209
FrqComM	-.1756	.1171	-1.4998	.1370	-.4081	.0568
int_1	.1149	.0566	2.0303	.0451	.0025	.2272

Interactions:

int_1 momcomp X FrqComM

****
Outcome: VegFrt

Model Summary

R	R-sq	MSE	F	df1	df2	p
.4407	.1942	.2008	5.6642	4.0000	94.0000	.0004

Model

	coeff	se	t	p	LLCI	ULCI
constant	2.2595	.2854	7.9168	.0000	1.6928	2.8262
psbdimg	-.3807	.1755	-2.1687	.0326	-.7292	-.0322

momcomp	-.0053	.0648	-.0817	.9351	-.1339	.1233
FrqComM	-.0017	.1049	-.0166	.9868	-.2100	.2065
int_2	.1273	.0637	1.9983	.0486	.0008	.2538

Interactions:

int_2 psbdimg X FrqComM

********** DIRECT AND INDIRECT EFFECTS **********

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
-.0053	.0648	-.0817	.9351	-.1339	.1233

Conditional indirect effect(s) of X on Y at values of the moderator(s):

Mediator

	FrqComM	Effect	Boot SE	BootLLCI	BootULCI
psbdimg	1.3274	-.0363	.0289	-.1171	.0044
psbdimg	2.3805	-.0227	.0239	-.0751	.0198
psbdimg	3.4335	.0233	.0487	-.0571	.1280

Values for quantitative moderators are the mean and plus/minus one SD from mean.
Values for dichotomous moderators are the two values of the moderator.

********** ANALYSIS NOTES AND WARNINGS **********

Number of bootstrap samples for bias corrected bootstrap confidence intervals: 5000

Level of confidence for all confidence intervals in output: 95.00

------ END MATRIX -----

Appendix E: Sample *SPSS* macro for a command PROCESS input and output file for Unconditional Model

```
Process vars= peersat PhAct psbdimg   /y = PhAct  /x = peersat /m =psbdimg  /model=4
/boot=5000.

Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Release 2.13 ****************

        Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3

**************************************************************************
Model = 4
    Y = PhAct
    X = peersat
    M = psbdimg

Sample size
        94

**************************************************************************
Outcome: psbdimg

Model Summary
        R       R-sq        MSE          F          df1          df2          p
     .1924      .0370      .3921     3.5373     1.0000      92.0000      .0632

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.1390      .2031     5.6088     .0000      .7357     1.5423
peersat       .2598      .1381     1.8808     .0632     -.0145      .5342

**************************************************************************
Outcome: PhAct

Model Summary
        R       R-sq        MSE          F          df1          df2          p
     .1609      .0259     9.6563     1.2098     2.0000      91.0000      .3030

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.4980     1.1675     1.2831     .2027     -.8211     3.8170
psbdimg       .7173      .5174     1.3863     .1690     -.3105     1.7451
peersat       .2973      .6986      .4256     .6714    -1.0904     1.6850

****************** DIRECT AND INDIRECT EFFECTS *************************

Direct effect of X on Y
    Effect         SE          t          p       LLCI       ULCI
```

.2973 .6986 .4256 .6714 -1.0904 1.6850

Indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
psbdimg	.1864	.1344	.0063	.5839

********** ANALYSIS NOTES AND WARNINGS **********

Number of bootstrap samples for bias corrected bootstrap confidence intervals: 5000

Level of confidence for all confidence intervals in output: 95.00

NOTE: Some cases were deleted due to missing data. The number of such cases was: 5

------ END MATRIX -----

Appendix F: Sample *SPSS* syntax file for a plot of the conditional indirect effect of PRH Model 2

```
data list free/FrqComP.
begin data.
0.393 1.536 2.678
end data.
compute indirect = (-0.098 + 0.258*FrqComP)*0.717.
graph/scatter(overlay)= FrqComP WITH indirect.
```

Appendix G: Sample *SPSS* syntax file for a plot of the conditional indirect effect of PRH Model 3

```
data list free/FrqComM.
begin data.
1.3274 2.3805 3.4335
end data.
compute indirect = (-0.381 + 0.127*FrqComM)*0.297.
graph/scatter(overlay)=FrqComM WITH indirect.
```

Appendix H: Sample *SPSS* syntax file for a plot of the conditional indirect effect of PRH Model 5

```
data list free/FrqComM.
begin data.
1.3274 2.3805 3.4335
end data.
compute indirect = (0.019 + 0.115*FrqComM)*(-0.381 + 0.127*FrqComM).
graph/scatter(overlay)=FrqComM WITH indirect.
```

Appendix I: Sample M*plus* input and output file for PRH Model 2.

```
Mplus VERSION 6.11
MUTHEN & MUTHEN
07/27/2015   4:53 PM

INPUT INSTRUCTIONS

  DATA:
  FILE IS body image_jun2015_latina_mplus.dat;

  VARIABLE:
  names are desireCu
  x momcomp peerCom matmsg encdiet feqcomm w RelQual ImpPeer VegFrt MealHbt
  peerinf AsstWgt Dieting DietFrq strategy Prof emotion PhysAcvtHabt EnjPhy
  MMDissatfdR resist Percept Belief standard yourculture mental MSupp recept Veracity
  m y;

  usevariables are x m y w xw;
  DEFINE:
  xw = x*w;
  ANALYSIS:
  bootstrap = 5000;
  MODEL:
  y on m (b1)
  x
  w
  xw;
  m on x (a1)
  w
  xw (a3);
  MODEL CONSTRAINT:
  new (ind wmodval);
  wmodval = 1.5355;
  ind=(a1+a3*wmodval)*b1;
  output:
  cinterval (bcbootstrap);


SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                          99

Number of dependent variables                    2
Number of independent variables                  3
Number of continuous latent variables            0

Observed dependent variables

  Continuous
```

M Y

Observed independent variables
X W XW

Estimator	ML
Information matrix	OBSERVED
Maximum number of iterations	1000
Convergence criterion	0.500D-04
Maximum number of steepest descent iterations	20
Number of bootstrap draws	
Requested	5000
Completed	0

Input data file(s)
body image_jun2015_latina_mplus.dat

Input data format FREE

MODEL RESULTS

	Estimate
Y ON	
M	214.378
X	-0.480
W	-4.996
XW	0.211
M ON	
X	0.000
W	0.058
XW	0.000
Intercepts	
M	1.431
Y	117.125
Residual Variances	
M	0.365
Y	*********
New/Additional Parameters	
IND	0.029
WMODVAL	1.536

MODEL COMMAND WITH FINAL ESTIMATES USED AS STARTING VALUES

y ON m*214.378 (b1);

```
y ON x*-0.480;
y ON w*-4.996;
y ON xw*0.211;
m ON x*0 (a1);
m ON w*0.058;
m ON xw*0 (a3);

[ m*1.431 ];
[ y*117.125 ];

m*0.365;
y*1956815.625;

! NEW statements in MODEL CONSTRAINT
NEW(ind*0.029);
NEW(wmodval*1.536);
```

Appendix J: Sample M*plus* input and output file for PRH Model 3.

```
Mplus VERSION 6.11
MUTHEN & MUTHEN
07/27/2015   4:10 PM

INPUT INSTRUCTIONS

  DATA:
  FILE IS body image_jun2015_latina_mplus.dat;

  VARIABLE:
  names are desireCu
  peersat x peerCom matmsg encdiet w FrqComP RelQual ImpPeer Y MealHbt
  peerinf AsstWgt Dieting DietFrq strategy Prof emotion PhysAcvtHabt EnjPhy
  MMDissatfdR resist Percept Belief standard yourculture mental MSupp recept Veracity
  m PhAct;

  usevariables are x m y w mw;
  DEFINE:
  mw = m*w;
  ANALYSIS:
  bootstrap = 5000;
  MODEL:
  y on m (b1)
  x
  w
  mw (b3);
  m on x (a1);
  w with m;
  mw with m;
  MODEL CONSTRAINT:
  new (ind wmodval);
  wmodval = 2.3805;
  ind=a1*(b1+b3*wmodval);
  output:
  cinterval (bcbootstrap);


SUMMARY OF ANALYSIS

Number of groups                 1
Number of observations           99

Number of dependent variables    2
Number of independent variables  3
Number of continuous latent variables 0

Observed dependent variables

  Continuous
```

M Y

Observed independent variables
X W MW

Estimator	ML
Information matrix	OBSERVED
Maximum number of iterations	1000
Convergence criterion	0.500D-04
Maximum number of steepest descent iterations	20
Number of bootstrap draws	
Requested	5000
Completed	5000

Input data file(s)
body image_jun2015_latina_mplus.dat

Input data format FREE

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 16

Loglikelihood

H0 Value	-403.190
H1 Value	-389.235

Information Criteria

Akaike (AIC)	838.381
Bayesian (BIC)	879.903
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	829.374

Chi-Square Test of Model Fit

Value	27.911
Degrees of Freedom	2
P-Value	0.0000

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.362	
90 Percent C.I.	0.250	0.486
Probability RMSEA <= .05	0.000	

CFI/TLI

CFI	0.865
TLI	0.528

Chi-Square Test of Model Fit for the Baseline Model

Value	198.934
Degrees of Freedom	7
P-Value	0.0000

SRMR (Standardized Root Mean Square Residual)

Value	0.163

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Y ON				
M	-0.381	0.187	-2.035	0.042
X	-0.005	0.072	-0.073	0.942
W	-0.002	0.120	-0.015	0.988
MW	0.127	0.072	1.773	0.076
M ON				
X	0.016	0.045	0.366	0.714
W WITH				
M	0.114	0.070	1.634	0.102
MW WITH				
M	1.161	0.206	5.624	0.000
W	1.953	0.318	6.146	0.000
Means				
W	2.380	0.106	22.445	0.000
MW	3.734	0.254	14.677	0.000
Intercepts				
M	1.486	0.106	14.021	0.000
Y	2.260	0.322	7.007	0.000
Variances				
W	1.098	0.141	7.785	0.000
MW	6.417	1.059	6.058	0.000
Residual Variances				
M	0.390	0.051	7.575	0.000
Y	0.191	0.025	7.562	0.000

New/Additional Parameters

IND	-0.001	0.005	-0.244	0.807
WMODVAL	2.381	0.000	*********	0.000

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
Y ON							
M	-0.871	-0.733	-0.668	-0.381	-0.058	0.003	0.119
X	-0.178	-0.136	-0.114	-0.005	0.121	0.144	0.195
W	-0.308	-0.229	-0.188	-0.002	0.202	0.242	0.314
MW	-0.053	-0.014	0.006	0.127	0.241	0.267	0.316
M ON							
X	-0.098	-0.070	-0.054	0.016	0.091	0.107	0.134
W WITH							
M	-0.053	-0.018	0.003	0.114	0.237	0.258	0.297
MW WITH							
M	0.711	0.806	0.853	1.161	1.551	1.621	1.753
W	1.236	1.397	1.487	1.953	2.544	2.655	2.885
Means							
W	2.104	2.165	2.202	2.380	2.549	2.579	2.636
MW	3.123	3.253	3.326	3.734	4.165	4.253	4.418
Intercepts							
M	1.217	1.272	1.311	1.486	1.658	1.694	1.769
Y	1.459	1.632	1.730	2.260	2.778	2.890	3.151
Variances							
W	0.779	0.849	0.889	1.098	1.359	1.408	1.496
MW	4.155	4.681	4.954	6.417	8.450	8.863	9.741
Residual Variances							
M	0.279	0.304	0.320	0.390	0.496	0.511	0.543
Y	0.139	0.153	0.161	0.191	0.248	0.257	0.268
New/Additional Parameters							
IND	-0.031	-0.021	-0.016	-0.001	0.003	0.005	0.009
WMODVAL	2.381	2.381	2.381	2.381	2.381	2.381	2.381

Appendix K: Sample M*plus* input and output file for PRH Model 4.

```
Mplus VERSION 6.11
MUTHEN & MUTHEN
07/28/2015  12:39 PM

INPUT INSTRUCTIONS

  DATA:
  FILE IS body image_jun2015_latina_mplus.dat;

  VARIABLE:
  names are x
  peersat momcomp peerCom matmsg encdiet FrqComM FrqComP RelQual ImpPeer z y
  peerinf AsstWgt w DietFrq strategy Prof emotion PhysAcvtHabt EnjPhy
  MMDissatfdR resist Percept Belief standard yourculture mental MSupp recept Veracity
  m PhAct;

  usevariables are x m y w z mz xw;
  DEFINE:
  mz = m*z;
  xw = x*w;
  ANALYSIS:
  bootstrap = 5000;
  MODEL:
  y on m (b1)
  x
  w
  z
  mz (b3)
  xw;
  m on x (a1)
  w
  xw (a3);
  z with m;
  mz with m;
  MODEL CONSTRAINT:
  new (ind wmodval zmodval);
  wmodval = 0.3402;
  zmodval = 2.1441;
  ind=(a1+a3*wmodval)*(b1+b3*zmodval);
  output:
  cinterval (bcbootstrap);


SUMMARY OF ANALYSIS

Number of groups                 1
Number of observations           99

Number of dependent variables    2
```

Number of independent variables 5
Number of continuous latent variables 0

Observed dependent variables

Continuous
M Y

Observed independent variables
X W Z MZ XW

Estimator ML
Information matrix OBSERVED
Maximum number of iterations 1000
Convergence criterion 0.500D-04
Maximum number of steepest descent iterations 20
Number of bootstrap draws
Requested 5000
Completed 28

Input data file(s)
body image_jun2015_latina_mplus.dat

Input data format FREE

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 20

Loglikelihood

H0 Value -260.841
H1 Value -239.861

Information Criteria

Akaike (AIC) 561.681
Bayesian (BIC) 613.584
Sample-Size Adjusted BIC 550.423
(n* = (n + 2) / 24)

Chi-Square Test of Model Fit

Value 41.959
Degrees of Freedom 6
P-Value 0.0000

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.246
90 Percent C.I.	0.179 0.319
Probability RMSEA <= .05	0.000

CFI/TLI

CFI	0.880
TLI	0.780

Chi-Square Test of Model Fit for the Baseline Model

Value	309.999
Degrees of Freedom	11
P-Value	0.0000

SRMR (Standardized Root Mean Square Residual)

Value	0.133

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Y ON				
M	-0.592	0.253	-2.337	0.019
X	-0.209	0.101	-2.068	0.039
W	0.000	0.000	7.085	0.000
Z	-0.180	0.208	-0.866	0.386
MZ	0.362	0.120	3.010	0.003
XW	0.000	0.000	-3.770	0.000
M ON				
X	0.018	0.023	0.782	0.434
W	0.000	0.000	-3.322	0.001
XW	0.000	0.000	3.043	0.002
Z WITH				
M	-0.002	0.021	-0.078	0.938
MZ WITH				
M	0.827	0.097	8.542	0.000
Z	0.374	0.053	7.072	0.000
Means				
Z	2.142	0.040	53.830	0.000
MZ	3.251	0.080	40.763	0.000

Intercepts				
M	1.496	0.042	35.685	0.000
Y	2.245	0.448	5.017	0.000
Variances				
Z	0.237	0.019	12.639	0.000
MZ	2.469	0.271	9.114	0.000
Residual Variances				
M	0.388	0.034	11.278	0.000
Y	0.232	0.025	9.248	0.000
New/Additional Parameters				
IND	0.003	0.003	0.984	0.325
WMODVAL	0.340	0.000	0.000	1.000
ZMODVAL	2.144	0.000	0.000	1.000

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
Y ON							
M	-1.108	-1.108	-1.108	-0.592	-0.322	-0.195	0.258
X	-0.477	-0.376	-0.354	-0.209	-0.058	-0.051	-0.051
W	0.000	0.000	0.000	0.000	0.000	0 .000	0.000
Z	-0.490	-0.490	-0.490	-0.180	0.150	0.161	0.439
MZ	-0.045	0.173	0.232	0.362	0.558	0.558	0.558
XW	0.000	0.000	0.000	0.000	0.000	0.000	0.000
M ON							
X	-0.053	-0.028	-0.018	0.018	0.060	0.061	0.061
W	0.000	0.000	0.000	0.000	0.000	0.000	0.000
XW	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Z WITH							
M	-0.031	-0.031	-0.030	-0.002	0.034	0.046	0.046
MZ WITH							
M	0.640	0.640	0.666	0.827	0.954	0.959	0.959
Z	0.262	0.262	0.291	0.374	0.448	0.467	0.467
Means							
Z	2.078	2.078	2.079	2.142	2.202	2.206	2.206
MZ	3.079	3.079	3.079	3.251	3.352	3.352	3.402
Intercepts							
M	1.408	1.408	1.408	1.496	1.559	1.559	1.597
Y	1.043	1.462	1.550	2.245	3.057	3.057	3.057

Variances

Z	0.194	0.194	0.195	0.237	0.263	0.267	0.267
MZ	1.934	2.023	2.096	2.469	2.931	2.931	2.931

Residual Variances

M	0.329	0.329	0.329	0.388	0.424	0.448	0.448
Y	0.186	0.195	0.199	0.232	0.286	0.286	0.286

New/Additional Parameters

IND	-0.005	0.000	0.001	0.003	0.009	0.009	0.009
WMODVAL	0.340	0.340	0.340	0.340	0.340	0.340	0.340
ZMODVAL	2.144	2.144	2.144	2.144	2.144	2.144	2.144

Appendix L: Sample M*plus* input and output file for PRH Model 5.

```
Mplus VERSION 6.11
MUTHEN & MUTHEN
07/27/2015   4:22 PM

INPUT INSTRUCTIONS

  DATA:
  FILE IS body image_jun2015_latina_mplus.dat;

  VARIABLE:
  names are desireCu
  peersat x peerCom matmsg encdiet w FrqComP RelQual ImpPeer Y MealHbt
  peerinf AsstWgt Dieting DietFrq strategy Prof emotion PhysAcvtHabt EnjPhy
  MMDissatfdR resist Percept Belief standard yourculture mental MSupp recept Veracity
  m PhAct;

  usevariables are x m y w xw mw;
  DEFINE:
  mw = m*w;
  xw = x*w;
  ANALYSIS:
  bootstrap = 5000;
  MODEL:
  y on m (b1)
  x
  w
  mw (b2)
  xw;
  m on x (a1)
  w
  xw (a3);
  mw with m;
  MODEL CONSTRAINT:
  new (ind wmodval);
  wmodval = 2.3805;
  ind=(a1+a3*wmodval)*(b1+b2*wmodval);
  output:
  cinterval (bcbootstrap);


SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                          99

Number of dependent variables                    2
Number of independent variables                  4
Number of continuous latent variables            0
```

Observed dependent variables

Continuous
M Y

Observed independent variables
X W XW MW

Estimator	ML
Information matrix	OBSERVED
Maximum number of iterations	1000
Convergence criterion	0.500D-04
Maximum number of steepest descent iterations	20
Number of bootstrap draws	
Requested	5000
Completed	5000

Input data file(s)
body image_jun2015_latina_mplus.dat

Input data format FREE

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 15

Loglikelihood

H0 Value	-290.362
H1 Value	-237.426

Information Criteria

Akaike (AIC)	610.725
Bayesian (BIC)	649.652
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	602.281

Chi-Square Test of Model Fit

Value	105.872
Degrees of Freedom	3
P-Value	0.0000

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.589
90 Percent C.I.	0.495 0.687
Probability RMSEA <= .05	0.000

CFI/TLI

CFI	0.492
TLI	-0.523

Chi-Square Test of Model Fit for the Baseline Model

Value	211.645
Degrees of Freedom	9
P-Value	0.0000

SRMR (Standardized Root Mean Square Residual)

Value	0.527

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Y ON				
M	-0.311	0.206	-1.513	0.130
X	-0.126	0.145	-0.863	0.388
W	-0.048	0.127	-0.378	0.706
MW	0.091	0.084	1.079	0.281
XW	0.057	0.062	0.910	0.363
M ON				
X	0.202	0.121	1.669	0.095
W	-0.352	0.093	-3.776	0.000
XW	-0.088	0.045	-1.983	0.047
MW WITH				
M	2.227	0.346	6.438	0.000
Means				
MW	3.734	0.254	14.677	0.000
Intercepts				
M	2.400	0.266	9.023	0.000
Y	2.354	0.345	6.828	0.000
Variances				
MW	6.417	1.059	6.058	0.000

Residual Variances

M	0.832	0.134	6.226	0.000
Y	0.188	0.024	7.788	0.000

New/Additional Parameters

IND	0.001	0.005	0.166	0.868
WMODVAL	2.381	0.000	*********	0.000

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
Y ON							
M	-0.832	-0.670	-0.604	-0.311	0.075	0.150	0.303
X	-0.527	-0.393	-0.353	-0.126	0.116	0.174	0.306
W	-0.399	-0.293	-0.250	-0.048	0.166	0.201	0.273
MW	-0.157	-0.090	-0.062	0.091	0.213	0.240	0.299
XW	-0.110	-0.062	-0.044	0.057	0.159	0.180	0.229
M ON							
X	-0.088	-0.028	0.005	0.202	0.409	0.446	0.520
W	-0.584	-0.530	-0.498	-0.352	-0.190	-0.164	-0.101
XW	-0.210	-0.179	-0.166	-0.088	-0.019	-0.007	0.013
MW WITH							
M	1.499	1.646	1.723	2.227	2.875	3.022	3.243
Means							
MW	3.123	3.253	3.326	3.734	4.165	4.253	4.418
Intercepts							
M	1.711	1.857	1.958	2.400	2.834	2.912	3.080
Y	1.540	1.732	1.815	2.354	2.915	3.044	3.346
Variances							
MW	4.155	4.681	4.954	6.417	8.450	8.863	9.741
Residual Variances							
M	0.565	0.614	0.645	0.832	1.097	1.158	1.256
Y	0.140	0.154	0.162	0.188	0.244	0.254	0.263
New/Additional Parameters							
IND	-0.010	-0.005	-0.004	0.001	0.013	0.016	0.023
WMODVAL	2.381	2.381	2.381	2.381	2.381	2.381	2.381