

THESIS

USING INTEGRATED MODEL OF BEHAVIORAL PREDICTION
TO IDENTIFY THE MOST PREDICTIVE DETERMINANTS OF COLLEGE STUDENTS'
INTENTION TO DO REGULAR VIGOROUS EXERCISE

Submitted by

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ABSTRACT

USING INTEGRATED MODEL OF BEHAVIORAL PREDICTION TO IDENTIFY THE MOST PREDICTIVE DETERMINANTS OF COLLEGE STUDENTS' INTENTION TO DO REGULAR VIGOROUS EXERCISE

This study aimed to use the Integrative Model of Behavioral Prediction (IMBP) to identify the strongest predictors of college student's intention to do vigorous exercise regularly. The results of the study will be useful for health communicators to design messages and campaigns more effectively and further promote college students' exercise intention. In the first phase of study, a small convenience sample of undergraduates (n=19) were asked to indicate their beliefs about doing vigorous exercise regularly with an open-ended questionnaire. After analyzing the qualitative responses by using content analysis, the most salient beliefs were used to design a close-ended survey in the second phase of study. The survey included the questions regarding the salient beliefs and exercise-related attitude, perceived norm, self-efficacy and intention. In the second phase, a larger sample of undergraduates (n=183) participated in the survey. The major findings showed that: (1) college students' exercise intention could be predicted by their attitude perceived norm, and self-efficacy. However, perceived norm was a weaker predictor compared to the other two. (2) More specifically, their exercise intention could be best predicted by their affective attitude, injunctive norm, and confidence. (3) In terms of the predictability of beliefs, both college students' behavioral belief and control belief significantly predicted their exercise intention, but normative belief was not predictive. (3) Lastly, the mediation analysis showed that the IMBP is a

partial mediation model instead of a full mediation model. The study concluded by discussing its implications and limitations.

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CHAPTER 1. INTRODUCTION

Participating in regular physical activity brings many health benefits. Prolonged physical activity can help reduce heart disease, type 2 diabetes, hypertension and many other chronic diseases. It can also provide numerous short-term benefits, such as improving the quality of sleep and reducing depression (US Department of Health and Human Services, 2008). Evidences clearly indicate that physical activity can improve people's physical and mental health. Recommendation by the American College of Sports Medicine (ACSM) and the American Heart Association (AHA) states that "all healthy adults aged 18 to 65 years need moderate-intensity aerobic (endurance) physical activity for a minimum of 30 minutes on five days each week or vigorous-intensity aerobic physical activity for a minimum of 20 minutes on three days each week" (Haskell et al., 2007; p.1081). However, according to National College Health Assessment conducted by American College Health Association in 2015 to 2017, only about 30% of college students met the recommendations proposed by ACSM and AHA, and this indicates that health communication campaigns on college campuses are needed to promote regular physical activities.

Health communication has an essential role in human health and well-being. An efficient health communication campaign combines theories with health practice to promote health and prevent diseases (Rimal & Lapinski, 2009). There is an increasing recognition that behavioral theories are useful in developing behavior change interventions (National Institutes of Health, 1997) because they provide a framework for health communicators to identify the determinants of targeted behaviors (Fishbein & Cappella, 2006). Poor communication can also be avoided if a message is developed based on theoretical models (Corcoran, 2007). Designing appropriate messages is a core mission for health communicators because it affects whether the audience receives health messages correctly, and how health behavior is promoted (Cho, 2012). The more

they know about the determinants of targeted behaviors, the more likely for them to design effective messages or interventions to change the behaviors of their target audience (Fishbein & Cappella, 2006). Therefore, to design a persuasive health messages and interventions, it is essential for health communicators to turn to behavioral theories that guide strategic health communications (Fishbein & Cappella, 2006; Ajzen, 1991; Bandura, 1998).

Given the considerable benefits of participating in a regular physical activity, and the current prevalence of insufficient physical activity among college students in the US, the purpose of this study is to apply the Integrated Model of Behavioral Prediction (IMBP) (Fishbein, 2000) to examine the most predictive determinant of U.S. college students' intention to do vigorous exercise for a minimum of 20 min on three days each week. Although there are a variety of behavioral theories, such as Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1985), Health Belief Model (Becker, 1974), and Social Cognitive Theory (Bandura, 1997), IMBP is one of the latest models that synthesizes the key constructs from the above theories to explain behaviors more comprehensively (Fishbein & Ajzen, 2010). In addition, it puts greater emphasis on population differences, and suggests that researchers should take salient beliefs into account since beliefs vary depending on population and target behavior. Those salient beliefs are important since they can serve as the key messages in health campaigns.

The target behavior in this study is students' intents to do vigorous exercise for a minimum of 20 minutes on three days each week. The reasons why "doing vigorous exercise for a minimum of 20 minutes on three days each week" was chosen as target behavior are as follows: First, researches have shown that interventions will be more effective in changing specific behaviors (e.g. jogging for 20 minutes three times a week) than behavioral categories (e.g. workout) and

goals (e.g. improving health) (Fishbein, 1995, 2000; Fishbein, & Yzer, 2003). Second, vigorous exercise is more time efficient than moderate-intensity exercise because the same energy expenditure can be achieved in vigorous exercise. Lastly, some researches (Helgerud et al., 2007; Gibala, & McGee, 2008) indicated that vigorous-intensity exercise could elicit additional physiological adaptations, such as maximal oxygen consumption and skeletal muscle adaptations. Therefore, this study aimed to investigate the most predictive determinants of college students' intentions to perform the target behavior. Once identified, the knowledge of the determinants would help health communicators to design theoretically-based health messages or interventions for U.S. college students in the future.

CHAPTER 2. LITERATURE REVIEW

This chapter included a literature review of the role of communication in health promotion, the trend of physical activity research, the most common theories that have been applied in physical activity studies, and the theoretical model (IMBP) that guides this study. Research questions and hypotheses of this study were proposed at the end of this chapter.

The Role of Communication in Health Promotion

Since health communication is a process that gathers, creates and shares health information (Kreps, 2003), communication plays an important role in health promotion. Health information serves as an important resource in health promotion because it can lead people to healthy behavior and decisions (Kreps, 1988). When the audience responds to the messages or interventions, the health communication process is considered successful (Corcoran, 2007). However, communicators are faced with a variety of concerns when designing messages. For instance, the characteristics of the target audience, the goals of the health interventions, such as the necessity of the target behavior and its implementation, and the selection of information that needs to be addressed (Fishbein & Yzer, 2003).

Tones and Tilford (1994) suggest that a framework is needed when health promoters design or select health messages because it serves as a guide and helps them to identify the crucial determinants of the target behavior. For instance, communicators can put more emphasis on determinants into the messages to promote healthy behavior or prime the audience's existing healthy beliefs that may influence the behavioral intention to perform healthy behaviors. The more communicators know about the determinants underlying the target behavior, the more they know about what needs to be addressed in the messages (Fishbein & Cappella, 2006). Therefore, in order to develop messages effectively and promote health successfully, health messages need to be

develop based on theoretical concepts (Corcoran, 2007). Although many theories have been used in healthy behaviors, several researchers assert that only a few determinants need to be considered when predicting and explaining the behaviors (Fishbein et al., 2002; Fishbein & Yzer, 2003; Slater, 1999; Witte, 1995). These determinants will be covered in the context below.

Overview of Physical Activity Studies

There are extensive studies related to benefits of physical activity. Based on the researcher's review of the existing literature in this field, one of the most popular topics for researchers is to investigate the relationship between physical activity and health issues, such as obesity (Setty, Padmanabha & Doddamani, 2013), depression (Martinsen, 2008; Taliaferro et al., 2009), and cardiovascular disease and mortality (Nocon et al., 2008; Thompson et al., 2003). The results of the abovementioned studies showed that physical activity could reduce the rate of those health symptoms. In addition, several studies (Bauman et al., 2012; Dishman, Sallis & Orenstein, 1985; Giles-Corti & Donovan, 2002; Trost et al., 2001; Wilcox et al., 2000) examined the determinants of physical activity. Behavioral theories were often used to guide those studies since there could be various factors of physical activities (Bauman et al., 2002, 2012). Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1985), and Social Cognitive Theory (Bandura, 1997) are some of the most popular theories among researchers in this field of study. The following sections will introduce the key concepts and prior literature on these theories.

Theory of Reasoned Action (TRA)

Theory of Reasoned Action (Ajzen & Fishbien, 1980; Fishbien & Ajzen, 1975) was first designed to predict volitional behaviors, which means the behavior is under one's control. TRA claims that an individual's intention to perform a target behavior is the most immediate and

predictive determinant of that behavior (Ajzen & Fishbein, 1980). The behavioral intention is in turn determined by two determinants: *attitude* toward the behaviors and *subjective norm* (see Figure 1. below). Attitude refers to individuals' overall evaluation of the target behavior. In other words, whether they are favorable/unfavorable or positive/negative toward the behaviors determines their intentions to perform the target behavior. Subjective norm refers to one's evaluation of whether significant others think he/she should perform the target behavior. TRA hypothesizes that individuals have higher intentions to perform the target behavior when they have a more positive/favorable attitude toward that behavior, and when they perceive greater social pressure to do so (Ajzen, 1985).

Previous meta-analyses (Randall & Wolff, 1994; Sheppard, Hartwick, & Warshaw, 1988) supported the assumption that an individual's intention was the most direct predictor to perform the target behavior. An earlier meta-analysis (Hausenblas, Carron, & Mack, 1997) on the utility of TRA and Theory of Planned Behavior in exercise behavior found that attitude was over two times stronger to predict intention to exercise than subjective norm. This meta-analytic review also investigated the relationship between attitude and exercise behavior, and relationship between subjective norm and exercise behavior. The result indicated that there was a strong relationship between attitude and exercise behavior. On the contrary, there was no relationship between subjective norm and exercise behavior. This finding demonstrated that subjective norm could only have influence on intention to exercise, but it could not directly affect exercise behavior.

Another recent meta-analytic review (Hagger, Chatzisarantis, & Biddle, 2002) regarding TRA and Theory of Planned Behavior in physical activity consistently showed that intention was a significant predictor of the target behavior. As for the determinants of intention, it indicated that both attitude and subjective norm had significant influence on intention, but subjective norm had

a smaller influence. Besides, two narrative reviews (Blue, 1995; Godin, 1993) regarding TRA in exercise behavior had consistent results of the above meta-analytic review. They also concluded that intention was determined by both attitude and subjective norm, but subjective norm had smaller influences on intention.

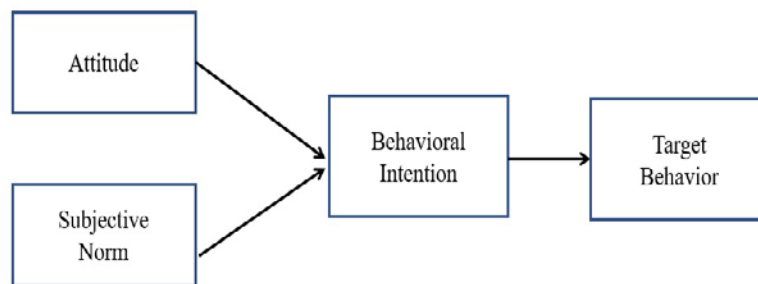


Figure 1. Diagram of Theory of Reasoned Action (Ajzen & Fishbien, 1980; Fishbien & Ajzen, 1975)

Theory of Planned Behavior (TPB)

Another theory that has been extensively used in physical activity is Theory of Planned Behavior (Ajzen, 1985). Like TRA, TPB points out that one's intention is the most dominant determinant to perform the target behavior. TPB is different from TRA in that it has an additional determinant of intention which is *perceived behavioral control (PBC)* (see Figure 2. below). Perceived behavioral control refers to one's perception of how easy or difficult it is to perform the target behavior. In addition to claiming that intention is the most immediate predictor of target behavior, TPB also asserts that perceived behavioral control can directly predict the target behavior when individuals have actual control over the behaviors (Ajzen & Madden, 1986; Sheeran, Trafimow, & Armitage, 2003). TPB hypothesizes that with more positive/favorable attitudes, greater subjective norm, and higher perceived behavioral control, individuals are more likely to perform the target behaviors (Ajzen, 1991).

Prior literature suggests that TPB is viewed as one of the most effective theories to predict and understand why people engage or not engage in physical activities (Biddle & Nigg, 2000;

Chatzisarantis & Biddle, 1998). Meta-analyses consistently showed that TPB had a strong correlation with physical activities (Armitage, 2005; Blue, 1995; Godin, 1993, 1994; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron, & Mack, 1997). Besides, a meta-analysis on 72 studies that assessed the effectiveness of TRA and TPB in the context of physical activities had the same results. However, it demonstrated that TPB was superior to TRA in predicting intention to do physical activities (Hagger et al., 2002) because it included perceived behavioral control as a factor which may hinder or facilitate physical activities (Blue, 1995).

As for the predictability of the three predictor variables in TPB, meta-analytic reviews regarding physical activities suggested that perceived behavioral control had as strong predictability as attitude (Blue, 1995; Godin, 1993; Hausenblas et al., 1997). On the other hand, perceived norm was a weaker predictor of intention to perform physical activities (Godin, 1993). Additionally, a cross-cultural study that examined the generalizability of TPB in the context of physical activities among young people also pointed out that attitude and perceived behavioral control were strong predictors of intention to carry out physical activities. The samples in this study crossed five cultures, which suggested that the effectiveness of TPB did not greatly vary among different cultures (Hagger et al., 2007).

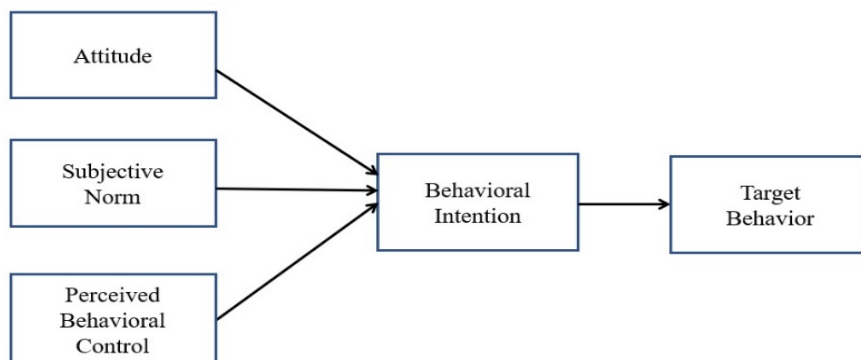


Figure 2. Diagram of Theory of Planned Behavior (Ajzen, 1985, 1991)

Social Cognitive Theory (SCT)

In addition to TRA and TPB, Social Cognitive Theory (Bandura, 1986) was also commonly used in the context of physical activities. It was developed based on the view of human agency. Through the view of human functioning, Bandura asserted that people are not reactive organisms that are passively shaped and affected by the external environment. Instead, people are self-organizing, proactive, self-reflecting and self-regulating organisms that have abilities to control over their actions. He argued that human behaviors are not one-sided determinants, but bidirectionally determined by personal factors (e.g. an individual's cognitive and affective states) and environmental influences (e.g. social and cultural environment). This causation was referred to as the Triadic Reciprocity Model (see Figure 3. below) (Bandura, 1986).

According to Bandura (1977), human behaviors are affected by many factors. Among all the factors, *self-efficacy* (Bandura, 1977) is the most significant determinant that triggers people's motivation to act in certain ways. Self-efficacy is the key concept in Social Learning Theory (Bandura, 1977) and Social Cognitive Theory (Bandura, 1986). It refers to "the beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p.3). Self-efficacy provides people with the foundations of motivation, well-being and personal sense of achievement. People have little incentive to take action or persist when encountering difficulties unless they believe that they have abilities to accomplish a certain task (Bandura, 1986).

Self-efficacy has been considerably used as a predictor variable in health behaviors due to its accurate predictability. Prior studies showed that there was a significant correlation between self-efficacy and healthy behaviors. Those studies included exercise behaviors (Shin, 2006), dietary behaviors (Saksvig, 2005), cardiovascular diseases (Sanz, 2006), asthma (Zebracki, 2004),

diabetes (Griva, 2000) and so on. They all found that those with higher self-efficacy had better control of diseases and healthy outcomes. In the context of physical activities, self-efficacy has been considered as a crucial predictor in promoting physical activities (Bauman et al., 2012; Olander et al., 2013). McAuley and Blissmer (2000) also asserted that self-efficacy was a significant predictor of exercise.

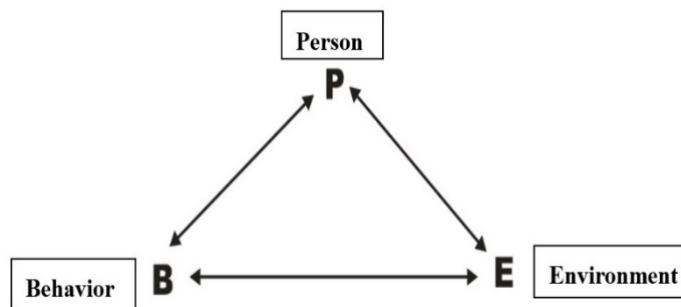


Figure 3: Triadic Reciprocity Model (Bandura, 1986)

Flaws in TRA and TPB

Theory of Reasoned Action and Theory of Planned Behavior are useful theories that have been applied in diverse healthy behaviors. However, they both have their own limitations. For TRA, although Ajzen and Fishbein (1980) asserted that TRA could be applied to all volitional behaviors, not all behaviors were under human control. In order to accommodate this limitation, Ajzen (1985) added *perceived behavioral control (PBC)* as an additional determinant of intention to perform target behavior and further proposed Theory of Planned Behavior (Ajzen, 1985, 1991).

With an addition of perceived behavioral control, TPB has been successfully applied, but the concept of perceived behavior control (PBC) was ambiguous and therefore caused uncertainties (Ajzen, 2002; Conner & Armitage, 1998; Sheeran & Orbell, 1999a; Sutton, 1998). For instance, many researchers mentioned that PBC was considered as overarching predictor variable that included many types of measures (e.g. measure of perceived difficulty, perceived

controllability, confidence, etc.) (Kraft et al., 2005; Pertl et al., 2010). The diverse measures and inconsistent definition facilitated further researches on PBC's dimensionality.

In order to clarify the ambiguity, Ajzen (2002), re-conceptualized PBC and claimed that PBC contained two major subcomponents: *perceived self-efficacy* and *controllability*. Several studies (Ajzen, 2002; Armitage & Conner, 1999; Manstead & van Eekelen, 1998; Terry & O'Leary, 1995) indicated that perceived self-efficacy was referred to individuals' perception of the ease and difficulty of performing the target behavior, and their confidences in their abilities to perform the target behavior even in the face of adversity. Controllability was referred to the extent to which individuals have control over the target behavior. Perceived self-efficacy and controllability were distinct but interrelated subcomponents of PBC (Ajzen, 2002; Pertl et al., 2010). Meta-analysis conducted by Cheung and Chen (2000) as well as several studies (Armitage & Conner, 1999; Manstead & van Eekelen, 1998; Sparks et al., 1997; Terry & O'Leary, 1995) that explored the distinction between perceived self-efficacy and controllability have shown that perceived self-efficacy enhanced the prediction of behavioral intention and behavior. As for controllability, it could predict intention only when it was combined with self-efficacy. However, it accounted for the variance in behavior.

Integrated Model of Behavioral Prediction (IMBP)

Although there are several behavioral theories that are commonly used in this area of research, such as Theory of Reasoned Action (Fishbein & Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1985), Health Belief Model (Becker, 1974), Social Cognitive theory (Bandura, 1977, 1986), Transtheoretical Model (DiClemente & Prochaska, 1983), researchers felt that these theories had their own strengths and weakness. While some of the constructs in these theories are different, they are complementary. The National Institute of Mental Health (NIMH) held a workshop for the

theorists to develop a theoretical framework that synthesized their constructs in 1992. They reached the consensus and concluded that self-efficacy, intention, anticipated outcome, social pressure, emotional reaction, skill and environmental constraints were the key factors in predicting and changing behaviors (Glanz, 2015). In addition, the Institute of Medicine (IOM) report, *Speaking of Health*, also recommended to use an integrated model in communication to change behaviors (IOM, 2002). Based on the recommendation provided by previous scholars that only a few constructs must be taken into consideration when predicting the target behavior, Fishbein and Ajzen (2000, 2010) proposed the Integrated Model of Behavioral Prediction by synthesizing the major behavioral constructs from Theory of Reason Action (Ajzen & Fishbien, 1980; Fishbien & Ajzen, 1975), Theory of Planned Behavior (Ajzen & Fishbein, 1980), and Social Cognitive Theory (Bandura, 1977, 1986), which explains a broader range of behaviors.

Like TPB, there are three predictor variables of behavioral intention in IMBP, which are *attitude*, *perceived norm*, and *self-efficacy* (see Figure 4. below). Attitude refers to an overall evaluation of the target behavior. Perceived norm is an overall perceived social pressure to perform the target behavior. Unlike TRA and TPB that simply consider subjective norm as social factor, IMBP divides perceived norm into two types, *injunctive norm* and *descriptive norm*. Injunctive norm is a perception of what others think if the target behavior should be performed. On the other hand, descriptive norm is a perception of whether others actually perform the target behavior. Lastly, self-efficacy refers to one's belief in his/her ability to perform the target behavior (Fishbein & Ajzen, 2010).

In addition, IMBP is different from TRA and TPB in that it emphasizes more on the role of background factors. IMBP posits that background factors may affect the behavioral determinants which subsequently influence behavioral intention (Fishbein & Ajzen, 2010). In other words,

IMBP puts greater emphasis on cultural and population differences. It suggests that it is necessary to identify the behavioral beliefs, normative beliefs and control beliefs that are salient among the populations under investigation (Fishbein & Cappella, 2006). According to the model, one's attitude, perceived norm, and self-efficacy are respectively formed by underlying beliefs in the outcome of target behavior, normative pressure of significant referents, and factors that hinder or facilitate one's intention to perform the target behavior. For instance, the more one believes that the target behavior will lead to positive outcome, the more favorable one's attitude toward to target behavior will be. Also, the more one believes that significant others think he/she should perform the target behavior, it is more likely for an individual to comply with them and perform the target behavior. Similarly, the more one believes that he/she has ability to perform the target behavior even in the face of obstacles, he/she is more likely to perform the target behavior (Fishbein & Yzer, 2003).

Those underlying beliefs are derived from various sources, such as personal past experience, educational background, interactions with family and friends, as well as all kinds of media. The model clearly shows that persuasive messages conveyed in the campaigns or interventions are not able to change people's behavioral intention directly. Instead, they first change the audience's beliefs. Those beliefs then affect people's attitude, perceived norm and self-efficacy, which further affect the intention to perform the target behavior (Fishbein & Ajzen, 2010; Fishbein & Yzer, 2003). Therefore, IMBP suggests that it is important to identify the salient beliefs underlying the population under consideration because they can serve as the basis for message designs. It hypothesizes that with a more favorable and positive attitude toward the target behavior, greater perceived norm, and higher self-efficacy to perform the target behavior, one is more likely to perform the target behavior. Besides, IMBP also claims the target behavior is more likely to occur

if an individual has related skills, and if there is no environmental constraint (Fishbein, 2000; Fishbein et al., 2002).

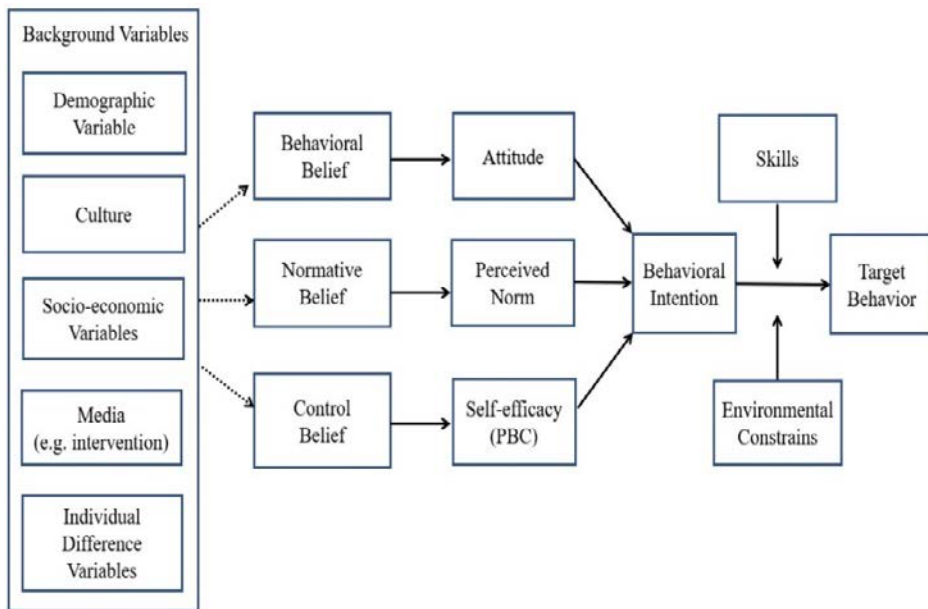


Figure 4. Diagram of Integrated Model of Behavioral Prediction (Fishbein & Cappella, 2006)

IMBP has been applied in a variety of health issues. For instance, it is used to predict adolescent sexual behaviors (Bleakley et al., 2011), predict intention to use nutritional supplement (Tsochasa et al., 2013), and design messages to promote healthier sleeping behaviors (Robbins & Niederdeppe, 2015). The results of the study show that the significant predictors of behaviors varied depending on the population and target behaviors. Some of the findings found that all the three predictor variables, attitude, perceived norm, and self-efficacy, significantly predicted the intention to do target behaviors, while some of them showed that attitudes and perceived norms were more predictive than self-efficacy.

Research Questions & Hypotheses

A majority of prior studies (Godin & Kok, 1996; Hagger, Chatzisarantis & Biddle, 2002; Hagger et al, 2007) used TPB in physical activities demonstrated that attitude and perceived behavioral control were stronger predictors of behavioral intention than subjective norm. However,

as IMBP asserted, the predictors of behavioral intention varied depending on the target population and behaviors. To the researcher's knowledge, the prior studies rarely applied IMBP in the context of vigorous exercise among college students, seldom identified the population's salient beliefs about target behaviors, and examined the predictability of beliefs. Also, this model considers background variables when explaining the behavioral intention, but there was a paucity of research that took background variables into consideration when testing the model.

Therefore, the researcher proposed the following research questions and hypotheses while controlling the background variables.

RQ1:

Which belief (behavioral belief, normative belief, and control belief) will be the strongest predictor of intention to do vigorous exercise for a minimum of 20 min on three days each week?

H1:

Attitude and self-efficacy will be stronger predictors of intention to do vigorous exercise for a minimum of 20 min on three days each week compared to perceived norm.

In addition, there were another two topics that prior studies barely investigated. First, the IMBP model itself shows that the three major predictor variables (i.e., attitude, perceived norm, self-efficacy) mediate the relationship between beliefs and behavioral intention, but very few studies tested mediation effects of IMBP. Second, although the IMBP showed that behavioral intention is primarily determined by the three predictor variables, prior studies (Conner & Sparks, 2005; Fishbein, 2007; French et al, 2005) suggested that when measuring these predictor variables, each predictor variables could be further divided into two components to enhance the prediction of intention. They split attitude into *instrumental attitude* and *affective attitude* (McEachan et al,

2011). Perceived norm was divided into *injunctive norm* and *descriptive norm*. As for self-efficacy, although it was generally found to be a strong predictor of intention (Ajzen, 2002), a meta-analysis (Cheung & Chan, 2000) used TPB to distinguish the measure of perceive behavioral control (i.e., controllability) and self-efficacy (i.e., confidence) suggested using the mixed items of both confidence and controllability to enhance the predictability of self-efficacy. However, the strengths of components contained in each predictor variable were unknow. Therefore, the researcher proposed the following hypothesis and research question. The conceptual model of the study was shown as Figure 5 below.

H2: The three predictor variables in the IMBP model will mediate the relationships between beliefs and intention such that

H2A: Attitude will mediate the relationship between behavioral belief and intention to do vigorous exercise for a minimum of 20 min on three days each week.

H2B: Perceived norm will mediate the relationship between normative belief and intention to do vigorous exercise for a minimum of 20 min on three days each week.

H2C: Self-efficacy will mediate the relationship between control belief and intention to do vigorous exercise for a minimum of 20 min on three days each week.

RQ2:

Which components contained in the predictor variables will be stronger predictors of intention to do vigorous exercise for a minimum of 20 min on three days each week?

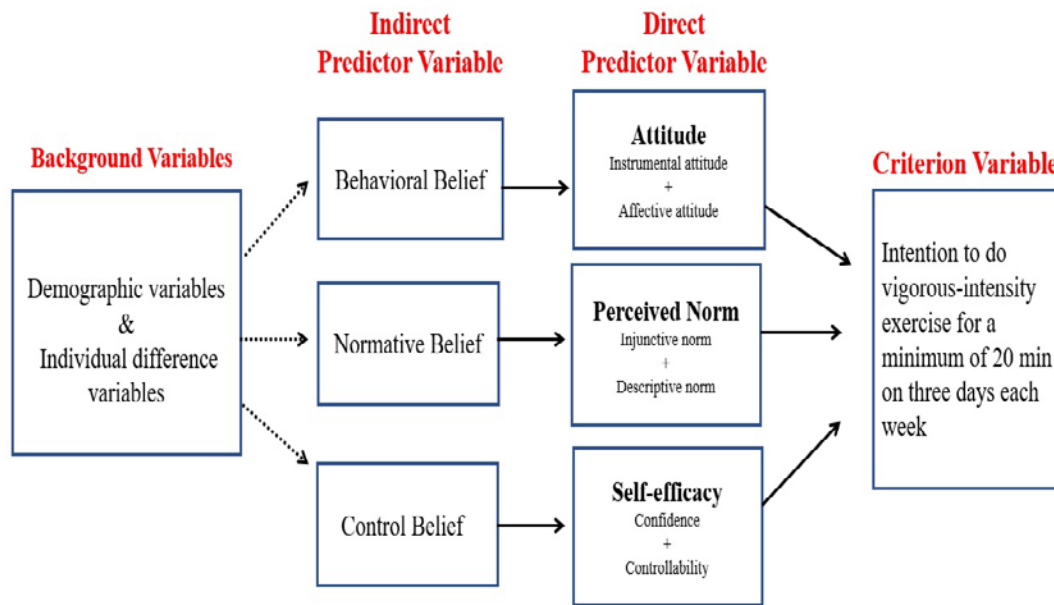


Figure 5. Conceptual Model of The Study (Fishbein & Cappella, 2006)

Current Study

This study was conducted in two phases which are an elicitation study (Phase I) and a survey (Phase II). This study design was recommended by Fishbein and Ajzen (2010). The two-phase study was essential because different populations had different beliefs about particular behaviors. The elicitation study allowed participants to indicate their beliefs about the target behavior (i.e., doing vigorous exercise for a minimum of 20 min on three days each week) instead of being predetermined by the researcher (Ajzen, 1991). It enables the researchers to have deeper understandings of population under study and helps them design a better survey instrument for the second phase of the study (Sun, Acheampong, Lin & Pun, 2015).

In the first phase of the study, an opened-ended questionnaire was sent to a small convenience sample within the population under study through the Qualtrics, an online data collection system. The open-ended questions aimed to identify the undergraduate students' salient beliefs about "doing vigorous exercise for a minimum of 20 minutes on three days each week." After conducting the content analysis on the data collected in the first phase, the researcher slightly

modified some predetermined survey questions in the second phase based on the result of elicitation study. The revised survey was resubmitted to Institutional Review Board (IRB) at Colorado State University for review and approval. In the second phase of the study, a close-ended survey was sent to a larger sample through two online data collection systems, Sona and Qualtrics. The survey aimed to investigate (1) the strengths of predictor variables in the IMBP; (2) the predictability of beliefs on exercise intention; (3) the comparison between the strengths of instrumental attitude and affective attitude, injunctive norm and descriptive norm, confidence and controllability; (4) the mediation effect of attitude, perceived norm, and self-efficacy on the relationships between the beliefs and exercise intention.

CHAPTER 3. ELICITATION STUDY

Method

Participants

The researcher recruited 25 undergraduate students enrolled in JTC300 class, taught by the Department of Journalism and Media Communication at Colorado State University, to participate in the elicitation study. There were no exclusion criteria for participants. The number of the small convenience sample was determined based on the prior studies (Francis et al., 2004; Godin & Kok, 1996; Fishbein & Ajzen, 2010). Students who participated in the study received extra credit for the class as incentive.

19 students (76 %) completed the open-ended survey while the rest of students did not respond to the survey invitation. The participants came from diverse departments, including Mechanical Engineering, Sociology, Animal Science, Zoology, Communication Studies, etc. Their exercise frequency was as follows: exercise everyday 5.3%, exercise 3-5 days a week 42.1%, exercise less than three days a week 42.1 %, never exercise 5.3%, I prefer not to answer 5.3%.

Procedure

The participants were asked to answer 8 open-ended questions (Table 11 in Appendix) to elicit their behavior beliefs, normative beliefs, and control beliefs through the Qualtrics. For each question, the researcher created five response lines for participants to fill in the answer.

Measure

The questions regarding *behavioral beliefs* aimed to elicit cognitive beliefs and affective beliefs. For cognitive belief, the participants were asked to list the advantages/benefits and disadvantages/ drawbacks of performing the target behavior (Refer to Table 11 in Appendix, Question 1-2). For affective belief, they were asked to list what they like/enjoy and dislike/not

enjoy about doing the target behavior (Refer to Table 11 in Appendix, Question 3-4). These questions aimed to elicit the respondents' general beliefs about performing the target behavior. For *normative belief*, participants were asked to list the people who would be supportive and not supportive of their choice to do the target behavior (Refer to Table 11 in Appendix, Question 5-6). The answers to these questions indicated the significant others who may affect the students' intention to perform the target behavior. For *control belief*, participants were asked to answer what makes it easy or difficult for them to perform the target behavior (Refer to Table 11 in Appendix, Question 7-8). Their responses demonstrated the potential factors that may deter and facilitate them to perform the target behavior.

In addition to the 8 open-ended questions concerning their beliefs, they were asked to fill in their majors and exercise frequency. The researcher wanted to examine if students majoring in different fields have different exercise beliefs. Additionally, the researcher wanted to explore the difference in the beliefs held by the students who exercised more frequently and those who exercised less frequently. All the questions are shown in the Table 11 in Appendix.

Coding Process

The researcher first read through all the responses carefully and classified them into different categories. A codebook and a coding scheme were created to code all 431 responses. The responses were coded at sentence level. In order to assess reliability of the coding scheme, a volunteer was trained to follow the same coding scheme to code the responses independently. The researcher went over the definitions of each category and demonstrated the coding process to the volunteer. The volunteer was a graduate student in the Department of Journalism and Media Communication with no involvement with this study. It took about 2-3 hours for the volunteer to complete the task. After that, the researcher entered the data into SPSS to run descriptive statistic and estimated the

inter-rater reliability with Cohen's Kappa. The value of Cohen's kappa for each question ranged from 0.74 to 0.98 (Refer to Table 12 in Appendix).

Result

Beliefs Selection Criteria

For each question, the researcher chose two answers with highest percentage as students' salient beliefs. However, if the cumulative percentage of the two answers was not over 60%, the third highest answer was also chosen as the salient belief. Those salient beliefs were used to design the closed-ended questions in the second part of the study to measure students' behavioral beliefs, normative beliefs and control beliefs in the target behavior.

Salient Beliefs

There were 431 total responses to the 8 questions in the elicitation study. The salient beliefs used to design the survey instrument were depicted in the following Table 1. The results indicated that (1) the salient belief elicited in "advantage/benefit" question was the same as "like/enjoy" question; (2) the salient belief elicited in "disadvantage/drawback" question was the same as "dislike/not enjoy" question. As for "not supportive" question, we found that (3) the majority of respondents did not list anyone who would not be supportive of their choice to do exercise regularly. Therefore, we did not use the beliefs elicited from "like/enjoy," "dislike/not enjoy," and "not supportive" questions in the survey. For the coding frame of each question, please refer to the Table13-20 in the Appendix.

Table 1. Salient Beliefs Used in the Survey

Beliefs	Elicited Salient Beliefs	Response Percentage
<i>Behavioral Belief</i> (Advantage/benefit)	Improve physical and mental health	37.50%
	Release stress and promote relaxation	27.78%
<i>Behavioral Belief</i> (Disadvantage/drawback)	Take too much time	22.64%
	Tiredness and fatigue	18.87%
	Potential injury	18.87%
<i>Normative Belief</i> (Supportive)	Family member	51.95%
	Friends	33.77%
<i>Control Belief</i> (Hard)	Lack of time	46.67%
	Lack of motivation/energy	20.00%
<i>Control Belief</i> (Easy)	Know the benefits of exercise	21.43%
	Have social supports	16.07%
	Have motivations	14.29%

CHAPTER 4. SURVEY STUDY

Method

Participants

The researcher recruited 521 undergraduates, which consisted of 300 undergraduates from JTC100 class and 221 undergraduates from JTC300 class. Both classes were taught by the Department of Journalism and Media Communication at Colorado State University and contained students from different departments in the University. There were no exclusion criteria for participants. Among all the valid sample (n=183), 111 (61%) were self-identified as female and 71 (39%) were male. The age varied from 18 to 43 (M=20). The sample consisted of 18 (10%) Asian American/Asian, 10 (5%) of Black/African American, 131 (72%) of Caucasian/white, 10 (5%) of Hispanic/Latino, and 14 (8%) of Other. Participants' class standings were as follows: 33 (18%) of Freshman, 44 (24%) of Sophomore, 66 (36%) of Junior and 40 (22%) of Senior.

Procedure

Participants were asked if they would be willing to complete a survey regarding exercise behavior. Those who showed an interest in the study were asked to complete a consent form before proceeding to take part in the survey. They were offered 5 points extra credit for the classes they were taking as an incentive. They were also offered an alternative assignment to earn the same extra credit if they chose not to participate in the survey.

Measure

The survey aimed to assess the strengths and correlations among central predictor variables in IMBP - attitude, perceived norm, self-efficacy and intention. In addition, it measured the strengths of behavioral, normative and control beliefs that underlie those predictor variables. The predictor variables and beliefs were assessed with 7-points Likert scale and semantic differential

scale. The items were adapted from previous researches (Ajzen, 2002 & 2013; Francis et al., 2004; Sutton et al., 2003; Gileset al., 2007; González et al., 2012). The Cronbach's α for the items ranged from .72 to .95, which implied that our survey instrument had high reliability. The descriptive statistics for items are shown in Table 2 and Table 3 in result section below. The items for each predictor variable and belief were described as follows:

Direct Measure-Attitude

Attitude was directly assessed through six responses to the question “For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:” with 7-point semantic differential scale. These six items formed attitude with high reliability ($\alpha = .82$, $M = 5.68$, $SD = .917$). Among the six responses, three of them were used to measure participants’ *instrumental attitude* while the rest of them were used to measure *affective attitude*. The responses for instrumental attitude included useful-useless, wise-foolish, and beneficial-harmful. These three items had high reliability ($\alpha = .86$, $M = 6.24$, $SD = .854$). The responses for affective attitude included enjoyable-unenjoyable, pleasant-unpleasant, and interesting-boring. These three items had high reliability ($\alpha = .91$, $M = 5.12$, $SD = 1.37$).

Direct Measure-Perceived norm

Perceived norm was directly measure through four questions. These four items formed perceived norm with high reliability ($\alpha = .81$, $M = 4.59$, $SD = 1.36$). Two of them were used to measure participants’ *injunctive norm* (e.g., It is expected of me that I do vigorous exercise for a minimum of 20 minutes on three days each week). These two items had high reliability ($\alpha = .80$, $M = 4.81$, $SD = 1.72$).

The other two were used to measure *descriptive norm* (e.g., Most people who are important to me do vigorous exercise for a minimum of 20 minutes on three days each week). These two

items had high reliability ($\alpha = .91$, $M = 4.37$, $SD = 1.45$). The responses ranged from 1 (strongly disagree) to 7 (strongly agree).

Direct Measure-Self-efficacy

Self-efficacy was directly measured by six questions. These six items form self-efficacy with high reliability ($\alpha = .85$, $M = 5.56$, $SD = 1.08$). Four of six questions asked participants' *confidence* (e.g., How confident are you that you will be able to do vigorous exercise for a minimum of 20 minutes on three days each week?), and *perceived ease and difficulty* (e.g., For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:). These four items form confidence with high reliability ($\alpha = .86$, $M = 5.71$, $SD = 1.13$). We also use the other two items to measure their *controllability* (How much personal control do you have over doing vigorous exercise for a minimum of 20 minutes on three days each week?). These two items had high reliability ($\alpha = .72$, $M = 5.24$, $SD = 1.38$). The responses included 7-point Likert scale and semantic differential scale.

Direct Measure-Intention

Participants' intentions to do exercise regularly were measured with three items ($\alpha = .95$, $M = 5.31$, $SD = 1.47$). For instance, "I intend to do vigorous exercise for a minimum of 20 minutes on three days each week in the following two weeks." The responses ranged from 1 (strongly disagree) to 7 (strongly disagree).

Direct Measure-Exercise Behavior

In addition to measuring the aforementioned variables, this study also took participants' exercise behaviors into consideration. Therefore, they were also asked to indicate their agreements with the following statements. "During the past 4 weeks, I did vigorous exercise for a minimum of 20 minutes on three days each week."

Indirect Measure-Behavioral Belief

Participants were asked to indicate their agreements with five items regarding the outcome beliefs in order to measure their behavioral belief strengths. The items included positive statements (e.g., Doing vigorous exercise for a minimum of 20 minutes on three days each week will help me to improve my physical or mentally health.) and negative statements (e.g., Doing vigorous exercise for a minimum of 20 minutes on three days each week will make me feel tired.). The responses ranged from 1 (strongly disagree) to 7 (strongly agree).

Additionally, participants were asked to evaluate the outcomes with corresponding five items (e.g., Improving my physical or mentally health is:) The responses were assessed with 7-point semantic differential scale. To compute the behavioral beliefs, the belief strength was multiplied by outcome evaluation, and added up the sum of each pair (Ajzen, 2002; Francis et al., 2004).

Indirect Measure-Normative Belief

We used two items regarding the normative expectations of two referents (family members and close friends) to measure normative belief strength. For example, “My family members think that I should do vigorous exercise for a minimum of 20 minutes on three days each week.” The responses ranged from 1 (strongly disagree) to 7 (strongly agree).

We also used another two corresponding items to measure their motivation to comply with the referents. For instance, “Generally speaking, how much do you care about what your family members think you should do?” The responses were gauged by using 7-point semantic scale that ranged from 1 (not at all) to 7 (very much). To assess participants’ normative beliefs, we multiplied their normative belief strength and motivation to comply with the referents and added up the sum of each pair (Ajzen, 2002; Francis et al., 2004).

Indirect Measure-Control Belief

Participants were asked to indicate their agreements with five items with regard to the control belief strength. The items included the statements concerning facilitators (e.g., Having motivations makes it easy for me to do vigorous exercise for a minimum of 20 minutes on three days each week) and barriers (e.g., Lacking time makes it hard for me to do vigorous exercise for a minimum of 20 minutes on three days each week). The responses ranged from 1 (strongly disagree) to 7 (strongly agree).

We also gauged their control belief power with another five corresponding items. For instance, “How confident are you that you could do vigorous exercise for a minimum of 20 minutes on three days each week when you know the benefits of exercise?” Each item was measured by using 7-point semantic scale, with range from 1(not confident at all) to 7 (extremely confident). The assessment of control beliefs follows the same logic with the measurement of behavioral and normative beliefs. The control belief strength was multiplied by control belief power and added up the sum of each pair (Ajzen, 2002; Francis et al., 2004).

Results

Descriptive Statistics

The following Table 2 and Table 3 provide the descriptive summary of the data. Both tables show that the reliability of each variable was high.

Table 2. Descriptive Statistic and Correlation for Components of IMBP

Variables	Mean	SD	α	1	2	3	4	5	6	7
1 Instrumental	6.24	.854	.86							
2 Affective	5.12	1.37	.91	.313**						
3 Injunctive	4.81	1.72	.80	.191**	.320**					
4 Descriptive	4.37	1.45	.91	.164*	.336**	.466**				
5 Confidence	5.71	1.13	.86	.322**	.552**	.346**	.317**			
6 Controllability	5.24	1.38	.72	.161*	.349**	.179*	.191**	.548**		
7 Intention	5.31	1.47	.95	.293**	.642**	.458**	.368**	.690**	.461**	

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

Table 3. Descriptive Statistic and Correlation for Beliefs of IMBP

Variables	Mean	SD	α	1	2	3	4	5	6	7
1 Behavioral beliefs	147.78	34.09								
2 Normative beliefs	54.19	19.48		.304**						
3 Control beliefs	133.83	35.97		.391**	.210**					
4 Attitude	5.68	.917	.82	.521**	.227**	.502**				
5 Perceived norm	4.59	1.36	.81	.128	.369**	.279**	.383**			
6 Self-efficacy	5.24	1.38	.85	.504**	.277**	.473**	.539**	.364**		
7 Intention	5.31	1.47	.95	.495**	.270**	.566**	.618**	.486**	.680**	

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

Comparing the Strength of IMBP Predictor Variables

As IMBP suggested, the behavioral intention was determined by attitude, perceived norm and self-efficacy. The regression analysis (refer to Table 4) showed that college students' attitude, perceived norm, and self-efficacy were all significant predictors of their exercise intention. However, the predictability of perceived norm ($\beta=.107$, $p<.05$) was weaker than attitude ($\beta=.269$, $p<.00$) and self-efficacy ($\beta=.283$, $p<.00$). This result was consistent with prior studies and it also supported **H1** that attitude and self-efficacy would be stronger predictors of college student's intention to do vigorous exercise regularly.

More specifically, when comparing the predictive power of components contained in each predictor variable as **RQ2** proposed, the regression analysis (refer to Table 5) indicated that affective attitude ($\beta=.254$, $p<.00$) was more predictive than instrumental attitude ($\beta=.051$, $p>.05$).

Injunctive norm ($\beta=.135$, $p<.01$) was more predictive than descriptive norm ($\beta= -.031$, $p>.05$). Confidence ($\beta=.275$ $p<.00$) was more predictive than controllability ($\beta=.039$, $p>.05$). It was notable that as a whole, all the predictor variables significantly predicted students' exercise intention. However, when they were split into two components, the results revealed that only affective attitude, injunctive norm, and confidence significantly predicted exercise intention. Instrumental attitude ($p=.265$), descriptive norm ($p=.528$), and controllability ($p=.444$) were not predictive at all. Therefore, the results concluded that affective attitude, injunctive norm, and confidence were more predictive than their counterparts (i.e., instrumental attitude, descriptive norm, and controllability).

Table 4. Regression Analysis of Predictor Variables

	β	Intention		
		SE	t	P
Gender(dummy)	-.026	.128	-.616	.539
Class (dummy 1)	-.022	.198	-.419	.675
Class (dummy 2)	-.033	.186	-.618	.537
Class (dummy 3)	-.067	.168	-1.228	.221
Exercise behavior	.403	.039	7.558	.000***
Attitude	.269	.083	5.214	.000***
Perceived norm	.107	.053	2.166	.032*
Self-efficacy	.283	.075	5.137	.000***

Note: 1. $R^2=.694$. $\Delta R^2=.192$. * $p<.05$. ** $p<.01$. *** $p<.001$

2. Gender (dummy): Male=1, Female=0

3. Class (dummy 1): Freshman=1, Sophomore=0, Junior=0, Senior=0

4. Class (dummy 2): Sophomore =1, Freshman =0, Junior=0, Senior=0

5. Class (dummy 3): Junior =1, Freshman =0, Sophomore =0, Senior=0

Table 5. Regression Analysis of Component Contained in Predictor Variables

	β	Intention		
		SE	t	P
Gender(dummy)	-.046	.128	-1.086	.279
Class (dummy 1)	-.005	.196	-.097	.923
Class (dummy 2)	-.007	.187	-.125	.900
Class (dummy 3)	-.040	.167	-.734	.464
Exercise behavior	.392	.039	7.389	.000***
Instrumental attitude	.051	.078	1.119	.265
Affective attitude	.254	.056	4.860	.000***
Injunctive norm	.135	.042	2.729	.007**
Descriptive norm	-.031	.050	-.632	.528
Confidence	.275	.079	4.518	.000***
Controllability	.039	.054	.768	.444

Note: 1. $R^2=.711$. $\Delta R^2=.209$. * $p<.05$. ** $p<.01$. *** $p<.001$

2. Gender (dummy): Male=1, Female=0

3. Class (dummy 1): Freshman=1, Sophomore=0, Junior=0, Senior=0

4. Class (dummy 2): Sophomore =1, Freshman =0, Junior=0, Senior=0

5. Class (dummy 3): Junior =1, Freshman =0, Sophomore =0, Senior=0

Mediation analyses & Strength of Beliefs

According to the flow of IMBP model, the researcher expected to find that the three predictor variables mediate the relationships between beliefs and exercise intention. However, the mediation analysis of attitude (Table 6) showed that the direct effect of behavioral belief on intention was significant ($\beta=.010$, $p<.00$). With the mediation of attitude, the effect ($\beta=.011$, $p<.00$) of behavioral belief on exercise intention slightly amplified, which partially supported the **H2A** that attitude mediated the relationship between behavioral belief and exercise intention. As for mediation effect of perceived norm, the Table 7 illustrated that without the mediation of perceived norm, normative belief did not directly ($\beta=.008$, $p>.05$) predict intention. This supported the **H2B** that perceived norm mediated the normative belief and intention. Lastly, the mediation analysis of self-efficacy (Table 8) indicated that without the mediation of self-efficacy, the control belief still significantly ($\beta=.013$, $p<.00$) predicted intention. Moreover, the direct effect of control belief was stronger than the indirect effect ($\beta=.010$, $p<.00$). The result failed to back up the **H2C** that self-efficacy mediated

the relationship between the control belief and intention. Instead, it reflected a suppression effect in this mediation analysis. Therefore, the researcher asserted that the IMBP was simply a partial mediation model instead of a full mediation model as the diagram displayed.

In terms of the predictability of beliefs, the regression analysis (Table 9) showed that both behavioral belief ($\beta=0.259$, $p<.00$) and control belief ($\beta=0.278$, $p<.00$) significantly predicted exercise intention, but control belief was a little stronger than behavioral belief. With regard to normative belief, it was not a significant predictor of exercise intention ($\beta=.025$, $p>.05$). The result answered the **RQ1** that the control belief was the strongest predictor of intention among the three beliefs.

Table 6. Mediation Analysis of Attitude

	Attitude		Intention	
	β	SE	β	SE
Behavioral beliefs	.014***	.002	.010***	.003
Attitude			.798***	.107
Direct effect			.010***	.003
Indirect effect			.011***	.002
Adjusted R ²	.272		.423	
F value	67.53***		65.98***	

Note: *** $p<.001$

Table 7. Mediation Analysis of Perceived Norm

	Perceived norm		Intention	
	β	SE	β	SE
Normative beliefs	.026***	.005	.008	.005
Perceived norm			.484***	.075
Direct effect			.008	.005
Indirect effect			.013***	.003
Adjusted R ²	.136		.246	
F value	28.58***		29.34***	

Note: *** $p<.001$

Table 8. Mediation Analysis of Self-efficacy

	Self-efficacy		Intention	
	β	SE	β	SE
Control beliefs	.014***	.002	.013***	.002
Self-efficacy			.723***	.078
Direct effect			.013***	.002
Indirect effect			.010***	.002
Adjusted R ²	.224		.539	
F value	52.239***		105.23***	

Note: *** p<.001

Table 9. Regression Analysis of Beliefs

	β	Intention		
		SE	t	P
Gender(dummy)	.078	.139	1.680	.095
Class (dummy 1)	0.11	.025	.196	.845
Class (dummy 2)	.025	.191	.443	.659
Class (dummy 3)	-.053	.177	-.914	.362
Exercise behavior	.518	.037	10.327	.000***
Behavioral Belief	.259	.002	5.231	.000***
Normative Belief	.025	.004	.532	.596
Control Belief	.278	.002	5.333	.000***

Note: 1. R²=.666 Δ R²= .165 *p<.05, **p<.01, ***p<.001

2. Gender (dummy): Male=1, Female=0

3. Class (dummy 1): Freshman=1, Sophomore=0, Junior=0, Senior=0

4. Class (dummy 2): Sophomore =1, Freshman =0, Junior=0, Senior=0

5. Class (dummy 3): Junior =1, Freshman =0, Sophomore =0, Senior=0

CHAPTER 5. DISCUSSION

This study first aimed to identify the college students' salient behavioral, normative, and control beliefs about doing vigorous exercise regularly, and used those beliefs to design a better survey instrument. Through identifying the salient beliefs, we also have a deeper understanding of college students. The second purpose was to assess the strengths of predictor variables in the IMBP and identify the strongest predictor of college students' intention to do vigorous exercise regularly. According to the IMBP, a message conveyed in the media does not directly affect people's attitudes, perceived norm, and self-efficacy. Instead, it first affects people's behavior, normative, and control beliefs in performing a particular behavior. Those beliefs then affect their attitude, perceived norm and self-efficacy, which directly influence their behavioral intentions. Therefore, it is essential to identify which belief in the model is the best one to be addressed in the messages. Finally, the third purpose was to test the mediation of the model because the prior studies regarding exercise intention rarely examined the mediation effect of the three predictor variables on the relationships between beliefs and exercise intention.

In general, the findings of this study showed that (1) students had various beliefs about doing vigorous exercise regularly, but most of salient beliefs were consistent with the beliefs elicited from previous exercise-related studies (Carron, Hausenblas & Estabrooks, 2003; Downs & Hausenblas, 2005; Terry & O'Leary, 1995; Pastor et al, 2015). For example, the most salient behavioral belief was improving physical and mental health. The most frequently mentioned normative influences were from family and friends. As for control belief, lack of time was the major inhibitors of exercise intention while knowing the benefits of regular exercise was the facilitator of their exercise intention. (2) Attitude, perceived norm, and self-efficacy were all significant predictors of exercise intention as the IMBP suggested, but perceived norm was found

to be a weaker predictor compared to attitude and self-efficacy. This finding was consistent with previous studies (Godin & Kok, 1996; Hagger, Chatzisarantis & Biddle, 2002; Hagger et al, 2007).

(3) However, when the researcher divided each predictor variable into two components, the result indicated that only affective attitude, injunctive norm and confidence were significant predictors of exercise intention. By splitting the predictor variables into smaller components, the study clarified which kind of attitude, norm and self-efficacy more significantly predicted college students' exercise intention. (4) As for the predictability of beliefs, both behavioral belief and control belief significantly predicted exercise intention, but normative belief could not predict exercise intention. This finding implied that having exercise intention was not very related to normative influence. Therefore, health communicator should emphasize more on behavioral and control belief and less mention about the social norm. (5) Lastly, unlike what the IMBP model illustrated, the mediation analyses showed that only the perceived norm fully mediated the relationship between normative belief and exercise intention. Without the mediation of attitude and self-efficacy, the direct effect of behavioral belief and control belief remained significant. Therefore, this study concluded that the IMBP was a partial mediation model instead of a full mediation model. This assumption was also supported by a previous study (Bekalu & Eggermont, 2015) about HIV testing intention.

In addition to the above primary findings, this study also found something different from the prior literature. First, several prior studies have supported the idea of Freshman 15, an assumption that the college freshman tend to gain 15 pounds during their first year in college (Butler et al, 2004; Levitsky, Halbmaier, & Mrdjenovic, 2004; Racette et al, 2005), so the researcher had interest to examine if class standing would be a factor that affected students' exercise intention. The result (Table 4) showed that the class standing was not a significant factor that influenced students'

exercise intention. Second, prior studies (Ajzen & Fishbein, 2005; Hagger et al, 2002) also demonstrated that a person's past behavior can be a predictor of future exercise intention. Thus, the researcher wanted to test if students' exercise behaviors for the past four weeks would affect their exercise intention. Table 4 showed that students' exercise behaviors for the past four weeks were significant predictors of their exercise intention, which supported the prior studies. Based on our major findings, we proposed the following implications and described the limitations of this study.

Implication of IMBP

This study had several theoretical implications and practical implications. For theoretical implication, first, the model claimed that the behavioral intention could be predicted by attitude, perceived norm, and self-efficacy, and this assumption completely explained the data of this study because the findings revealed that the aforementioned predictor variables could all significantly predict college students' exercise intention. The second theoretical implication of this study is related to the mediation of the model. The diagram of IMBP suggested that the three beliefs had indirect effects on behavioral intention, and the three predictor variables fully mediated the strengths of beliefs. Nevertheless, the findings showed that both behavioral belief and control belief could directly and significantly predict intention. The full mediation only occurred in the relationship among normative belief, perceived norm and intention. Our findings showed that IMBP model needs to be tweaked to highlight how beliefs have a strong direct and indirect effects on behavioral intentions.

From practical perspective, this study provided insights for health communicators who have interest to enhance college students' intention to do exercise regularly. According to the results, colleges students' exercise intention could be predicted by their attitude, perceived norm, and self-

efficacy in doing regular exercise. More specifically, their exercise intention could be best influenced by their affective attitude, injunctive norm, and confidence. Thus, the health communicators should tailor the messages that enhance students' affective attitude, injunctive norm, and confidence. First, they can disseminate the health information that promotes their favorable and positive emotions. The promotional message can focus on the immediate reward, such as feeling of enjoyment and pleasure that doing vigorous exercise brings.

Second, health communicators should emphasize that college students' family members and close friends expect them to do vigorous exercise regularly because according to the elicitation study, family members and friends were both influential significant others for college students. As for confidence, according to Bandura (1977, 1986, 1997), one's self-efficacy mainly comes from the following four sources: (1) personal experience/ accomplishment, (2) vicarious experience, (3) verbal persuasion, and (4) emotional/ physiological arousal. Health communicators can first enhance students' knowledges of doing exercise regularly and then set different levels of health goal for the students. The goals can include elementary, intermediate and advanced levels, such as how many times they need to do the exercise in a week, or what kind of strengths of exercise they need to do. If the students know the benefits of doing regular exercise and things to avoid during exercise, it is more likely to enhance their exercise intention. When they actually do the exercise and achieve the suggested goals, it will build up their senses of accomplishment and enhance their self-efficacy. Next, health communicators can create videos or journal columns that share other college students' testimonials which emphasize the ease of doing vigorous exercise regularly and their success stories. By doing so, the students would learn from others' successful experiences and further enhance their self-efficacy. This message strategy is related to vicarious experience. As for verbal persuasion, people tend to believe that they can achieve certain goals when they are

verbally encouraged and convinced by someone else. Thus, the health messages can include the encouragement that motivates students' intentions to exercise regularly. However, when doing verbal persuasion, the persuasive messages should be corresponded to students' abilities. If the persuasive content is feasible, it is more likely to enhance their self-efficacy and motivation. Lastly, emotional arousal and self-efficacy have negative correlation. When people are anxious, nervous, frightened, or under any negative emotions, their self-efficacy are weakened. Therefore, the health communicators should avoid using negative wording or images when designing the health messages. The message can also be designed to reduce perceived barriers to do exercise regularly. In addition, the results of elicitation study also provide some guidance for health communicators to design health messages more effectively.

Based on the abovementioned findings and the salient beliefs elicited in elicitation study, the researcher proposed the following examples of message design (refer to Table 10).

Table 10. Example of Key Sentence for Message Design

Significant Predictors of Exercise Intention	Example of Key Sentences for Message Creation
Affective attitude	<ol style="list-style-type: none"> 1. Doing regular vigorous exercise will make you feel good about yourself. 2. You will get a feeling of accomplishment and well-being during vigorous exercise. 3. Endorphins will wake you up and make you feel better.
Injunctive norm	<ol style="list-style-type: none"> 1. Your family member and friends expect that you can do vigorous exercise regularly because they want you to be healthy. 2. Your family member and friends will support your choices of doing vigorous exercise regularly.
Confidence	<ol style="list-style-type: none"> 1. Have you ever done vigorous exercise for at least 20 minutes before? If so, you have ability to do it again! There are

different levels of exercise. You can start with the elementary level which simply requires you to do vigorous exercise for 20 minutes once a week. And then you can try intermediate level which requires you to do vigorous exercise for 20 minutes 1-3 days a week. Lastly, you can challenge the advanced level which requires you to do vigorous exercise for 20 minutes 3-5 days a week.

2. Many college students do vigorous exercise for at least 20 minutes three one days a week to improve their physical and mental health. If they can do it, as a college student, you can start a regular exercise as well.
3. Yes, you can! You can do vigorous exercise for at least 20 minutes three one days a week to keep healthy. You have abilities to challenge yourself and change your lifestyle.

Behavioral belief

1. Doing vigorous exercise leads to many benefits, including improving cardiovascular health, staying fit, preventing anxiety attacks, and maintaining stable mental status.
2. Doing vigorous exercise may cause temporary tiredness and fatigue in the beginning. However, when your body get used to a regular exercise, it releases your stress and promotes relaxation.

Control belief

1. You do not need to spend much time doing vigorous exercise because it only takes you 20 minutes a day, which is shorter than an episode of the shows on Netflix.
 2. If you lack motivation, you can invite your friends to do vigorous exercise with you. It's fun and you will feel supported and motivated.
-

Limitation

This study had some limitations. First, using different wordings and questions in the elicitation study may have elicited different beliefs, and thus result in different survey instruments

being designed. Second, some responses to the open-ended questions in the elicitation are vague and hard to be classified into particular categories. This may affect how the answers were coded. Third, although the sample size for elicitation study was recommended by Ajzen and Fishbein (1980), whether the small convenience sample in this study could represent the beliefs for larger population is uncertain. Fourth, simply using students as convenience sample may affect the generalizability to other populations. Fifth, the participants in this study had more female students than male students. This gender bias may affect the results of the study because generally the females dislike to get sweaty, and they are also less physically active than the males. Sixth, 72% of participants in this study were white. The racial difference may also affect the results of the study because Western culture tends to be individualistic while East Asian culture tends to be collectivistic. The importance of personal attitude and self-efficacy may outweigh perceived norm in Western culture. On the other hand, social norm plays an important role in East Asia, if doing regular vigorous exercise becomes a norm, it is very likely for the Asians to comply with this social norm. Therefore, the effect of perceived norm on exercise intention may be as significant as attitude and self-efficacy if the study is conducted in Asia. In addition, this study was conducted in Colorado, the place where is famous for outdoor activities and full of outdoor athletes. Thus, students in Colorado may have higher exercise intention compared to students in other states in the US.

CHAPTER 6. CONCLUSION

In conclusion, in light of the insufficient physical activities among college students, this study applied the Integrated Model of Behavioral Prediction (IMBP) to examine the strengths and identify the strongest predictors of college students' exercise intention because the behavioral determinants vary depending on the target population and given behavior. It also identified the salient beliefs underlying college students' intention to do vigorous exercise regularly. Once identified, those salient beliefs can serve as key messages when developing health interventions or campaigns for college students. Although we admit that it is hard to change people's beliefs simply via the messages in health campaigns, the theoretical-based messages can reinforce people's beliefs and further amplify their behavioral intention to perform the given behaviors. The researcher expects that the study findings can be practically applied by health communicators to promote college students' intention to do vigorous exercise regularly.

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APPENDIX A: ELICITATION QUESTION& DESCRIPTIVE STATISTIC

Table 11. Open-ended questions in elicitation study

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1. For you, what are the advantages/benefits of doing vigorous exercise for a minimum of 20 minutes on three days each week?
 2. For you, what are the potential disadvantages/drawbacks of doing vigorous exercise for a minimum of 20 minutes on three days each week?
 3. What do you like/enjoy about doing vigorous exercise for a minimum of 20 minutes on three days each week?
 4. What do you dislike/not enjoy about doing vigorous exercise for a minimum of 20 minutes on three days each week?
 5. Who would be (or is) supportive of your choice to do vigorous exercise for a minimum of 20 minutes on three days each week? Please write down his/her name, and the relationship (e.g. Ariel, sister)
 6. Who would not be (or is not) supportive of your choice to do vigorous exercise for a minimum of 20 minutes on three days each week? Please write down his/her name, and the relationship (e.g. Ariel, sister).
 7. For you, what factors makes it hard to do vigorous exercise for a minimum of 20 minutes on three days each week?
 8. For you, what factors makes it easy to do vigorous exercise for a minimum of 20 minutes on three days each week?
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Table 12. Descriptive statistic for beliefs elicited from 8 open-ended questions

Questions	No. (%) of response	Mean (SD) beliefs per person	Cohen's Kappa
1. Advantages/benefits	72 (16.71%)	2.79 (1.66)	0.75
2. Disadvantages/drawbacks	53 (12.30%)	3.87 (2.40)	0.82
3. Like/enjoy	62 (14.39%)	3.35 (1.74)	0.87
4. Dislike/not enjoy	44 (10.21%)	2.98 (1.86)	0.83
5. Supportive	77 (17.87%)	1.75 (1.05)	0.98
6. Not supportive	22 (5.10%)	1.55 (0.74)	0.92
7. Hard	45 (10.44%)	2.89 (1.65)	0.74
8. Easy	56 (12.99%)	3.95 (2.38)	0.83
Total	431 (100%)		

Table 13. Coding frame for “advantages/benefits” questions

Category	Number of response (%)
1. Improve physical and mental health	27 (37.50%)
2. Improve physical appearance	10 (13.89%)
3. Weight loss	6 (8.33%)
4. Release stress and promote relaxation	20 (27.78%)
5. Improve social life	4 (5.56%)
6. Other	5 (6.94%)
Total	72 (100%)

Table 14. Coding frame for “disadvantages/drawbacks” questions

Category	Number of response (%)
1. Make you feel unwell	9 (16.98%)
2. Tiredness and fatigue	10 (18.87%)
3. Take too much time	12 (22.64%)
4. Cost money	2 (3.77%)
5. Cause inconvenience	3 (5.66%)
6. Potential injury	10 (18.87%)
7. Lack of motivation/energy	2 (3.77%)
8. Dislike to exercise	2 (3.77%)
9. Other	3 (5.66%)
Total	53 (100%)

Table 15. Coding frame for “like/enjoy” question

Category	Number of response (%)
1. Improve physical and mental health	12 (19.35%)
2. Improve physical appearance	5 (8.06%)
3. Release stress and promote relaxation	25 (40.42%)
4. Weight loss	2 (3.23%)
5. Improve social life	5 (8.06%)
6. Other	13 (20.97%)
Total	62 (100%)

Table 16. Coding frame for “dislike/not enjoy” question

Category	Number of response (%)
1. Take time	14 (31.82%)
2. Potential injury/pain	7 (15.91%)
3. Tiredness and fatigue	8 (18.18%)
4. Lack of motivation/energy	3 (6.82%)
5. Cause inconvenience	5 (11.36%)
6. Other	7 (5.91%)
Total	44 (100%)

Table 17. Coding frame for “supportive” question

Category	Number of response (%)
1. Family member	40 (51.95%)
2. Friends	26 (33.77%)
3. Roommate	5 (6.49%)
4. School or workplace personnel	2 (2.60%)
5. Other	4 (5.19%)
Total	77 (100%)

Table 18. Coding frame for “not supportive” question

Category	Number of response (%)
1. None	13 (59.09%)
2. Friends	6 (27.27%)
3. Other	3 (13.64%)
Total	22 (100%)

Table 19. Coding frame for “hard” question

Category	Number of response (%)
1. Feel physically or mentally unwell	5 (11.11%)
2. Lack of time	21 (46.67%)
3. Lack of motivation/energy	9 (20%)
4. Cost money	2 (4.44%)
5. Tiredness and fatigue	3 (6.71%)
6. Cause inconvenience	2 (4.44%)
7. Other	3 (6.71%)
Total	45 (100%)

Table 20. Coding frame for “easy” question

Category	Number of response (%)
1. Know the benefits of exercise	12 (21.43%)
2. Have social supports	9 (16.07%)
3. Exercise interest/experience	4 (7.14%)
4. Have motivations	8 (14.29%)
5. Have time	7 (12.50%)
6. Convenience	6 (10.71%)
7. Have healthy condition	4 (7.14%)
8. Other	6 (10.71%)
Total	56 (100%)

APPENDIX B: SURVEY QUESTION PART I

Instruction

Please select the answer that best represents your response to each question and fill in the blank as “●” or directly write down the answer.

1. How old are you?

I'm _____ years old.

2. What is your class standing?

Freshman

Sophomore

Junior

Senior

3. What is your gender?

Female

Male

Other

I prefer not to answer

4. What is your major?

5. What's your race/ethnicity? Select all that apply.

Asian American/Asian

Black/African American

Caucasian/white

Hawaiian/Pacific Islander

Hispanic/Latino

Multi-Racial

Native American

Other

I prefer not to answer

APPENDIX C: SURVEY QUESTION PART II

Instruction:

Vigorous exercise is defined as a physical activity that causes rapid breathing and a substantial increase in heart rate (Haskell et al., 2007). Examples of vigorous exercise include running, jogging, swimming, tennis, aerobic dancing, biking, jumping rope, etc. (O'Connor, 2012). Please use this definition to answer all the questions below and answer the questions as detailed as you can.

Please answer the following questions by circling the number that best represents your opinion. The questions may seem to be similar, but they do aim at different aspects. All the questions in this survey are rated by 7-point scales. The 7 points should be interpreted as the follows:

1 2 3 4 5 6 7

extremely/strongly quite slightly neither slightly quite extremely/strongly

Direct Measure- Attitude (instrumental)

1. For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:

useless 1 2 3 4 5 6 7 useful

2. For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:

foolish 1 2 3 4 5 6 7 wise

3. For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:

harmful 1 2 3 4 5 6 7 beneficial

Direct Measure- Attitude (affective)

4. For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:

unenjoyable 1 2 3 4 5 6 7 enjoyable

5. For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:

unpleasant 1 2 3 4 5 6 7 pleasant

6. For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:

boring 1 2 3 4 5 6 7 interesting

Direct Measure-Perceived Norm (injunctive norm):

7. Most people who are important to me think I SHOULD NOT do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

8. It is expected of me that I do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Direct Measure-Perceived Norm (descriptive norm):

9. Most people who are important to me do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

10. Most people whose opinions I value do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Direct Measure-Self-efficacy (confidence):

11. How confident are you that you will be able to do vigorous exercise for a minimum of 20 minutes on three days each week?

Not confident at all 1 2 3 4 5 6 7 Extremely confident

12. I am confident that if I really wanted to, I could do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

13. I believe I have the ability to do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Direct Measure-Self-efficacy (ease & difficulty):

14. For me, doing vigorous exercise for a minimum of 20 minutes on three days each week would be:

difficult 1 2 3 4 5 6 7 Easy

Direct Measure-Self-efficacy (controllability):

15. How much personal control do you have over doing vigorous exercise for a minimum of 20 minutes on three days each week?

Not at all 1 2 3 4 5 6 7 Very much

16. Whether or not I do vigorous exercise for a minimum of 20 minutes on three days each week IS NOT completely up to me.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Direct Measure-Intention:

17. I intend to do vigorous exercise for a minimum of 20 minutes on three days each week in the following two weeks.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

18. I WILL NOT try to do vigorous exercise for a minimum of 20 minutes on three days each week in the following two weeks.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

19. I plan to do vigorous exercise for a minimum of 20 minutes on three days each week in the following two weeks.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Past Behavior, Current Behavior & Maintenance:

20. During the past four weeks, I did vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

21. I currently do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

22. Based on question 21 above, the current exercise behavior is a maintenance behavior that has lasted for more than six months.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Indirect Measure-Behavioral Beliefs:

23. Doing vigorous exercise for a minimum of 20 minutes on three days each week will help me to improve my physical or mentally health.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

24. Doing vigorous exercise for a minimum of 20 minutes on three days each week will help me to relieve my stress.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

25. Doing vigorous exercise for a minimum of 20 minutes on three days each week WILL NOT take too much time for me.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

26. Doing vigorous exercise for a minimum of 20 minutes on three days each week will make me feel tired.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

27. Doing vigorous exercise for a minimum of 20 minutes on three days each week will cause potential injury for me.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

28. Improving my physical or mentally health is:

Not important at all 1 2 3 4 5 6 7 Extremely important

29. Relieving my stress is:

Not important at all 1 2 3 4 5 6 7 Extremely important

30. Taking too much of my time is:

Bad 1 2 3 4 5 6 7 Good

31. For me, feeling tired is:

Bad 1 2 3 4 5 6 7 Good

32. For me, causing potential injury is:

Bad 1 2 3 4 5 6 7 Good

Indirect Measure-Normative Beliefs:

33. My family members think that I should do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

34. My close friends think that I SHOULD NOT do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Indirect Measure-Motivation to Comply:

35. Generally speaking, how much do you care about what your family members think you should do?

Not at all 1 2 3 4 5 6 7 Very much

36. Generally speaking, how much do you care about what your close friends think you should do?

Not at all 1 2 3 4 5 6 7 Very much

Indirect Measure-Control Beliefs:

37. Lacking time makes it hard for me to do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

38. Lacking motivation or energy makes it hard for me to do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

39. Knowing the benefits of exercise makes it easy for me to do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

40. Having social supports DOES NOT make it easy for me to do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

41. Having motivations makes it easy for me to do vigorous exercise for a minimum of 20 minutes on three days each week.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

42. If you really wanted to, how confident are you that you could do vigorous exercise for a minimum of 20 minutes on three days each week even when you lack time?

Not confident at all 1 2 3 4 5 6 7 Extremely confident

43. If you really wanted to, how confident are you that you could do vigorous exercise for a minimum of 20 minutes on three days each week even when you lack motivation or energy?

Not confident at all 1 2 3 4 5 6 7 Extremely confident

44. How confident are you that you could do vigorous exercise for a minimum of 20 minutes on three days each week when you know the benefits of exercise?

Not confident at all 1 2 3 4 5 6 7 Extremely confident

45. How confident are you that you could do vigorous exercise for a minimum of 20 minutes on three days each week when you have social supports?

Not confident at all 1 2 3 4 5 6 7 Extremely confident

46. How confident are you that you could do vigorous exercise for a minimum of 20 minutes on three days each week when you have motivations?

Not confident at all 1 2 3 4 5 6 7 Extremely confident