GENERAL PASSION SCALE (GEN-PS): TOWARD THE VALIDATION OF PASSION AS A GENERAL TRAIT-LIKE PERSONALITY CONSTRUCT

A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF MASTER OF SCIENCE

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

COLLEGE OF ARTS AND SCIENCES

BY

LILIAN CHU B.S., M.B.A.

DENTON, TEXAS

DECEMBER 2011

TEXAS WOMAN'S UNIVERSITY
DENTON, TEXAS

November 15, 2011

To the Dean of the Graduate School:

I am submitting herewith a thesis written by Lilian Chu entitled "General Passion Scale (Gen-PS): Toward the Validation of Passion as a General Trait-Like Personality Construct." I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science with a major in Mathematics.

David Marshall, Ph.D., Major Professor

We have read this thesis and recommend its acceptance:

Mark S. Hamner

Department Chair

Accepted:

Jennifer Martin
Dean of the Graduate School

DEDICATION

This thesis is respectfully dedicated to my uncle, whose love and support I can never fully repay. His commitment and devotion to family is the true nature of passion defined. We should all be so lucky as to have his sense of loyalty and honor.

"Love is of all passions the strongest, for it attacks simultaneously the head, the heart and the senses."

-- Lao Tzu

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my committee chair, Dr. David Marshall, for his invaluable support and guidance throughout this process as well as my time here at Texas Woman's University. Additionally, I would like to extend my appreciation to my committee members, Dr. Mark Hamner and Dr. Christina Gawlik, as well as my department chair, Dr. Don Edwards, for their constant support and encouragement. To the community of faculty, staff, and colleagues I have established at Texas Woman's University, it has been my sincere pleasure working with each and every one of you.

I would also like to give a special thanks to Dr. Padmakumar Nair for always having my best interest at heart. His genuine belief in me was only surpassed by his unfaltering patience with me. In addition, cheers to all my friends who have been with it. Finally, to my mother and my brother, I humbly receive your support in my endeavors. I thank you for seeing my vision and trusting my actions.

ABSTRACT

LILIAN CHU

GENERAL PASSION SCALE (GEN-PS): TOWARD THE VALIDATION OF PASSION AS A GENERAL TRAIT-LIKE PERSONALITY CONSTRUCT

DECEMBER 2011

Although research regarding passion has been advancing, an explicit definition of passion has not been derived, nor has a universally accepted, standardized, and reliable method of measuring passion been constructed. This study proposes a relatively new concept of passion as a general trait-like personality construct rather than the more widely accepted classification of passion as an attitude. This paper also introduces a newly developed instrument of measurement, the General Passion Scale (Gen-PS), seeking to measure passion as a personality trait. The purpose of the study is to a) illustrate that passion can be defined as a general personality trait, b) to validate the Gen-PS, and c) to assess whether the scale is an internally reliable metric of passion. This paper is evaluates the Gen-PS's construct validity using factor analytic methods and tests of reliability.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Passion, a word customarily reserved for love and romance (Chen, Yao, & Kotha, 2009), has tended to be conceptualized as a classificatory term which incorporates a variety of other terms such as emotion, desire, and feeling (Lawrie, 1980). Passion has been referred to as a driver of intrinsic motivation with respect to ardent love and interpersonal relationships. Researching the nuances of passion has been prevalent among philosophers. The concept of passion has acquired extreme diametrically opposed viewpoints.

The first viewpoint is embedded in the derivation of the word itself. The etymology of the word *passion* is classically rooted from the Greek word, *pathos*, meaning 'to suffer.' Seeded in its word origin, passion has often been viewed in a detrimental context with negative connotations; an affliction upon an individual who is out of his or her locus of control. The word passion derives from the same root as passive, submissive, and pathetic. The term is commonly used to describe the events and sufferings of Jesus Christ's crucifixion. The Latin origin of passion, *pati*, is connected with the Greek root and appears in several derivatives of the word, such as patience. The term patience is linked with passion, inferring a psychological involuntary occurrence. Seventeenth century philosopher, Rene Descartes refers to passion as a profoundly intense emotion that is received or undergone (Gentile & Miller, 2008). Passion implies submission; inevitably requiring an individual to surrender to the object of the passion, either willingly or unwillingly. In this perspective a person is imprisoned by his or her passion, diseased by the loss of self-control and reason.

However, passion is also interpreted as a tremendously positive sentiment and has taken on a more optimistic application. Encompassing deep emotions, passion is referred to as a driver that leads to romance, physical attraction, and related phenomena in loving relationships (Sternberg, 1997). Additionally, passion is held as a main influential behavioral factor behind an individual's capacity to achieve success in whatever is pursued. Centered within the term's opposing dynamics, Belgium writer and editor, Paul Carvel famously stated, "Passion is a positive obsession. Obsession is a negative passion."

Recently, there has been an increased interest in defining passion, garnering more concentrated efforts in the measurement of passion as a key construct of multiple disciplines, such as psychology and business. More specifically, passion has become a frequent investigative variable of social entrepreneurship studies and practice. An emerging interest can be observed in social entrepreneurs, who are seen as highly motivated individuals intertwining their drive for passion and resolve along with business management principles. Within the academic community and private sector, there has been an increase of momentum directed toward passion research, especially within the field of management. Passion has become a reoccurring theme, gaining recognition as a key construct in the successful practice of business.

Precedent research falls in line with the categorization of passion as an emotion or more broadly, an attitude, defining passion as a specific attitude steered or casted toward an identifiable subject matter or object. Despite a widespread acceptance of this categorization and measurement of passion, this thesis takes on the perspective that passion can be categorized as a personality construct and therefore measureable as a general personality trait. For example, an individual can be passionate toward a specific activity such as a sport. The person can be described as 'very passionate about sports.' In this case, passion is presented as an attitude, a like or dislike toward an explicit attitude object. Conversely, an individual can be generally passionate. Regardless of the object matter, the individual consistently takes on anything he or she comes across in a passionate manner. The individual may be described as a 'very passionate individual.' In this case, passion is definable as a trait-like personality construct. This description identifies a consistent behavioral pattern, which is classified as a personality trait. Various attitude and personality theories and definitions are explored to support the argument that passion is definable as a general personality trait.

Although research regarding passion is progressively evolving, an explicit or consistent definition of the term has not been derived nor has a standardized and reliable method of measuring passion been constructed. According to Cardon, Wincent, Singh & Drnovsek (2005):

> While different researchers have used different, and often non-overlapping, ways of conceptualizing the notion of passion, four aspects are common to most research. Passion a) is wholly or partly a strong emotion that b) encapsulates a host of different and mixed emotions, c) is directed toward or focused around a specific object, and d) has a motivational effect. (p. G1-G6)

However, Robert J. Vallerand became a forerunner in passion research near the end of the 1990s by introducing a new conceptualization of passion. Consistent with passion being characterized as an attitude, Vallerand et al. (2003) defines passion as a strong inclination toward an activity that individuals like (or even love), that they value, find important, and in which they invest time and energy (Rousseau & Vallerand, 2008). Furthermore, Vallerand and his colleagues proposed the Dualistic Model of Passion, partitioning passion into two distinct types: obsessive passion and harmonious passion. Supporting his Dualistic Model of Passion, Vallerand et al. (2001) developed the Passion Scale with respect to activities individuals like, and additionally the Gambling Passion Scale (2002) with Rousseau et al., a measure of passion toward gambling, both substantiated through validity and reliability analyses.

Similarly, this paper introduces a newly developed instrument of measurement, the General Passion Scale (Gen-PS), seeking to measure passion as a trait-like personality construct, instead of an attitude. The purpose of the study is a) to illustrate that passion can be defined as a general personality trait, b) to validate the Gen-PS, and c) to assess whether the scale is an internally reliable metric of passion. This thesis evaluates the

Gen-PS's construct validity using factor analysis via principal components analysis followed by reliability analysis using Cronbach's alpha coefficient, a common index of reliability testing.

This thesis outlines the most customary and generally accepted definitions, theories, and models of attitude and personality. It introduces the argument of passion as a measureable personality construct based upon the presented framework. Additionally, current passion scales introduced by Robert J. Vallerand and colleagues are discussed and reviewed as well as other relevant scales regarding the validation and reliability assessment of a scale. The nature of these studies all involves factor analytic methods and tests of internal consistency. The fundamental mathematics of factor analysis and Cronbach's alpha coefficient are modeled and delineated to gain a deeper perspective of how the statistical outputs are derived. A similar methodological structure is employed for this study regarding the Gen-PS.

CHAPTER II

LITERATURE REVIEW

The very fiber of psychology and psychometric testing is subjective in nature with respect to other scientific fields of study. Psychology's subjective paradigm has left the discipline with terms open to interpretation and shifting definitions. The study takes into account generally accepted definitions, theories, and models of attitude and personality in psychology and applies them as a basis of defining passion as a personality construct.

Attitude

Attitude, defined by analytical psychologist, Carl Gustav Jung, is a predisposed action or reaction toward a characteristic direction or target object (Feist & Feist, 2009) that wavers as a function of experience. Attitude represents a level of like or dislike toward a person, place, or thing, referred to as an attitude object. For example, a child can display a negative attitude toward completing his or her schoolwork. Although attitudes can endure over varying lengths of time, they change over time as well. Attitudes can change from being nonexistent to having some valence, or they can change from one valence to another (Millon et al., 2003). Since attitude is considered a dependent variable based on time and circumstances, it is logically contingent to change.

Although a universally recognized formal definition of attitude has yet to be derived, most social psychologists agree that the distinguishing attribute of attitude is its evaluative nature (Ajzen, 2005). Considered a hypothetical construct: an explanatory variable such as an entity, process, or event that is not directly observable (MacCorquodale & Meehl, 1948), attitude must be interpreted from quantifiable responses. Depending on the construct, the produced responses are either positive or negative toward the given attitude object (Ajzen, 2005). Attitude is a measurable preference, for or against, with respect to the subject or subject matter. Taken together, we can summarize attitude as malleable evaluative reactions—favorable or unfavorable—toward something—whether exhibited in beliefs, feelings, or an inclination to act (Olson & Zanna, 1993). This viewpoint is evidenced through standard attitude scaling techniques that result in a score that locates an individual on an evaluative dimension vis-à-vis an attitude object (Ajzen, 2005) such as a child gauging his or her sentiment regarding schoolwork on a five-point Likert scale.

One of the most commonly accepted theories of attitude formation is Rosenberg and Hovland's 1960 ABC Model of Attitude. The ABC Model, also referred to as the Tripartite Model, assimilates attitude into three separate measureable components: affect, behavior, and cognition. Figure 2.1 displays a Tripartite Model of Attitude predicated on Rosenberg and Hovland's (1960) tri-component attitude model.

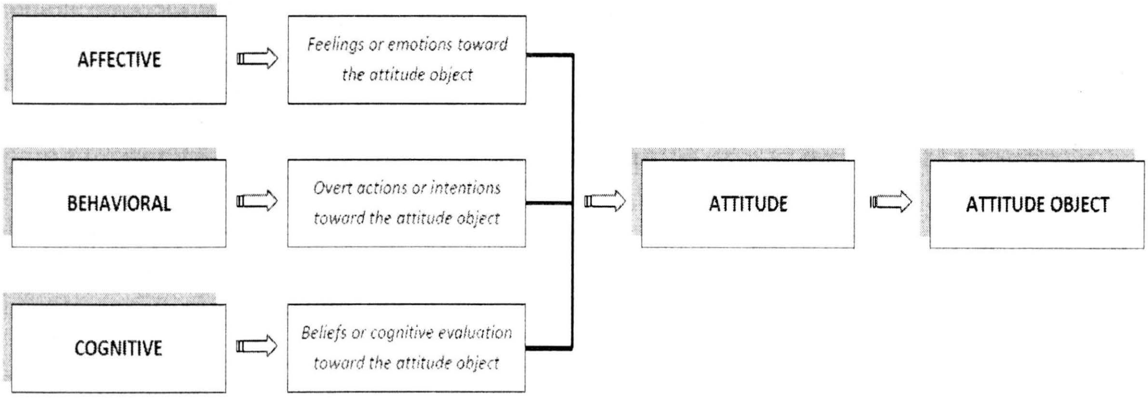

Figure 2.1 Three component model of attitude. This figure was adapted from Rosenberg & Hovland (1960) ABC Model of Attitudes.

Attitudes can be inferred from the three types of responses. The affective responses are emotional or physiological reactions evoked toward the attitude object: an individual's opinion about something. The behavioral or conative element is the inclination or tendency to act toward the attitude object: an individual's intent to act in a certain manner toward something. Cognitive responses, the third component, are responses that reflect an individual's perception or knowledge of the attitude object. According to Solomon (2009), the three component model of attitude accentuates the relationship between knowing, feeling, and doing.

Personality

Similarly to attitude, theorists have yet to agree upon a single universal definition of personality. According to Feist & Feist (2009), personality is a pattern of relatively permanent traits and unique characteristics that give both consistency and individuality to a person's behavior. Weiten (2010) describes personality as a durable disposition to behave in a particular way in a variety of situations. Additionally, Allport (1937) states that an individual's personality consists of his or her characteristic patterns of behavior, thought, or emotional experience that exhibits relative consistency across time and situations. Personality traits are considered comprehensive of an individual and do not deviate easily. For example, an individual can be summed up by stating 'John is a proud individual.' This statement implies that John is and has been a consistently proud individual.

Although there are different variations of the definition of personality, most are aimed at trying to encapsulate a person as a sum total. To undertake this task, multiple theories have been proposed, imposing centralized limitations upon specific observable constructs. One common approach to the study of personality is trait theory in which efforts are focused on the way individuals differ psychologically and how differences might be conceptualized and measured (Funder, 2007). The trait approach is concentrated on individual differences in behavior, consistency of behavior over time, and stability of behavior across situations (Weiten, 2010).

In contemporary psychology, Costa & McCrae's (1992) Five-Factor Model (FFM) is one of the most frequently utilized personality models. Costa & McCrae maintain that most personality traits are a derivative of five high-order traits: extraversion, neuroticism, openness, agreeableness, and conscientiousness, which are known as the "Big Five" (Weiten, 2010). Each of the five factors, considered a major domain of personality, contains six subordinate facets that correspond to each domain.

Figure 2.2 presents a Five-Factor Model of personality based on Costa & McCrae's FFM model.

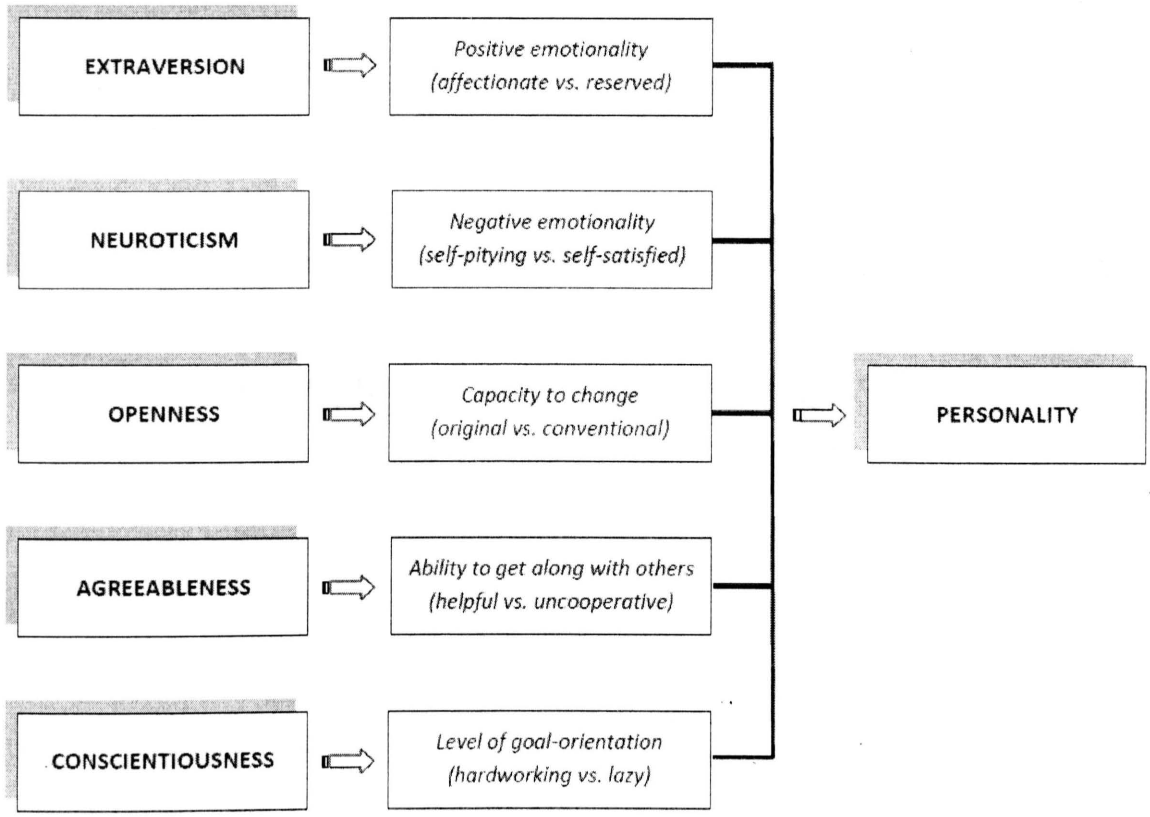

Figure 2.2 Five-factors of personality. This figure was adapted from Costa & McCrae (1992) Five-Factor Model of Personality.

Referred to as the Big Five, extraversion, neuroticism, openness, agreeableness, and conscientiousness can be considered the taxonomy of personality traits. Through research, the Big Five are five fundamental traits that repeatedly occur throughout an individual's description of him or herself. The FFM is an explanatory account of the role of the Big Five factors in personality (Srivastava, 2011). Like attitude, personality is considered a hypothetical construct which is to be inferred from quantifiable responses

(Ajzen, 2005). Personality reflects an individual's dominant characteristics, observed as a consistent pattern of behavior measured through quantitative responses that are considered to be the materialization of intrinsic personality traits. For instance, asking an individual to rate how they perceive themselves in accordance of multiple traits on a five-point Likert scale.

Passion: Attitude versus Personality

Both attitude and personality alike are regarded as latent, hypothetical constructs measured by quantifiable responses. However, there exist two specific distinctions. As previously stated, attitude responses possess an evaluative dimension (pro/con) toward an attitude object. Conversely, personality trait responses do not possess an evaluative dimension or a target object.

Since attitudes possess an evaluative dimension and personality traits do not, it alludes to the fact that attitudes are less resilient to change as compared to personality traits. Personality traits reveal long-term dispositions that remain a constant pattern of behavior. Attitudes have the ability to rapidly change due to new experiences or newly discovered information through the increased availability or accessibility of information. For instance, an individual may have a positive attitude toward his or her neighbor today. The very next day, that particular individual may have discovered some salacious information regarding his or her neighbor or perhaps engaged in a heated argument with the neighbor. The stimulus of uncovering new information or the experience of an intense altercation transforms the individual's perception toward that neighbor from a positive attitude to a negative attitude.

Additionally, attitudes are directed toward an attitude object whereas personality traits are not. Attitudes are measured through responses pertaining to a specific target. Personality traits are measured through responses that are reflective of an individual's self-perceptions. Personality traits are not directed at an object. For example, stating 'that person is angry at his neighbor' (attitude) differs significantly from stating 'that is an angry person' (personality).

Although passion is well received in research as an attitude, this study proposes that passion is clearly identifiable as a general trait-like personality construct and can be measured as such. As indicated previously, the concept of passion is usually found within the context of an attitude and is projected toward an attitude object, as in stating that John is passionate toward music. However, passion can be thought of as a personality trait, as in stating that John is a passionate person. Passion in this statement has no target object. However, it establishes a coherent picture of John, alluding to what type of person he is. We are able to deduce here that passion is a relatively durable characteristic that is a part of John's nature regardless of what it is toward. He responds to a variety of different stimuli or situations in a passionate manner. If an individual exhibits passionate characteristics and behavior across time and situations, passion is perceptible as a personality trait.

Psychometrics: Instruments of Scale

Based on the definitions of attitude and personality, passion can be conceptualized as trait-like personality construct. Therefore, utilizing psychometric scaling techniques, passion is a quantifiable construct in which responses can be measured and assessed. Psychometrics is the branch of psychology that involves the design, administration, and interpretation of quantitative tests for the measurement of psychological variables such as intelligence or aptitude (Shriberg & Shriberg, 2011). Presently, there exist thousands of available psychometric measures, with organically-developed instrument of scales emerging regularly across different fields of study. More recently, psychometric theory has been applied in the measurement of personality, attitudes and beliefs, academic achievements as well as health-related fields (Ivancevic & Ivancevic, 2007). Psychometrics has been the common thread, linking together and unifying different disciplines from psychological testing to industrial and organizational settings.

Passion Scales

Until recently, psychometric passion scales have been relatively limited. In 2001, Vallerand et al. developed the Passion Scale, later followed by the Gambling Passion Scale (GPS) in 2002 in collaboration with Rousseau et al. Both studies proposed passion as a measurable hypothetical construct defined as a strong inclination toward something individuals like (or love), find important, and invest time and energy in (Vallerand et al., 2003). However, the studies further broke down passion into two distinctive subsets: obsessive passion (OP) and harmonious passion (HP). This conceptualization of passion is identified as the Dualistic Model of Passion. OP is defined as an internal motivational factor experienced as an urge that is difficult to resist. Individuals experience OP as an overwhelming involuntary force to partake in the activity at hand. As a result, those possessing a high degree of OP encounter negative consequences during and after the practice of their passionate activity (Vallerand et al., 2003). In contrast, HP is defined as a voluntary choice to engage in an activity. Individuals with HP feel a sense of control in regards to their involvement in the activity, which usually results in positive consequences.

Vallerand et al.'s Passion Scale (2001) proposed a two-factor approach to the conceptualization of passion and sought to validate OP and HP in regards to an activity "that was very dear to a respondent's heart" (Vallerand et al., 2003). To test the factorial validity of the Passion Scale—a 34-item measure on a seven-point Likert scale—Vallerand et al. divided participants of the study into two randomized groups. A preliminary version of the scale was acquired using exploratory factor analysis of the first group. Item measures were eliminated if they loaded on both factors or if they had weak loadings. 14-item measures with the highest loadings were deduced, seven for each factor. A confirmatory factory analysis with the 14-item scale was conducted with the second group. A test of internal consistency yielded satisfactory levels of reliability for both OP ($\alpha = .89$) and HP ($\alpha = .79$) subscales (Vallerand et al., 2003). Overall, results of the study indicated the existence of dual factors corresponding to OP and HP supporting Vallerand et al.'s proposed Dualistic Model of Passion.

Consistent with Vallerand et al.'s Passion Scale study toward a passionate activity, Rousseau et al. developed the Gambling Passion Scale (2002). The GPS was adapted from the already existing Passion Scale—a 14-item measure consisting of two, seven-item subscales measuring HP and OP respectively (Castelda et al., 2007). The GPS was shortened into ten items (five for each factor) using a seven-point Likert scale and modified to refer to a gambling game or reflect specific characteristic of the act of gambling (Rousseau et al., 2002). Similarly, participants of the GPS study were divided into two randomized subsamples. Exploratory factor analysis conducted on the first group extracted a two-factor solution, OP and HP. This two-factor solution was confirmed with the other half of the sample using confirmatory factor analysis (Castelda et al., 2007). Cronbach's alpha coefficients were used to assess the two subscales' internal consistency, revealing acceptable levels of reliability for both OP (α = .90) and HP (α = .76) (Rousseau et al., 2002). Findings of the GPS study supported the Dualistic Model of Passion in the context of gambling.

Besides the Passion Scale and the GPS, Robert J. Vallerand continued collaborations with other researchers, conducting additional studies utilizing the dichotomous framework of passion. Other studies such as passion in relation to performance attainment, activity engagement and positive affect, subjective well-being in older adults, injury in dance students, and quality of interpersonal relationships (Vallerand et al., 2007; Mageau et al., 2007; Rousseau et al., 2008; Rip et al., 2006; Philippe et al., 2010) also applied the Dualistic Model of Passion.

Entrepreneurial Passion Scales

Instruments of scale measuring passion are also present in the field of business management, especially in entrepreneurial studies. Passion, within the entrepreneurial business context, is used interchangeably with words such as motivation and intent. Numerous studies have been geared toward the development and validation of an internally reliable metric of entrepreneurial passion. According to Chen et al., (2009) entrepreneurial passion (EP) is an entrepreneur's intense affective state accompanied by cognitive and behavior manifestations of high personal value. Cardon and Stevens (2009) defines the concept of entrepreneurial passion as the "consciously accessible intense positive feelings experienced by engagement in entrepreneurial activities associated with roles that are meaningful and salient to the self-identity of the entrepreneur" (p. 2). Cardon and Stevens (2009) further elaborate that passion includes feelings that are consciously experienced, positive, and intense, such as excitement, elation, or joy.

Cardon and Steven's (2009) study set out to develop a new psychometric scale with content validity for measuring entrepreneurial passion. Based on their definition of EP, a preliminary entrepreneurial passion scale was generated with three sub-scales relating to passion for inventing, founding, and developing ventures. Reiterative items were eliminated while remaining items were refined for clarity and diction resulting in a 24-item measure (eight for each factor). Using a five-point Likert scale, items were rated by participants of the study and subjected to a one-way ANOVA analysis employing individual mean difference comparisons among the three observations of the item and grouped comparisons (Cardon & Stevens, 2009). A 12-item entrepreneurial passion scale was derived from items that preserved high levels of significance through ANOVA analysis.

Chen et al.'s 2009 study proposed to verify the metric qualities of their developed Perceived Passion Scale. The scale was designed to measure venture capitalists' (VC) perception of entrepreneurs' passion and preparedness based on entrepreneurs' business plan presentations (Chen et al., 2009). Construct validity was determined through exploratory factor analysis, leading to a five-factor solution. Three factors were eliminated with high cross-factor loadings leaving a 19-item measure. A second exploratory factor analysis was conducted resulting in an 11-item measure with a two-factor solution of passion (six-item subscale) and cognitive preparedness five-item subscale). A test of reliability reflected satisfactory levels of internal consistency for passion ($\alpha = .95$) and cognitive preparedness ($\alpha = .87$). The results supported Chen et al.'s conceptualization of entrepreneurial passion as including two distinct components in the business plan presentation context (Chen et al., 2009).

Other Passion-Related Scales

Many other passion-related scales have been developed and validated in various fields of study. One such study is Robert J. Sternberg's 1997 'Construct Validation of a Triangular Love Scale' in which passion is referred to as one of three components of love. Another is Duckworth and Quinn's 2009 'Development and Validation of the Short

Grit Scale (Grit-S)' which measures trait-level perseverance and passion for long-term goals.

Passion and passion related scales, although fragmented, have been progressively emerging as the subject of research studies. Multiple shared similarities can be observed in the development of the scale and testing methodologies. Almost all studies use factor analytic methods to validate the scales as well as tests of reliability to assess internal consistency. Many of the passion scales were also developed based on Vallerand et al.'s research, applying the Dualistic Model of Passion. Regardless of what statistical method is employed, all aim to narrow the gap of defining, developing and validating a reliable measure of passion.

CHAPTER III

MODELS & METHODOLOGY

This study's primary purpose is to introduce and validate a newly developed psychometric scale, the Gen-PS, as an internally reliable measure of passion as a general trait-like personality construct. This chapter discusses the methodology utilized in the study, detailing the development of the scale along with the mathematical models and interpretations of the factor analysis and reliability test results.

Development of the Gen-PS

The Gen-PS is distinct from other already developed passion scales by conceptualizing passion as a one-dimensional model. While most studies base their scales from Vallerand et al.'s Dualistic Model of Passion, the Gen-PS is founded on the theory of passion as a general or single-model construct. Although the Gen-PS differs from other scales based on Vallerand et al.'s dichotomous framework of passion, the Gen-PS study uses a methodology of factor analysis and reliability testing similar to not just Vallerand et al.'s passion studies, but also most psychometric scale research.

The first version of the Gen-PS was comprised of 50 self-reflective statements generated as perceivable indicators of general passion. The items pertained to the definition of passion as a trait-like personality construct. All statements were founded around the universe of interest with responses scalable via a five-point Likert scale. Once the list of 50 items was established, the statements were evaluated and filtered into a smaller set based on three general criteria: 1) the ease of understanding of each item from both native and non-native English speakers, 2) the clarity and possible vagueness of the wording, and 3) the multicultural relevancy across cultural dimensions. Items that did not meet all three requirements were eliminated. Redundant items were also discarded. From this process emerged the final version of the Gen-PS (see Appendix A) distributed to participants for the study.

Participants

Data for the study was collected during the 2009-2010 academic year from two public universities located in North Central Texas. Sample data for the study was gathered from established classes in the universities, utilizing a quasi-experimental design and convenience sampling in which nonrandomized control groups were assigned as subjects. The selection of classes was dependent on location along with the instructor's compliance of the study. The Gen-PS was administered, with approval from the instructor, during the class period in which an administrator of the research team debriefed the students of the nature and intent of the study. Participants, who partook in the study, did so voluntarily. The confidentiality of the participants was ascertained by the anonymity of the study. Respondents consisted of undergraduate and graduate students currently enrolled in at least one course at either university during that academic year.

A total of 418 Gen-PS's were collected from participants. The responses from the Gen-PS were compiled into a single data set. The data was cleansed and missing values were removed and excluded from the study. The data set was imported and analyzed utilizing the statistical software, Statistical Package for the Social Sciences (SPSS). A total of 393 usable responses ($n = 393$), 185 or 47.1% of which were male and 208 or 52.9% were female, depicted in Table 3.1.

Table 3.1
Gender

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	185	47.1	47.1	47.1
	Female	208	52.9	52.9	100.0
	Total	393	100.0	100.0	

As depicted in Tale 3.2, the mean age of the all respondents was 26.67 years old with a standard deviation of 6.813 ($\bar{x}_{age} = 26.67, \sigma_{age} = 6.813$) with a range from 18 to 58 years old.

Table 3.2
Age

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	393	18	58	26.67	6.813
Valid N (listwise)	393				

As shown in Table 3.3, the mean age of males was 27.41 with a standard deviation of 6.381 ($\bar{x}_{male} = 27.41, \sigma_{male} = 6.381$) and mean age of females was 26.01 with a standard deviation of 7.125 ($\bar{x}_{female} = 26.01, \sigma_{female} = 7.125$).

Table 3.3
Age: Male versus Female

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Age	Male	185	27.41	6.381	.469
	Female	208	26.01	7.125	.494

A two-sample independent t-test was conducted to test whether a significant difference exists between the mean ages of the genders. Table 3.4 depicts the output from the t-test.

Table 3.4
Mean Differences in Age between Genders

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Age	Equal variances assumed	1.398	.238	2.043	391	.042	1.401	.686
	Equal variances not assumed			2.057	390.979	.040	1.401	.681

Using a default significance level of $\alpha = 0.05$, the results show a p-value of 0.238 which indicates significant evidence to conclude that there is a difference in mean ages of males and females. Statistically significant results can be observed that the mean ages of male and females differ with $t(391) = 2.043, p = 0.042, \alpha = 0.05$.

Factor Analysis

Initial Outputs

Once the statistics for gender and age have been investigated, a factor analysis was performed on the data. The application of factor analytic methods serves several related purposes in scale development. Originating in psychometrics, factor analysis is one of the most commonly used procedures in the development and evaluation of psychological measures (Floyd & Widaman, 1995). Factor analysis is a statistical technique of data reduction used to define meaningful underlying unobservable variables that are reflected in the observed variables ("Annotated SPSS Output," n.d.). It is a systematic method of determining how many latent variables, or factors, underlie a set of items by studying the pattern of correlations or covariances with the item set.

The factor analysis process initiates with an output of a correlation matrix of the responses. Table 3.5 shows in detail an abridged version of the R-matrix containing a Pearson correlation coefficient between all pairs of questions. It can be observed that the correlation coefficients do not cause a concern for singularity in the data. Since none of the correlation coefficients are particularly large (greater than 0.9) there is no need to consider eliminating any of the questions at this phase.

Table 3.5
Correlation Matrix

Correlation Matrix

	Whatever I do, I do with great enthusiasm.	My life revolves around my interests.	I become emotionally attached to my interests.	I am an enthusiastic person.	My friends consider me a passionate person.	My interests become an obsession.	I feel I am a passionate person.	I rarely get excited about anything.	It is hard for me to imagine my life without pursuing my passion.	I get excited when talking about something I am interested in.	I find myself thinking about my interests frequently in one day.	I am extremely dedicated to my interests.	I would sacrifice almost anything to pursue my interests.	I have many different subjects of interest.	I enjoy sharing my interest with others.	I do not hesitate speaking up to defend my interests.
Whatever I do, I do with great enthusiasm.	1.000	.386	.225	.534	.364	.207	.347	-.038	.296	.348	.299	.367	.242	.144	.216	.261
My life revolves around my interests.	.386	1.000	.410	.337	.197	.330	.224	-.005	.373	.209	.338	.379	.377	.198	.197	.251
I become emotionally attached to my interests.	.225	.410	1.000	.319	.297	.352	.334	.014	.280	.279	.368	.346	.320	.177	.265	.304
I am an enthusiastic person.	.534	.337	.319	1.000	.444	.192	.447	-.139	.276	.306	.294	.381	.214	.115	.278	.246
My friends consider me a passionate person.	.364	.197	.297	.444	1.000	.215	.470	-.161	.298	.270	.242	.384	.141	.150	.291	.231
My interests become an obsession.	.207	.330	.352	.192	.215	1.000	.278	.309	.219	.059	.313	.354	.403	.098	.163	.231
I feel I am a passionate person.	.347	.224	.334	.447	.470	.278	1.000	-.140	.400	.351	.329	.368	.213	.195	.266	.297

Table Cont'd

I rarely get excited about anything.	-.038	-.005	.014	-.139	-.161	.309	-.140	1.000	.029	-.148	-.009	.004	.246	.075	-.033	-.036
It is hard for me to imagine my life without pursuing my passion.	.296	.373	.280	.276	.298	.219	.400	.029	1.000	.423	.409	.483	.338	.223	.290	.296
I get excited when talking about something I am interested in.	.348	.209	.279	.306	.270	.059	.351	-.148	.423	1.000	.524	.369	.192	.226	.437	.331
I find myself thinking about my interests frequently in one day.	.299	.338	.368	.294	.242	.313	.329	-.009	.409	.524	1.000	.578	.433	.273	.389	.420
I am extremely dedicated to my interests.	.367	.379	.346	.381	.384	.354	.368	.004	.483	.369	.578	1.000	.512	.188	.294	.344
I would sacrifice almost anything to pursue my interests.	.242	.377	.320	.214	.141	.403	.213	.246	.338	.192	.433	.512	1.000	.181	.216	.309
I have many different subjects of interest.	.144	.198	.177	.115	.150	.098	.195	.075	.223	.226	.273	.188	.181	1.000	.413	.254
I enjoy sharing my interest with others.	.216	.197	.265	.278	.291	.163	.266	-.033	.290	.437	.389	.294	.216	.413	1.000	.534
I do not hesitate speaking up to defend my interests.	.261	.251	.304	.246	.231	.231	.297	-.036	.296	.331	.420	.344	.309	.254	.534	1.000

Outputs of two types of statistics that aid in assessing the adequacy of the correlation matrix for factor analysis, Kaiser-Meyer-Oklin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity, are assessed. Results of both tests are shown in Table 3.6.

Table 3.6
KMO & Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.858
Bartlett's Test of Sphericity	Approx. Chi-Square	1991.169
	df	120
	Sig.	.000

KMO Measure of Sampling Adequacy is an index for comparing the magnitudes of the observed and partial correlation coefficients. It predicts where the collected data is likely to 'factor well.' The KMO test represents the ratio of the squared correlation between variables to the squared partial correlation between variables (Field, 2000). KMO values range between 0 and 1: a value of 0 indicates the sum of partial correlations is large relative to the sum of correlations, and a value close to 1 indicates that patterns of correlations are fairly compact and so factor analysis should yield distinct and reliable factors. A KMO value of 0.6 is an acceptable minimum, with the higher the value, the better. The initial solution of the factor analysis reveals a KMO value of 0.858, which is notably larger than the minimum acceptable value.

Barlett's Test of Sphericity is used to determine the factorability of the correlation matrix. The test examines the hypothesis that variables are uncorrelated in the population where the population correlation matrix is an identity matrix; each variable correlates perfectly with itself ($r = 1$) but has no correlation with the other variables($r = 0$). Barlett's Test of Sphericity should reach a significance value to support the factorability of the correlation matrix of the items (Pallant, 2001). The test approximates a chi-square distribution assuming the sample correlation came from a Normal population with the variables being independent. Barlett's Test of Sphericity reveals an Appox. Chi-Square value of 1991.169 ($\chi^2 = 1991.169$) and a significance value of 0.000, considered highly significant ($p < 0.001$). The results indicate that the factorability of the correlation matrix is appropriate.

Common Factor Models

There are two basic types of factor analysis: exploratory factor analysis (EFA) and confirmatory factory analysis (CFA). EFA and CFA are both based on the common factor model, a mathematical model proposed by British psychologist Charles Spearman in 1904. It is a method of extracting latent factor(s) and modeling the relationships between the observed and latent variables. Figure 3 illustrates a common single-factor model and Figure 4 illustrates a common factor model using two factors. In both models, Y_i is the latent variable or factor(s) being measured, X_i is the observed measure of the factor(s) Y_i, and e_i is the residuals or unique factors which are assumed independent of each other and of Y_i. The arrows, or factor loadings, represent the extent to which the observed variables actually affect the underlying latent factor. The arrows specify the nature of the relationship, or lack thereof, between the latent factor(s) and the measured items through either strong or weak factor loadings. Figure 3.1 depicts a one-factor model with latent variable Y_1 and four observed variables, X_1 through X_4, assumed to reflect the underlying Y_1 factor. Figure 3.2 depicts a two-factor model in which each observed variable, X_1 through X_4, is partially influenced by underlying common factors, Y_1 and Y_2.

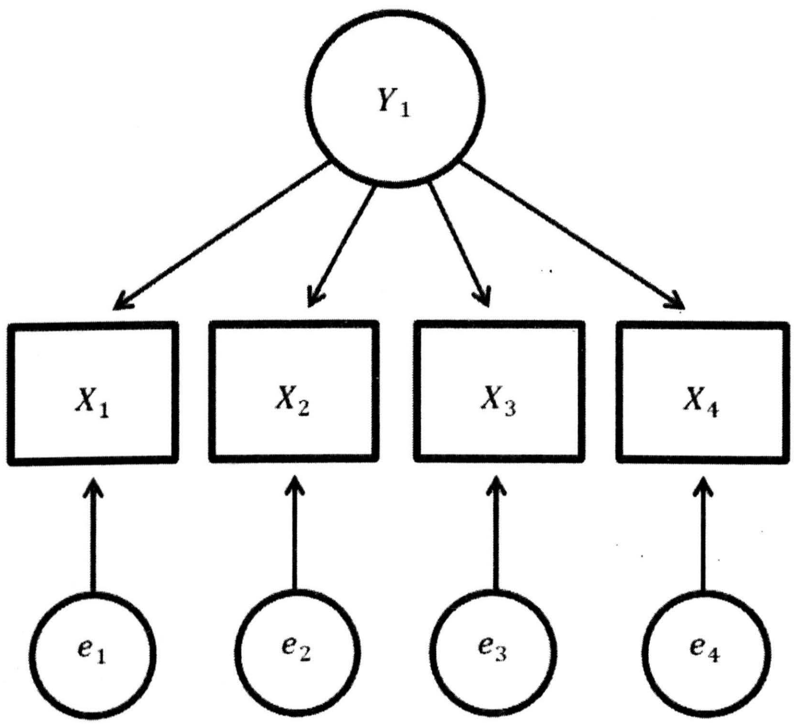

Figure 3.1 Common single-factor model. This figure was adapted from Spearman (1904) common factor model.

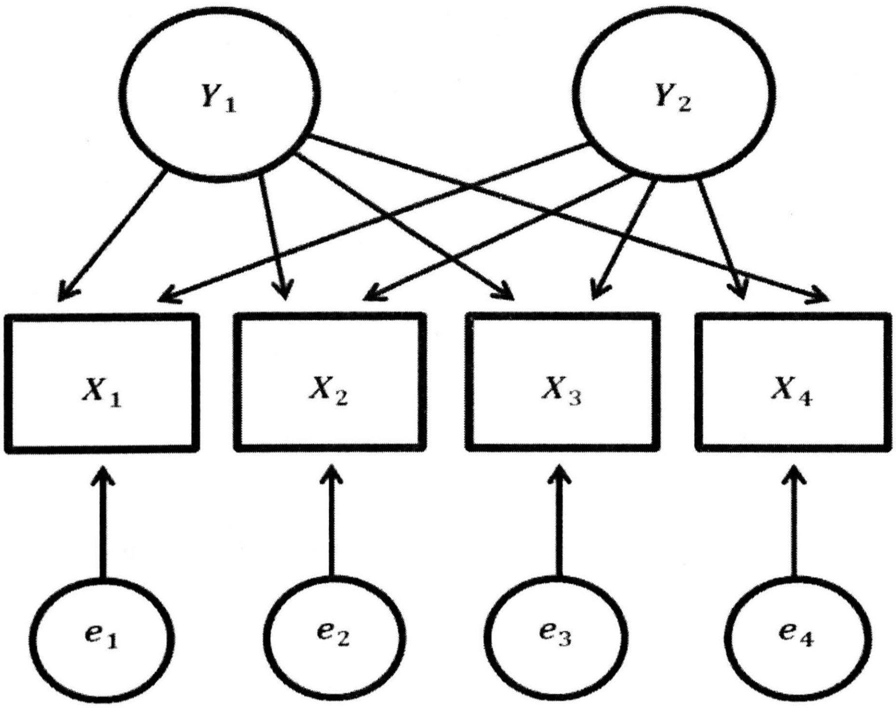

Figure 3.2 Common two-factor model. This figure was adapted from Spearman (1904) common factor model.

Exploratory Factor Analysis

Traditionally, EFA has been used to explore the possible underlying factor structure of a set of measured variables without imposing any preconceived structure on the outcome (Child, 1990). EFA is a data reduction method that identifies the number of latent factors that effectively represent the data (Kline, 1998). By performing EFA analysis, underlying relationships between variables are detected by the grouping of variables based on strong correlations. Factor scores, composite measures created for each observation on each factor extracted in the factor analysis, are calculated. EFA is concerned with finding the smallest number of interpretable factors to account for the correlations or covariances between observed variables. The observed variables are considered to be a linear combination of the latent variables (Suhr, n.d.). EFA is exploratory in the sense that it does not impose a structure on the relationship between the observed and latent variables, and there are no firm *a priori* expectations based on theory or prior research (Floyd & Widaman, 1995). The *a priori* assumption is that any indicator may be associated with any factor.

The model for EFA considers a data set X as $n \times p$ size matrix represented as:

$$X = |x_{ij}|$$

where p represents the observed variables of the item set and n (rows) represents the measured responses of each of the items from the set. The set of observed variables $X_1, X_2, \dots, X_p$ is considered and measured on n observable units. The following assumes that the p observed variables (the X_i) that have been measured for each of the n items so that:

$$X_1 = a_{11}Y_1 + a_{12}Y_2 + \cdots + a_{1m}Y_m + e_1$$

$$X_2 = a_{21}Y_1 + a_{22}Y_2 + \cdots + a_{2m}Y_m + e_2$$

$$\vdots$$

$$X_p = a_{p1}Y_1 + a_{p2}Y_2 + \cdots + a_{pm}Y_m + e_p$$

where a_{ij} is the factor $p \times m$ factor loadings and e_i is the independent p specific errors. Y_j is the m common factors and is also generally assumed to be independent. The Y_j variables are standardized with mean zero and standard deviation one (diagonals are adjusted for unique factors) where:

$$E(Y) = 0_{m\times 1}$$

and

$$Cov(Y) = E(YY') = I_{m\times m}.$$

The e_i is also independent where:

$$E(e) = 0_{p\times 1}$$

and

$$Cov(e) = E(ee') = \psi_{p\times p}.$$

The Y_j and e_i are also independent of each where:

$$eY = 0$$

and

$$Cov(e, Y) = E(e, Y') = 0_{p\times m}.$$

The model can be rewritten in the matrix form as:

$$X_{p\times 1} = A_{p\times m}Y_{m\times 1} + e_{p\times 1}$$

which implies:

$$Cov(X)$$

which is equivalent to:

$$\Sigma_{p\times p} = AA' + \psi$$

or

$$\Sigma_{p\times p} = AA' + cov(e)$$

where $\Sigma_{p\times p}$ is the correlation matrix of $X_{p\times 1}$. $Cov(e)$ or ψ should be a $p \times p$ diagonal matrix since the errors were assumed independent, implying that:

$$Var(X_i) = \sum_{j=1}^{m} a_{ij}^2 + \psi$$

or

$$Var(X_i) = \sum_{j=1}^{m} a_{ij}^2 + Var(e_i).$$

The sum of the X_i factor loadings is called communality, which is the variance of observed variables accounted for by the common factors.

Principal component analysis. Principal component analysis (PCA) is a factor extraction method of EFA used to form uncorrelated linear combinations of the observed variables, also referred to as principal components, using orthogonal transformations. PCA's goal is to understand the underlying data structure as well as to reduce the data into a smaller set with maximum variability. The first principal component has a maximum variance, which accounts for as much of the variability in the data as possible. Each successive component explains progressively smaller portions of the variance with the highest possible variance under the constraint that it is uncorrelated with the prior components.

PCA generates p new variables, the principal components, denoted as $Y_1, Y_2, \ldots, Y_p$. Each principal component is derived by a linear combination of the X variables so that the first principal component obtained is:

$$Y_1 = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1p}X_p.$$

According to the principal component model, the coefficients of A_1 are selected so as to maximize the variance of Y_1 such that:

$$Var(Y_1) = A_1^{'}\Sigma_{XX}A_1.$$

It stands that maximization will not be achieved for a finite A_1, since the multiplication of A_1 by a scalar also produces a set of constants that will satisfy the condition of maximization. Therefore, a constraint must be imposed requiring that A_1 be normalized, meaning that $Var(Y_1)$ is maximized subject to the constraint that $A_1^{'}A_1 = 1$. To maximize $A_1^{'}\Sigma_{XX}A_1$ subject to $A_1^{'}A_1 = 1$, the standard approach is to employ Lagrange multipliers using the mathematical function:

$$\phi = A_1^{'}\Sigma_{XX}A_1 - \lambda_1(A_1^{'}A_1 - 1)$$

where λ_1 is a Lagrange multiplier. Since $\left(A_1^{'}A_1 - 1\right) = 0$, the maximization of ϕ is identical to the maximization of $Var(Y_1)$. Differentiation with respect to A_1 gives:

$$\Sigma_{XX}A_1 - \lambda_1 A_1 = 0$$

which is equivalent to

$$\left(\Sigma_{XX} - \lambda_1 I_p\right)A_1 = 0.$$

The process is repeated when the values of λ_1 and A_1 are determined to form the second principal component:

$$Y_2 = a_{21}X_1 + a_{22}X_2 + \cdots + a_{2p}X_p.$$

The constants for the second component are selected so that Y_2 is maximized subject to being uncorrelated with Y_1, meaning that vector A_2 is selected so that:

$$A_2'A_2 = 1$$

and

$$A_2'A_1 = 0.$$

The process is continued until Y_p components have been obtained such that:

$$A_p'A_p = 1$$

and

$$A_p'A_{p'} = 0$$

for

$$p' = 1,2,3, \dots, P-1$$

where

$$(p \neq p').$$

Using a general Lagrange multiplier λ, the whole process can be completed with the general parameter:

$$\phi = A'\Sigma_{XX}A - \lambda(A'A - 1).$$

Standard calculus computations lead to the eigen equation:

$$|\Sigma_{XX} - \lambda I| = 0$$

with ordered roots:

$$\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_P \geq 0.$$

The first root, λ_1, and the set of homogeneous equations:

$$(\Sigma_{XX} - \lambda_1 I)A_1 = 0$$

is used to generate the eigen vector A_1. The second root is associated with the second principal component where:

$$Y_2 = a_{21}X_1 + a_{22}X_2 + \cdots + a_{2p}X_p$$

and is uncorrelated with Y_1 where:

$$A_2^{'}A_1 = 0$$

resulting in:

$$Cov(Y_1, Y_2) = A_2^{'}\Sigma_{XX}A_1 = 0.$$

In accordance, succeeding roots, $\lambda_1, \lambda_2, \cdots, \lambda_P$, are associated with corresponding principal components, which are all mutually orthogonal.

The process of principal component analysis for $\hat{\Sigma}_{XX}$ can be summarized in the following steps:

- Obtain sample variance-covariance matrix:

  $\hat{\Sigma}_{XX}$

- Solve the characteristic equation:

  $|\hat{\Sigma}_{XX} - \lambda I| = 0$

- Find the eigen vectors for each solution with roots $\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_p$ by solving the system of equations:

  $(\hat{\Sigma}_{XX} - \lambda_p I)A_p^{'} = 0$ with $A_p^{'}A_p = 1$

- Score each observation as:

$$Y_1 = A_1^{'}X, Y_2 = A_2^{'}X, \dots, Y_p = A_p^{'}X$$

- The mean for each principal component is:

$$\bar{Y}_1 = A_1^{'}\bar{X}, \bar{Y}_2 = A_2^{'}\bar{X}, \dots, \bar{Y}_p = A_p^{'}\bar{X}$$

- The variance for each principal component is:

$$S_{Y_1}^2 = \lambda_1, S_{Y_2}^2 = \lambda_2, \dots, S_{Y_P}^2 = \lambda_P$$

The central concept of PCA is the summarization and data reduction of a large set of data believed to have some redundancy or correlated with one another. The observed variables should be able to be reduced into a smaller number of principal components, which accounts for most of the observed variables' variance, due to the redundancy.

A factor analysis is performed using the extraction method of Principal Component Analysis in SPSS. Table 3.7 shows the table of Communalities before and after extraction.

Table 3.7
Communalities

Communalities

	Initial	Extraction
Whatever I do, I do with great enthusiasm.	1.000	.487
My life revolves around my interests.	1.000	.427
I become emotionally attached to my interests.	1.000	.379
I am an enthusiastic person.	1.000	.606
My friends consider me a passionate person.	1.000	.506
My interests become an obsession.	1.000	.586
I feel I am a passionate person.	1.000	.499
I rarely get excited about anything.	1.000	.578
It is hard for me to imagine my life without pursuing my passion.	1.000	.410
I get excited when talking about something I am interested in.	1.000	.548
I find myself thinking about my interests frequently in one day.	1.000	.566
I am extremely dedicated to my interests.	1.000	.560
I would sacrifice almost anything to pursue my interests.	1.000	.596
I have many different subjects of interest.	1.000	.430
I enjoy sharing my interest with others.	1.000	.650
I do not hesitate speaking up to defend my interests.	1.000	.498

Extraction Method: Principal Component Analysis.

Since PCA assumes that all variance is common, the communalities, the proportion of each variable's variance explained by the principal component, are all 1. The Extraction column reflects the common variance in the data structure. High values indicate a well representation in the common factor space, while low values are not. Question 1 can be interpreted as 48.7% of the variance is common, or shared.

Table 3.8 shows the Total Variance Explained output and lists the eigenvalues associated with each factor before and after extraction.

Table 3.8
Total Variance Explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.343	33.393	33.393	5.343	33.393	33.393
2	1.647	10.296	43.688	1.647	10.296	43.688
3	1.336	8.351	52.039	1.336	8.351	52.039
4	.954	5.963	58.002			
5	.848	5.297	63.299			
6	.835	5.216	68.516			
7	.769	4.808	73.324			
8	.659	4.120	77.444			
9	.624	3.897	81.341			
10	.552	3.452	84.793			
11	.529	3.309	88.102			
12	.456	2.853	90.955			
13	.427	2.668	93.623			
14	.370	2.314	95.937			
15	.337	2.108	98.046			
16	.313	1.954	100.000			

Extraction Method: Principal Component Analysis.

16 components are extracted during PCA since there should as many components extracted as there are variables inputted. The eigenvalues are the variances of the principal components. The variables are standardized, meaning that each variable has a variance of 1 and the sum of total variance is equal to the number of variables, 16. SPSS displays the eigenvalues in terms of the percent of variance explained. It can be observed that the first factor explains a significant amount of total variance, 33.393%, with each succeeding factor explaining progressively less amounts of variance. Since SPSS extracts all factors with eigenvalues greater than 1, three factors are extracted and displayed in column Extraction Sums of Squared Loadings. However, since the first factor accounts for most of the total variance, it suggests that the scale items are unidimensional.

A Scree Plot is an indicator of how many factors were generated. It is a two-dimensional plotted graph with factors on the horizontal axis and eigenvalues on the y-axis. A Scree Plot is read from left-to-right across the abscissa. Figure 3.3 present the Scree Plot of the factor analysis.

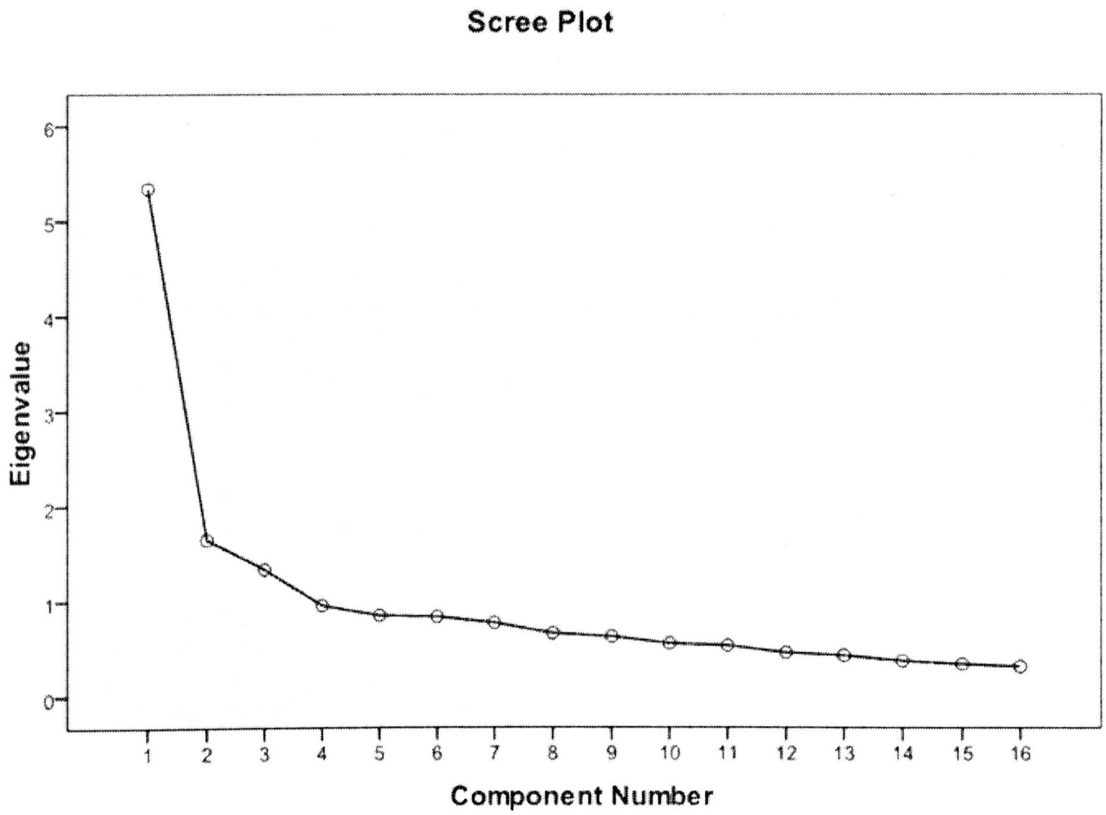

Figure 3.3 Scree Plot from SPSS.

A clear point of inflexion, or elbow, can be observed in the scree plot from the first component to the second component. Visually, it can be assumed that there is one factor to be retained from the analysis.

Another means of determining the number of factors is analyzing the factor loadings, the loadings of each variable onto each factor. Table 3.9 shows the Component Matrix of the uncorrelated factor loadings.

Table 3.9
Component Matrix

Component Matrix[a]

	Component		
	1	2	3
Whatever I do, I do with great enthusiasm.	.590	-.184	-.323
My life revolves around my interests.	.582	.194	-.226
I become emotionally attached to my interests.	.590	.131	-.118
I am an enthusiastic person.	.610	-.308	-.372
My friends consider me a passionate person.	.560	-.345	-.272
My interests become an obsession.	.481	.540	-.251
I feel I am a passionate person.	.624	-.266	-.199
I rarely get excited about anything.	-.018	.759	.035
It is hard for me to imagine my life without pursuing my passion.	.639	.023	.034
I get excited when talking about something I am interested in.	.609	-.302	.293
I find myself thinking about my interests frequently in one day.	.713	.096	.220
I am extremely dedicated to my interests.	.732	.127	-.094
I would sacrifice almost anything to pursue my interests.	.571	.518	-.035
I have many different subjects of interest.	.399	.043	.518
I enjoy sharing my interest with others.	.582	-.136	.542
I do not hesitate speaking up to defend my interests.	.595	-.012	.379

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Loadings below the threshold of 0.5 are considered to too low and discarded. Low factor loadings (less than 0.5) can be observed in questions 6, 8, and 14 and are excluded from the scale. Table 3.10 shows the Component Matrix with loadings below 0.5 suppressed.

Table 3.10
Component Matrix with Discarded Low Factor Loadings

Component Matrix[a]

	Component		
	1	2	3
Whatever I do, I do with great enthusiasm.	.590		
My life revolves around my interests.	.582		
I become emotionally attached to my interests.	.590		
I am an enthusiastic person.	.610		
My friends consider me a passionate person.	.560		
My interests become an obsession.		.540	
I feel I am a passionate person.	.624		
I rarely get excited about anything.		.759	
It is hard for me to imagine my life without pursuing my passion.	.639		
I get excited when talking about something I am interested in.	.609		
I find myself thinking about my interests frequently in one day.	.713		
I am extremely dedicated to my interests.	.732		
I would sacrifice almost anything to pursue my interests.	.571	.518	
I have many different subjects of interest.			.518
I enjoy sharing my interest with others.	.582		.542
I do not hesitate speaking up to defend my interests.	.595		

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Although three factors were extracted from the analysis, it can be clearly observed from the Component Matrix output, there is one main component or factor, being measured. The output identifies a single-factor solution measuring one latent variable, passion. The Gen-PS can be considered a valid instrument of scale from the analysis. The outputs reveal that the Gen-PS does indeed measure the postulated factor of passion.

Confirmatory Factor Analysis

CFA is a technique used to verify the factor structure of a set of observed variables (Suhr, n.d.). It is a special case of structural equation modeling (SEM) or covariance structure (McDonald, 1978). SEM is distinguished by two main models: a measurement model and a structural model. The measurement model shows the relationship between a set of observed variables and latent variables. The structural model shows potential causal and correlation relationships between variables. EFA is considered a theory-generating model in contrast to CFA, a theory-testing model by which an explicit hypothesis tests whether a relationship between observed variables and unobserved factors exists. In general, confirmatory analysis identifies and groups specific observed variables together as indicators of the shared latent variables *a priori* providing a more explicit framework of confirming prior notions regarding the factor structure. Construct measures are tested for consistency or "goodness of fit" of the predefined factor model: how well the proposed model accounts for the correlations between the variables in the observed set of data. However, factor scores are not calculated. CFA is commonly used to assess the validity of a single factor model.

Actual CFA can be conducted using structural equation modeling software where it is common to depict confirmatory factor models as path diagrams. Figure 3.4 depicts a general confirmatory factor model with two common factors.

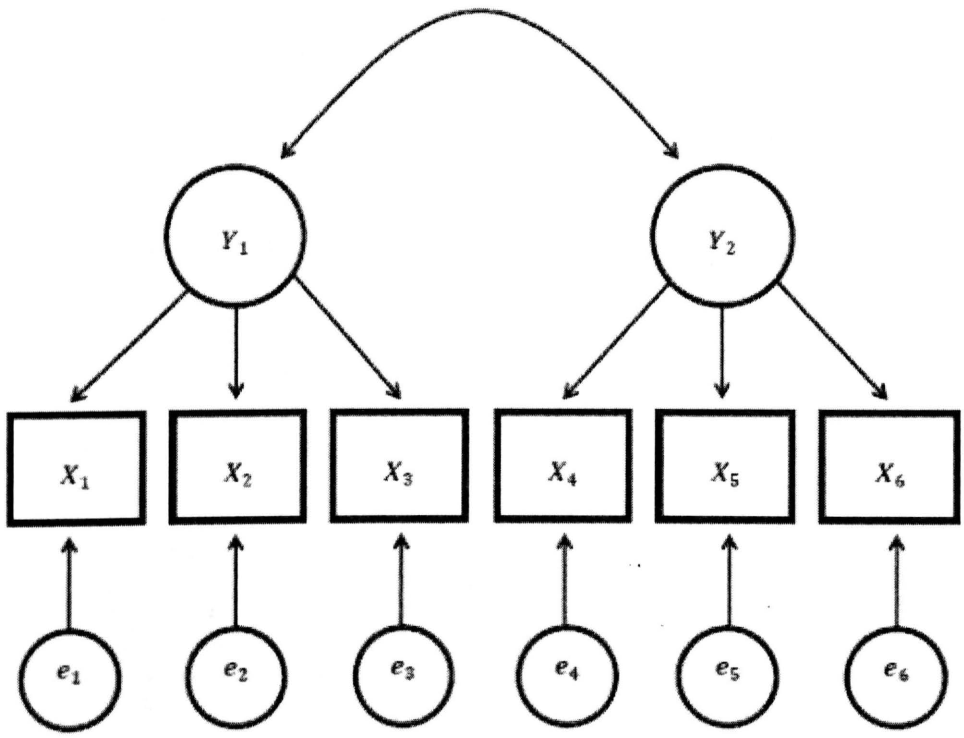

Figure 3.4 General confirmatory factor model.

This model differs from the common factor models in that the general confirmatory factor model includes a double-headed arrow indicating covariance between the two latent variables. The latent variables, Y_1 and Y_2, are each measured with observed variables, $X_1, X_2 X_3$ and X_4, X_5, X_6 where the latent variables are expected to covary.

When modeling CFA, observed and latent variables are treated as deviations from their mean, which can be denoted by the equation:

$$X = \Lambda\xi + \delta$$

where X is the vector of observed variables, ξ is the vector of common factors, Λ is the matrix of factor loadings (arrows) connecting ξ_i to x_i, and δ is the vector of unique factors. Figure 3.5 depicts the general confirmatory factor model with the above defined notations. Factor loadings are represented by λ_{ij}.

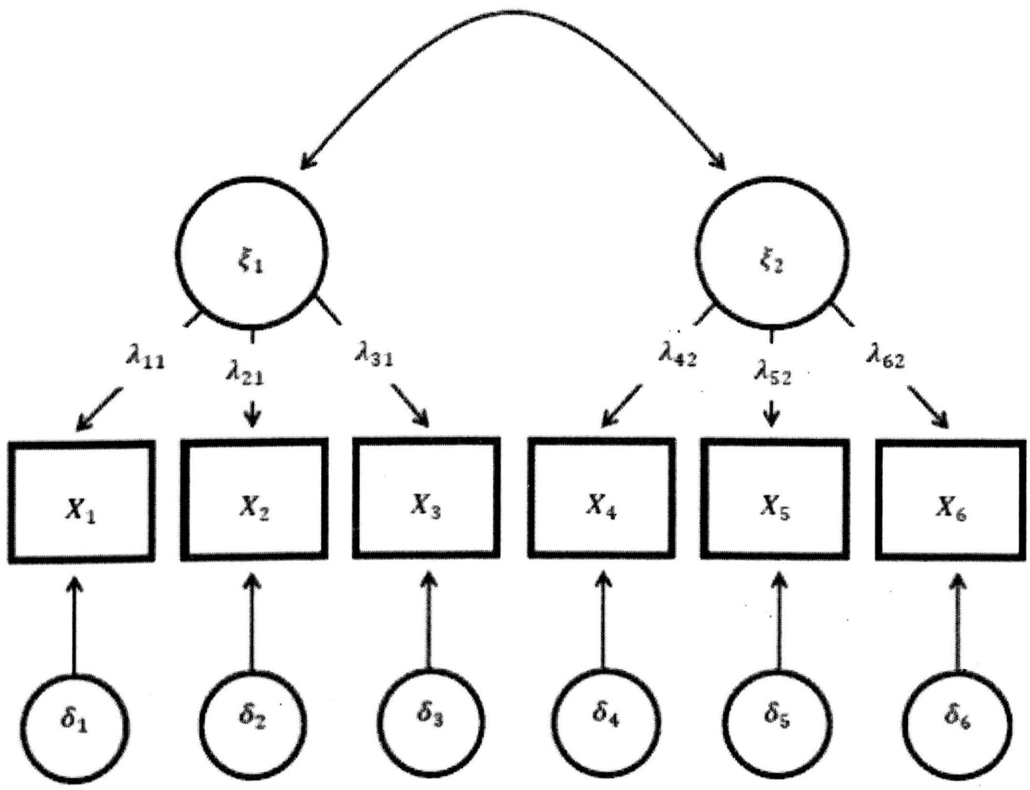

Figure 3.5 General confirmatory factor model with notations.

The errors are assumed to have a mean of zero such that:

$$E(\delta) = 0.$$

It is also assumed that the latent variables and unique factors are uncorrelated such that:

$$E(\xi\delta').$$

The CFA equation can be modified where each x_i is a linear function of a common factor(s) plus an error. Since the mean of the variables are centered, an intercept does not exist. Accordingly:

$$x_1 = \lambda_{11}\xi_1 + \delta_1$$

$$x_2 = \lambda_{21}\xi_1 + \delta_2$$

$$x_3 = \lambda_{31}\xi_1 + \delta_3$$

$$x_4 = \lambda_{42}\xi_2 + \delta_4$$

$$x_5 = \lambda_{52}\xi_2 + \delta_5$$

$$x_6 = \lambda_{62}\xi_2 + \delta_6.$$

CFA bears a remarkable resemblance to regression analysis; as with CFA the ξ_i is unobserved.

A CFA was performed for the one-factor model of the Gen-PS, providing a reasonable fit to the data. The structural equation model was run with EQS Version 6.1 using the maximum likelihood method and multiple goodness-of-fit indexes. Figure 3.6 presents the one-factor model of the Gen-PS generated through the structural equation modeling software, EQS.

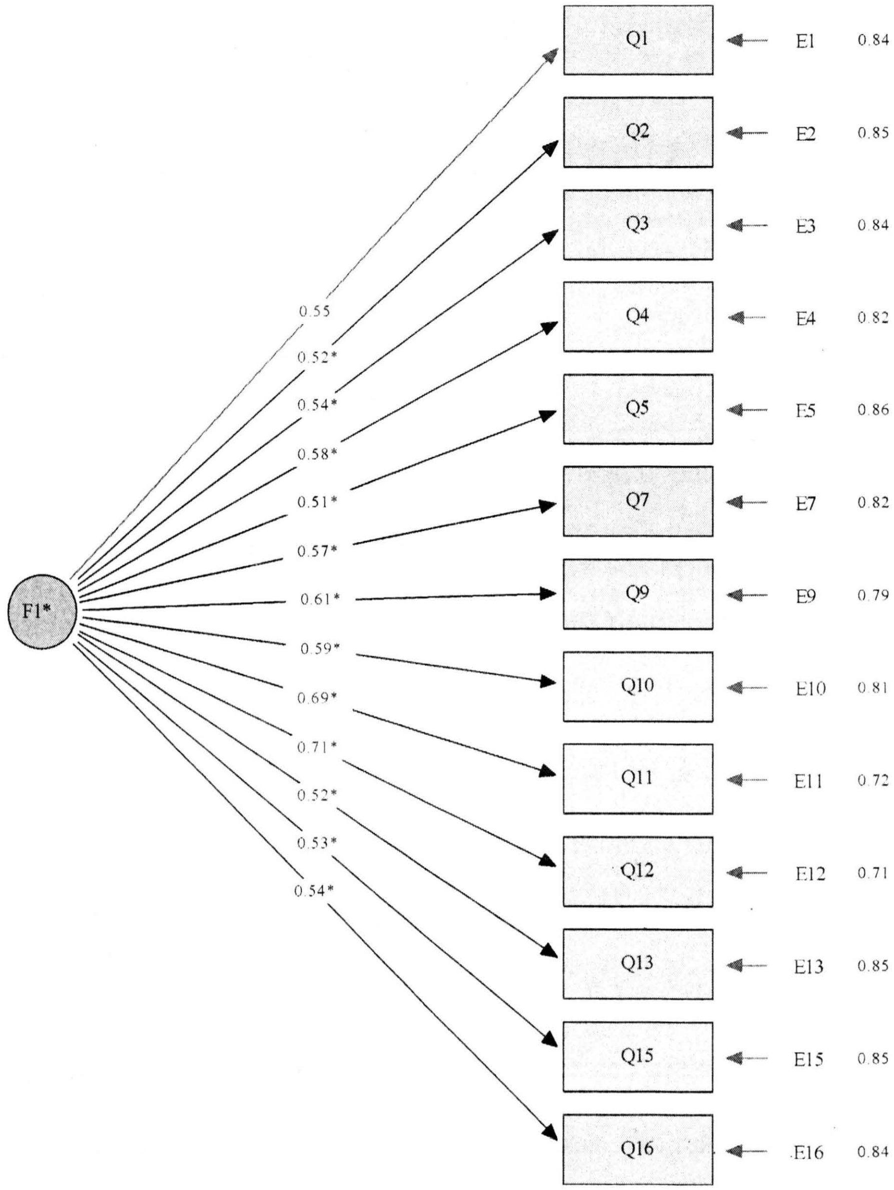

Figure 3.6 One-factor model of Gen-PS from EQS Version 6.1.

Results of the CFA yielded a statically significant $\chi^2 = 385.66, p = 0.00$. Chi-squared is sensitive to sample size. With large samples sizes, usually 400 cases or more, chi-squared values will be inflated, erroneously implying a poor data-to-model fit

(Schumacker & Lomax, 2004). The Root Mean Square Error of Approximation (RMSEA) was 0.10 and Comparative Fit Index (CFI) was 0.80. RMSEA values range from 0 to 1 and are related to the residual in the model. The smaller the RMSEA, the better the model fit. An acceptable model fit is indicated by a RMSEA value of 0.06 or less (Hu & Bentler, 1999); however a value from 0.8 to 0.10 indicates a mediocre fit. CFI values close to 1 indicate a very good fit of the model. Values above 0.90 are considered an excellent model, where a value 0.80 is considered acceptable.

Reliability

Reliability refers to the consistency of the results delivered in a measurement instrument, or how well a set of observed variables measure a latent variable. Reliable tests possess tendencies toward consistency which infers that under the same conditions items that propose to measure the same construct will produce similar scores and generate similar results. Based on the correlations between different items on the same test, reliability, also referred to as internal consistency, is the extent to which measurements are able to yield the same results in repeated trials. Reliability is concerned with the homogeneity of the instrument items. An instrument is considered reliable to the degree that what it is measuring is being measured consistently; the items are highly intercorrelated.

Four basic methods exist for estimating the reliability of empirical measurements: retest method, alternative-form method, split-halves method, and internal consistency method. While each of the methods measures reliability somewhat differently, the internal consistency method measures the consistency within the test instrument. Internal consistency usually coincides with Lee J. Cronbach's (1951) coefficient alpha, α, calculated from pairwise correlations between items. It is defined as the proportion of a scale's total variance attributable to the true score of the latent variable: the measure of the relationship between the squared correlations of observed scores and the true score. A true score is the score that would be obtained if the scores were not contaminated with noise, e.g. fortuitous guessing in the absence of knowledge of the true response (Flanagan, 2010). Cronbach's alpha produces two coefficients: a raw coefficient based of inter-item correlations and a standardized coefficient based upon item covariance.

Consider a k-item measure whose covariance matrix for the item scores $X_1, X_2, \dots, X_k$ such that:

$$\begin{array}{ccccc} & \boldsymbol{X_1} & \boldsymbol{X_2} & \cdots & \boldsymbol{X_k} \\ \boldsymbol{X_1} & Var_1 & Cov_{12} & \cdots & Cov_{1k} \\ \boldsymbol{X_2} & Cov_{12} & Var_2 & \cdots & Cov_{2k} \\ \vdots & \vdots & \vdots & & \vdots \\ \boldsymbol{X_k} & Cov_{1k} & Cov_{2k} & \cdots & Var_k \end{array}$$

or using notations:

$$\begin{bmatrix} \sigma_1^2 & \sigma_{12} & \cdots & \sigma_{13} \\ \sigma_{12} & \sigma_2^2 & \cdots & \sigma_{23} \\ \vdots & \vdots & & \vdots \\ \sigma_{13} & \sigma_{23} & \cdots & \sigma_3^2 \end{bmatrix}.$$

The three variables, X_1, X_2, and X_3, added together make up the scale, Y. Two variables can be readily accessed from the covariance matrix: the total variance of Y (σ_y^2) and the sum of individual item variances ($\sum \sigma_i^2$). The variances, or elements of the main diagonal, are considered single-variable terms; each variance contains information only about one item or unique (non-communal) variation. The off-diagonal elements of the covariance matrix are pairs of terms or common variation. The ratio of non-communal variation to total variation in *Y* is:

$$\frac{\sum \sigma_i^2}{\sigma_y^2}$$

such as its complement or communal variation is:

$$1 - \left(\frac{\sum \sigma_i^2}{\sigma_y^2}\right)$$

where the numerator is based on k values and denominator is based on k^2 values. Recall, the total number of elements in the covariance matrix is k^2 with k non-communal elements and $k^2 - k$ communal elements. To calculate the relative magnitudes, the communal variation is multiplied by:

$$\frac{k^2}{(k^2 - k)}$$

or

$$\frac{k}{(k - 1)}.$$

This limits the range of possible values of alpha to between 0.0 and 1.0, resulting in Cronbach's alpha consistency coefficient defined as:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum \sigma_i^2}{\sigma_{yi}^2}\right).$$

which is equivalent to:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{the\ sum\ of\ item\ variances}{total\ variance}\right).$$

For a standardized alpha, the numerator must equal k times the average item variance, $\bar{v}$, and the denominator must equal k times $\bar{v}$ plus $(k^2 - k)$ [or $(k)(k-1)$] multiplied by the average covariance, $\bar{c}$, such that:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{k \cdot \bar{v}}{k \cdot \bar{v} + (k)(k-1) \cdot \bar{c}}\right).$$

Replacing "1" with its equivalent:

$$\frac{k\bar{v} + (k)(k-1)\bar{c}}{k\bar{v} + (k)(k-1)\bar{c}}$$

allows the consolidation of the equation to:

$$\alpha = \frac{k}{k-1}\left(\frac{k\bar{v} + k(k-1)\bar{c} - k\bar{v}}{k\bar{v} + (k)(k-1)\bar{c}}\right)$$

which simplifies to:

$$\alpha = \frac{k}{k-1}\left(\frac{k(k-1)\bar{c}}{k[\bar{v} + (k-1)\bar{c}]}\right).$$

By cross-canceling the k and $(k-1)$ the equation further simplifies to:

$$\alpha_{standardized} = \frac{k\bar{c}}{\bar{v} + (k-1)\bar{c}}$$

which is the standardized form of Cronbach's alpha.

The internal consistency of the Gen-PS was analyzed with SPSS using Cronbach's alpha coefficient. Scale items 6, 8, and 14 were excluded from the analysis, yielding results found in Table 3.11.

Table 3.11
Reliability Statistics

Reliability Statistics

Cronbach's Alpha	N of Items
.863	13

Reliability coefficients of 0.70 or higher are considered acceptable in most social science research. High values of alpha coefficients implying that the items measure an underlying latent construct. Reliability testing of the Gen-PS yielded a Cronbach's alpha of 0.863 ($\alpha = 0.863$) demonstrating the items have a relatively high inter-item reliability.

CHAPTER IV

CONCLUSION

The purpose of the study was to test the validity and reliability of the Gen-PS; a newly developed scale measuring passion as a personality trait rather than an attitude. Although passion has been generally regarded as an attitude, it was argued that passion can be categorized as a personality trait. Utilizing specific definitions of both constructs, passion was shown to possess the characteristics of a personality trait and therefore measurable as such. The Gen-PS, an instrument of scale, was developed to test the measurability of passion. Factor analysis determined the data structure and identified a one-factor solution measuring passion. Reliability test utilizing Cronbach's alpha coefficient yielded a high level of internally consistency ($\alpha = 0.863$) inferring that the items measure the underlying latent factor. Based on these results, it can be supported that passion is a trait-like personality construct and the Gen-PS is an internally reliable metric of general passion.

Limitations and Future Research

Although initial results of the study are promising, limitations of the study are acknowledged. Repeated testing of the Gen-PS should be conducted with larger and more diverse sample populations. Participants of this study were mostly students enrolled in higher-level education, possibly limiting the generalizability of the facture structure. The scale was validated with a sample population comprised of already higher than average motivated individuals. Since individuals attending college can be considered more highly-motivated than those individuals not in pursuit higher education, further validation of the scale should be conducted with more wide-ranging, comprehensive, and representative sample population.

Factor analysis can only be as good as the data allows. The saying "garbage in, garbage out" has been directed at factor analytic studies more often than toward studies using other multivariate techniques (Floyd & Widaman, 1995). Since psychometric testing is mostly reliant on self-reporting items, the determination of the number of factors and the interpretation of the factors are considerably subjective and highly dependent on the quality of data. The quality of the factor analytic research depends primarily on the quality of input data submitted. Future studies should continue to ensure the quality of the data through careful item selection and item analysis.

With single-item scales, a sizable disadvantage emerges since true reliability can only be determined by either the test-retest method or by the comparison of the same attribute measure with already established psychometric properties. However, the test-retest method also suffers from the dilemma of the impossibility of differentiating the instability of the measurement process from the instability of the phenomenon being measured (DeVellis, 1991). Since reliability is a required condition for validity, reliability can be inferred if validity is evident. Again, repeated testing of the Gen-PS need to be administered in order to conclude if the scale is truly internally reliably.

This study constitutes a first attempt to develop and validate a measure of general passion. Future research should include validation of the Gen-PS across cultural dimensions, examining whether levels of passion are consistent within the nature of particular cultures. Perhaps some cultures are generally less passionate that others. The Gen-PS can also be used to explore the role of passion in business and its relationship regarding successful business/entrepreneurial ventures. Passion has been considered a key construct and underlying critical characteristic of a success entrepreneur. If passion can be effectively correlated with the success of entrepreneurs, great strides can be made in the field of management. Future studies should seek to further validate the Gen-PS, examining the nature of passion as a personality trait, as well as the understanding the effects of passion as an empirically unique construct.

REFERENCES

Ajzen, I. (2005). *Attitudes, personality and behavior*. Berkshire, GBR: McGraw-Hill Education.

Albright, J. J., & Park, H. M. (2009). *Confirmatory factor analysis using Amos, LISREL, Mplus, SAS/STAT CALIS*. Working Paper. The University Information Technology Services (UITS) Center for Statistical and Mathematical Computing, Indiana University, Bloomington, IN.

Allport, G. W. (1937). *Personality: A psychological interpretation*. New York, NY: Holt, Rinehart, & Winston.

Annotated SPSS Output: Factor Analysis. (n.d.) UCLA: *Academic Technology Services, Statistical Consulting Group*. Retrieved from http://www.ats.ucla.edu/stat/spss/output/factor1.htm.

Athayde, R. (2009). Measuring enterprise potential in young people. *Entrepreneurship Theory and Practice*, *33*(2), 481-500.

Augoustinos, M., Walker, I., & Donaghue, N. (2006). *Social cognition: An integrated introduction*. Thousand Oaks, CA: Sage Publications, Inc.

Blalock, Jr., H. M. (1985). *Causal model in the social sciences*. Hawthorne, NY: Aldine Publishing Company.

Blalock, Jr., H. M. (1974). *Measurement in the social sciences: Theories and strategies*. Chicago, IL: Aldine Publishing Company.

Brice, Jr., J., & Spencer, B. (2007). Entrepreneurial profiling: Decision policy analysis of the influence of entrepreneurial self-efficacy on entrepreneurial intent. *Academy of Entrepreneurship Journal, 13*(2), 47-67.

Brinberg, D., & McGrath J. E. (1985). *Validity and the research process.* Beverly Hills, CA: Sage Publications, Inc.

Burger, J. M. (2011). *Personality.* Belmont, CA: Cengage Learning.

Cardon, M. S., & Stevens, C. E. (2009). The discriminate validity of entrepreneurial passion. *Academy of Management Annual Meeting Proceedings.* P1-P6.

Cardon, M. S., Wincent, J., Singh, J., & Drnovsek, M. (2005). Entrepreneurial passion: The nature of emotions in entrepreneurship. *Academy of Management Proceedings.* G1-G6.

Cardon, M. S., Wincent, J., Singh, J., & Drnovsek, M. (2009). The nature and experience of entrepreneurial passion. *Academy of Management Review, 34*(3), 511-532.

Carmines, E. G., & Zeller, R. A. (1979). *Reliability and validity assessment.* Thousand Oaks, CA: Sage Publications, Inc.

Castelda, B. A., Mattson, R. E., MacKillop, J., Anderson, E. J., & Donovick, P. J. (2007). Psychometric validation of the gambling passion scale (GPS) in an English-speaking university sample. *International Gambling Studies, 7*(2), 173-182.

Chatfield, C., & Collins, A. J. (1980). *Introduction to multivariate analysis.* London: Chapman and Hall.

Chen, X., Yao, X., & Kotha, S. (2009). Entrepreneur passion and preparedness in business plan presentations: A persuasion analysis of venture capitalists' funding decisions. *Academy of Management Journal, 52*(1), 199-214.

Child, D. (1990). *The essentials of factor analysis*. London: Cassel Educational Limited.

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, *7*(3), 309-319.

Coolican, H. (2009). *Research methods and statistics in psychology*. London: Hodder Education.

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO personality inventory (NEO-PI-R) and NEO five-factor inventory (NEO-FFI) manual*. Odessa, FL: Psychological Assessment Resources.

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin, 52*, 281-302.

Cronbach, L. J. (1949). *Essentials of psychological testing*. New York, NY: Harper & Row.

DeVellis, R. F. (1991). *Scale development: Theory and applications*. Newbury Park, CA: Sage Publications Inc.

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale (Grit-S). *Journal of Personality Assessment, 91*(2), 166-174.

Feist, J., & Feist, G. J. (2009). *Theories of personality*. New York, NY: McGraw-Hill.

Field, A. (2000). *Discovering statistics using SPSS for windows*. London: Sage Publications.

Flanagan, M. T. (2010). Cronbach analysis: An application performing a Cronbach's alpha consistency analysis. *Michael Thomas Flanagan's Java Scientific Library*. Retrieved from http://www.ee.ucl.ac.uk/~mflanaga/java/CronbachAnalysis.html.

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, 7(3), 286-299.

Forgas, J. P., Cooper, J., & Crano, W. D. (2010). *The psychology of attitudes and attitude change*. New York, NY: Taylor and Francis Group, LLC.

Funder, D. C. (2007). *The personality puzzle*. New York, NY: Norton.

Gentile, B. F., & Miller, B. (2008). *Foundations of psychological thought: A history of psychology*. Los Angeles, CA: Sage.

Gliem, J. A., & Gliem, R. R. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. *Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education*, The Ohio State University, Columbus, OH.

Haldane, E. L., & Ross, G. R. (1911). *The philosophical works of Descartes*. New York, NY: Dover.

Harris, R. J. (1975). *A Primer of Multivariate Statistics*. New York, NY: Academic Press, Inc.

Hendriks, A. A. J. (1997). *The construction of the five-factor personality inventory (FFPI).* Groningen, The Netherlands: University of Groningen.

Howell, J. M., Shea, C. M., & Higgins, C. A. (2005). Champions of product innovations: Defining, developing, and validating a measure of champion behavior. *Journal of Business Venturing, 20*, 641-661.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1-55.

Ivancevic, V. G., & Ivancevic, T. T. (2007). *Computational mind: A complex dynamics perspective*. Berlin: Springer.

Izard, C. E. (1991). *The psychology of emotions*. New York, NY: Springer.

Janda, L.H. (1998). *Psychological testing: Theory and applications*. Needham Heights, MA: Allyn & Bacon.

Kilmann, R. H., & Thomas, K. W. (1977). Developing a forced-choice measure of conflit-handling behavior: The "MODE" instrument. *Educational and Psychological Measurement, 37*(2), 309-325.

Kim, J. O., & Mueller, C. W. (1978). *Introduction to factor analysis: What it is and how to do it.* Newbury Park , CA: Sage.

Kline, R. B. (1998). *Principles and practice of structural equation modeling*. New York, NY: The Guilford Press.

Lawrie, R. (1980). Passion. *International Phenomenological Society, 41*(1/2), 106-126.

Lazarsfeld, P. F. (1954). *Mathematical thinking in the social sciences*. Glencoe, IL: The Free Press.

Lewis, M., Haviland-Jones, J. M., & Barrett, L. F. (2008). *Handbook of emotions*. New York, NY: The Guilford Press.

Linan, F., & Chen, Y. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship: Theory and Practice, 33*(3), 593-617.

MacCorquodale, K., & Meehl, P. E. (1948). On a distinction between hypothetical constructs and intervening variables. *Psychological Review, 55*, 95-107.

Mageau, G. A., & Vallerand, R. J. (2007). The moderating effect of passion on the relation between activity engagement and positive affect. *Motivation and Emotion, 31*(4), 312-321.

Mageau, G. A., Vallerand, R. J., Charest, J., Salvy, S., Lacaille, N., Bouffard, T., & Koestner, R. (2009). On the development of harmonious and obsessive passion: The role of autonomy support, activity specialization, and identification with the activity. *Journal of Personality, 77*(3), 601-646.

Marascuilo, L. A., & Levin, J. R. (1983). *Multivariate statistics in the social sciences: A researcher's guide*. Monterey, CA: Brooks/Cole Publishing Company.

McDonald, R. P. (1978). A simple comprehensive model for the analysis of covariance structures. *British Journal of Mathematical and Statistical Psychology, 37*, 234-251.

McGee, J. E., Peterson, M., Mueller, S. L., & Sequeira, J. M. (2009). Entrepreneurial self-efficacy: Refining the measure. *Entrepreneurship: Theory and Practice, 33*(4), 965-988.

Michel, G., Mouren-Simeoni, M.–C., Perez-Diaz, F., Falissard, B., Carton, S., & Jouvent, R. (1999). Construction and validation of a sensation seeking scale for adolescents. *Personality and Individual Differences, 26*, 159-174.

Millon, T., Lerner, M. J., & Weiner, I. B. (2003). *Handbook of psychology, personality and social psychology*. Hoboken, NJ: John Wiley & Sons, Inc.

Norman, G. R., & Streiner, D. L. (2008). *Biostatistics: The bare essentials*. Hamilton, ON: BC Decker Inc.

Nunnally, J. C. (1967). *Psychometric theory*. New York, NY: McGraw-Hill.

Olson, J. M., & Zanna, M. P. (1993). Attitudes and attitude change. *Annual Review of Psychology, 44*, 117-154.

Pallant, J. (2001). *SPSS survival manual*. Maidenhead, PA: Open University Press.

Philippe, F. L., Vallerand, R. J., Houlfort, N., Lavigne, G. L., & Donahue, E. G. (2010). Passion for an activity and quality of interpersonal relationships: The mediating role of emotions. *Journal of Personality and Social Psychology, 98*(6), 917-932.

Rip, B., Fortin, S., & Vallerand, R. J. (2006). The relationship between passion and injury in dance students. *Journal of Dance Medicine & Science, 10*(1-2), 14-20.

Robichaud, Y., McGraw, R., & Roger, A. (2001). Toward the development of a measuring instrument for entrepreneurial motivation. *Journal of Developmental Entrepreneurship*, *6*(2), 189-201.

Rosenberg, M. J., & Hovlande, C. I. (1960). *Cognitive, affective, and behavioral components of attitudes.* NewHaven, CT: Yale University Press.

Rousseau, F. L., & Vallerand, R. J. (2008). An examination of the relationship between passion and subjective well-being in older adults. *International Journal of Aging and Human Development, 66*, 195-211.

Rousseau, F. L., Vallerand, R. J., Ratelle, C. F., Mageau, G. A., & Provencher, P. J. (2002). Passion and gambling: On the validation of the gambling passion scale (GPS). *Journal of Gambling Studies, 18*(1), 45-66.

Rummel, R. J. (1970). *Applied Factor Analysis*. Evanston, IL: Northwestern University Press.

Sani, F., & Todman, J. (2006). *Experimental design and statistics for psychology: A first course*. Malden, MA: Blackwell Publishing.

Saud, M. B. (2009). An attitude approach to the prediction entrepreneurship on students at institution of higher learning on Malaysia. *International Journal of Business and Management*, *4*(4), 129-135.

Schreiber, J. B., Stage, F. K., King, J., Nora, A., & Barlow, E. A. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research*, *99*(6), 323-337.

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*. Mahwah, NJ: Lawrence Erlbaum Associates.

Shane, S., Locke, E. A., & Collins, C. J. (2003). Entrepreneurial motivation. *Human Resource Management Review, 13*, 257-279.

Shriberg, A., & Shriberg, D. (2011). *Practicing Leadership Principles and Applications*. Hoboken, NJ: John Wiley & Sons, Inc.

Solomon, M. (2009). *Consumer behavior buying, having, and being*. Upper Saddle River, NJ: Pearson Prentice Hall.

Solomon, R. C. (1993). *The passions: Emotions and the meaning of life*. Indianapolis, IN: Hackett Publishing Company, Inc.

Srivastava, S. (2011). *Measuring the big five personality factors*. The Personality and Social Dynamics Lab. Retrived from http://www.uoregon.edu/~sanjay/bigfive.html.

Sternberg, R. J. (1997). Construct validation of a triangular love scale. *European Journal of Social Psychology 27*, 313-335.

Strongman, K. T. (2003). *The psychology of emotion: From everyday life to theory*. Hoboken, NJ: Wiley.

Suhr, D. D. (n.d.) Exploratory or confirmatory factor analysis? *Statistics and Data Analysis*, 200-231. Retrieved from http://www2.sas.com/proceedings/sugi31/200-31.pdf.

Suhr, D. D. (n.d.) Principal component analysis vs. exploratory factor analysis. *Statistics and Data Analysis*, 203-230. Retrieved from http://www2.sas.com/proceedings/sugi30/203-30.pdf.

Thompson, E. R. (2009). Individual entrepreneurial intent: Construct clarification and development of an internally reliable metric. *Entrepreneurship Theory and Practice, 33*(3), 669-694.

Vallerand, R. J., Blanchard, C. M., Koestner, R., & Gagne, M. (2001). *Les passions de l'ame: On obsessive and harmonious passion.* Manuscript in preparation, Universite du Quebec a Montreal, Montreal, Canada.

Vallerand, R. J., Blanchard, C. M., Mageau, G. A., Koestner, R., Ratelle, C. F., Leonard, M., & Gagne, M. (2003). Les passions de l'ame: On obsessive and harmonious passion. *Journal of Personality and Social Psychology, 85*, 756-767.

Vallerand, R. J. (2008). On the psychology of passion: In search of what makes people's lives most worth living. *Canadian Psychology, 49*(1), 13.

Vallerand, R. J., Salvy, S., Mageau, G. A., Elliot, A. J., Denis, P. L., Grouzet, F.M.E., & Blanchard, C. (2007). On the role of passion in performance. *Journal of Personality, 75*(3), 505-533.

Wang, C., & Chu, Y. (2007). Harmonious passion and obsessive passion in playing online games. *Social Behavior and Personality, 35*(7), 997-1006.

Weiten, W. (2010). *Psychology: Themes and variations*. Belmont, CA: Cengage Learning.

APPENDIX A

Final Version: General Passion Scale

Thank you for participating in this research study. This study is part of a bigger effort to understand the psychological basis of entrepreneurship. ***The return of your completed questionnaire constitutes your informed consent to act as a participant in this research.*** *Thank you again for your time and participation in our study.*

	Self-evaluative items	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	Whatever I do, I do with great enthusiasm.	1	2	3	4	5
2	My life revolves around my interests.	1	2	3	4	5
3	I become emotionally attached to my interests.	1	2	3	4	5
4	I am an enthusiastic person.	1	2	3	4	5
5	My friends consider me a passionate person.	1	2	3	4	5
6	My interests become an obsession.	1	2	3	4	5
7	I feel I am a passionate person.	1	2	3	4	5
8	I rarely get excited about anything.	1	2	3	4	5
9	It is hard for me to imagine my life without pursuing my passion.	1	2	3	4	5
10	I get excited when talking about something I am interested in.	1	2	3	4	5
11	I find myself thinking about my interests frequently in one day.	1	2	3	4	5
12	I am extremely dedicated to my interests.	1	2	3	4	5
13	I would sacrifice almost anything to pursue my interests.	1	2	3	4	5
14	I have many different subjects of interest.	1	2	3	4	5
15	I enjoy sharing my interest with others.	1	2	3	4	5
16	I do not hesitate speaking up to defend my interests.	1	2	3	4	5
17	Your gender?	Male			Female	
18	Your age?	____________ years old				

APPENDIX B

IRB Approval Letter

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378 Fax 940-898-3416
e-mail: IRB@twu.edu

April 14, 2010

Ms. Lilian Chu
17211 Marianne Circle
Dallas, TX 75252

Dear Ms. Chu:

Re: General Passion Scale

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was determined to be exempt from further review.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. Because a signed consent form is not required for exempt studies, the filing of signatures of participants with the TWU IRB is not necessary.

Another review by the IRB is required if your project changes in any way, and the IRB must be notified immediately regarding any adverse events. If you have any questions, feel free to call the TWU Institutional Review Board.

Sincerely,

Kathy DeOrnellas, PhD.

Dr. Kathy DeOrnellas, Chair
Institutional Review Board - Denton

cc. ✓ Dr. Don Edwards, Department of Mathematics & Computer Science
Dr. Mark Hamner, Department of Mathematics & Computer Science
Graduate School