ABSTRACT

Flow, Hypnotizability, Absorption, and Neuroticism in a College Student Population

Juliette J. Bowers, Psy.D.

Mentor: Gary Elkins, Ph.D.

The concept of “flow” refers to a state of attention and concentration in a current task. Benefits of entering a flow state may include the ability to optimize performance by reducing conscious cognitive processing (Nakamura & Csikszentmihalyi, 2002). For example, studies have found a state of flow is associated with improved athletic performance (Swann, Keegan, Piggot, & Crust, 2012). However, little is known about the relationship between other constructs and the impact they have on flow state. Dietrich (2004) has suggested that the ability to enter a flow state may relate to the same conscious state as hypnosis and absorption. Research also suggests a negative correlation between neuroticism and flow (Ullen et al., 2012). Further, Carlstedt (2004) posits a theory on optimal performance which suggests that high hypnotizability, high absorption ability, and low neuroticism may combine to improve the ability to enter a flow state. The present study addresses the relationship between flow and the constructs of hypnotizability, absorption, and neuroticism. One hundred and seventy undergraduate students completed measures of flow (CORE Flow Scale; CORE), hypnotizability (Elkins Hypnotizability Scale; EHS), absorption (Tellegen Absorption Scale; TAS), neuroticism (International Personality Item Pool- Neuroticism; IPIP-N), and dispositional flow (Dispositional Flow Scale-long version; DFS). Results indicated positive correlations between CORE and EHS as well as between DFS and IPIP-N. Multiple regression analysis confirmed a relationship between DFS, EHS, and CORE such that DFS has a moderating effect on the relationship between EHS and CORE. Results of this study advance knowledge of the gaps in components of flow and our understanding of the flow state experience by expanding on the relationship between flow state and hypnosis as well as neuroticism.

Flow, Hypnotizability, Absorption and Neuroticism in a College Student Population

by

Juliette Bowers, M.A., M.S.C.P.

A Dissertation

Approved by the Department of Psychology and Neuroscience

____

Charles A. Weaver III, Ph.D., Chairperson

Submitted to the Graduate Faculty of
Baylor University in Partial Fulfillment of the
Requirements for the Degree
of

Doctor of Psychology

Approved by the Dissertation Committee

____

Gary R. Elkins, Ph.D., Chairperson

____

Thomas A. Fergus, Ph.D.

____

Sara L. Dolan, Ph.D.

____

John W. Klocek, Ph.D.

____

Corey P. Carbonara, Ph.D.

Accepted by the Graduate School
August 2016

____

J. Larry Lyon, Ph.D., Dean

Page bearing signatures is kept on file in the Graduate School.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

I would like to thank the many people in the Mind-Body Medicine Research Laboratory who helped to make this dissertation possible. In particular I would like to acknowledge my dissertation chair, Dr. Gary Elkins. Without all the advice and hours that he contributed, this dissertation would not have come together. Additionally, I would like to thank my committee, Dr. Thomas Fergus, Dr. Sara Dolan, Dr. John Klocek, and Dr. Corey Carbonara for the time and knowledge that they contributed to this dissertation.

DEDICATION

To my family, especially my parents: without their support and love I never would have become the person I am today. Additionally, I would like to dedicate this to Justine and Nicole, who held me accountable through hours and hours of work by inspiring me and matching me sweet tea for sweet tea. I could not have created better partners in writing if I had tried.

CHAPTER ONE

Introduction

Flow

Flow is a subjective state that involves heightened attention and concentration in the task at hand. Inspired by theories such as Maslow's (1965) "peak experiences," deCharms and Muir's (1978) social motivation, and Deci and Ryan's (1985) self-determination theory, Csikszentmihalyi first published on flow theory in 1975. Similar to these theories, flow is a theory based on intrinsic motivation (Csikszentmihalyi, 1975). Csikszentmihalyi reported a strong interest in intrinsic motivation, but even more so, he described a desire to understand the experience of this motivation rather than why people wished to achieve it (Csikszentmihalyi, 1988). Several factors make up the definition of flow, which will be described in the following paragraphs. Levin and Steele (2005) describe flow as being a "green transcendent experience" (p. 90). According to these authors, a green transcendent experience is a profound, transitory experience that involves great pleasure, which may be difficult to describe (Levin & Steele, 2005).The nature of being a state means that there are factors that must be present to enter the state as well as factors that exist during this state. According to the definition of flow, there are two components of flow, the prerequisites and the experiential components, and nine factors of flow, including the autotelic experience (Csikszentmihalyi, 2000). In order for a flow state to occur, three different factors must be present prior to beginning a task: these are known as the prerequisite components. The prerequisites of flow state include the factors of challenge-skill balance, clear goals, and unambiguous feedback.

Additionally, five factors are used to describe the flow experience and are known as the experiential components. A final factor of flow describes the overall experience and is known as the autotelic experience.

In regards to challenge-skill balance, during a flow state it is assumed that someone is functioning at an optimal level in skill for a task and level of challenge. This means that the person is not distracted by concerns about ability level because the person experiences an optimal balance of the perceived challenge of the task and perceived ability to complete the task. When describing challenge of a task, flow state has been conceptualized on a continuum with anchors being anxiety, as defined by a combination of high perceived challenge and/or low perceived ability, on one end and boredom, as defined by a combination of low perceived challenge and/or high perceived ability, on the other. In this model, flow state is located in the middle of this continuum because there is a match between perceived ability and perceived skill. In a state of flow, there is an interaction between the person and the environment based on the capabilities of the person and the challenge of the task (Nakamura & Csikszentmihalyi, 2002). Particularly, consistent with the theory, Csikszentmihalyi (2014) argues that high challenges that are complemented by high skills or abilities of the person are optimal to achieve a state of flow, maximizing the chances that a person will enter this state. This high challenge could be in an individual challenge, such as rock climbing, where each climb is different from the previous climb. It could also be found in a competitive experience such as a chess match where the challenge is the opponent across the table (Csikszentmihalyi, 2014).

The challenge-skill balance has been studied by Fullagar, Knight, and Sovern (2013) through musicians' perceived challenge of a task, perceived skill in a task, flow state, and challenge/skill balance. Musicians were asked to complete questions involving all four of these areas weekly following practice over the course of 10 weeks and leading up to a recital. Fullagar et al. (2013) found that flow, as measured by the Flow State Scale (Jackson & Eklund, 2004), was more likely to occur when challenge and skill matched. The authors also found that performance anxiety, as defined by the discrepancy between challenge and skill, prior to a task led to unbalance, and therefore the person was less likely to enter a flow state (Fullagar, Knight, & Sovern, 2013).

Additional pre-requisites include clear goals and unambiguous feedback. Clear goals and unambiguous feedback allow a person to know what needs to be done, increasing the probability of his or her immersion in the moment. There is an expectation to entering a flow state that people understand their ability to complete the task (Csikszentmihalyi, 1988). Individual differences are considered within flow state including goals, task, and the ability to perform under pressure. An example may be that while some tasks may be more adaptive to higher levels of physiological arousal, such as running (Davis, & Green, 2009), other tasks, such as those involving fine motor skills, are much more difficult to perform with high anxiety. Depending on the task, the person and the person's goals, these factors could affect a person's ability to enter a flow state.

In his book on flow states Csikszentmihalyi (1990) describes flow state as:

> The best moments in our lives, are not the passive, receptive, relaxing times—although such experiences can also be enjoyable, if we have worked hard to attain them. The best moments usually occur when a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile. Optimal experience is thus something that we make happen. For a child, it could be playing with trembling fingers the last block on a tower she has

> built, higher than any she has built so far; for a swimmer, it could be trying to beat his own record; for a violinist, mastering an intricate musical passage. For each person there are thousands of opportunities, challenges to expand ourselves. (p. 3)

This emphasizes the pre-requisites and challenge-skill balance for each individual to attain flow state, highlighting the individualist nature of flow state and the demanding nature of the task at hand. Hard work is an element of this description as well as goals that vary based on developmental ability and performance area.

In addition to the pre-requisite components, five factors describe the experience of a state of flow including: action-awareness merging, concentration in the task at hand, sense of control, loss of self-consciousness, and transformation of time. Experientially, flow state describes a person who is both engrossed and shows high concentration in the task at hand. A flow state incorporates a balanced experience of a loss of awareness and a sense of control. The first of the factors, action-awareness merging describes a sense that one is so focused on the activity, that all of a person's awareness is on it. Concentration on the task at hand is similar to this and incorporates a sense of enjoyment that a person experiences, causing the person to desire to concentrate on the activity. Sense of control describes the feeling of the challenge-skill balance in the moment, the experience that a person is capable of achieving the task. Loss of self-consciousness continues to describe the immersion in the task because all other problems are forgotten when a person is in this state. The final experiential component is that of transformation of time. When in flow state, time may become distorted as the individual becomes absorbed. Time may slow for an individual as he notices every detail around him and being very productive in a short period of time. Time could also speed up for an individual, where the person looks back and cannot remember the experience beyond feelings of accomplishment

(Csikszentmihalyi, 1988). To describe the experiential components, Allison and Duncan (1988) quote a participant who describes flow as being: "totally absorbed in what you are doing and … enjoy[ing] it so much that you don't want to be doing anything else, I don't see how people survive if they don't experience something like that" (p. 124).

Finally, the ninth factor of flow state is the autotelic experience. The autotelic experience can be described as an intrinsically rewarding experience, "having a goal within itself" (Csikszentmihalyi, 2014, p. 181). The autotelic experience is one in which a person is performing an activity for pure enjoyment rather than possible benefits from the outcome (Csikszentmihalyi, 1990). Based on flow theory, flow state creates a sense of intrinsic motivation and enjoyment in a task that encourages continued participation in the activity. This intrinsic motivation is encompassed in the autotelic experience and an important part of what makes flow beneficial (Nakamura & Csikszentmihalyi, 2002).

In his book on flow states, Csikszentmihalyi (1990) discusses the primary benefit of flow state as influencing happiness in an individual's life. Intrinsic reward is increased in experiences that are beyond external rewards due to their high level of enjoyment. It is in this state that people are capable of being at their fullest capacity. According to Csikszentmihalyi (1990) the requirements of challenge-skill balance, intrinsic motivation, and loss of self-consciousness are direct reflections of happiness, making happiness a primary benefit of flow state. Csikszentmihalyi (2014) suggests that feelings of intrinsic motivation and enjoyment may allow the self to grow and flourish during flow experiences (Csikszentmihalyi, 2014). One area that may allow for the most self-growth is the workplace, where flow state is more frequent. The increase in flow state in the workplace compared to leisure activities is explained through the challenges that people tend to face allowing for optimal experience that may not be experienced in leisure activities (Csikszentmihalyi & LeFevre, 1989).

The secondary benefits of entering a flow state include the ability to optimize experience and therefore continued participation in a task. Optimal performance is described as acting in the most efficient manner by minimizing cognitive effort for the most advantageous results. The reduction in distracting thought and trust in one's ability to meet the current task increases a person's willingness to continue a task as well as a person's intrinsic motivation. Rebeiro and Polgar (1999) suggest that flow theory is essential for occupational therapy due to the goal of increasing intrinsic motivation and matching the client's goals so that practice will continue and the client can improve. Additional research in occupational therapy suggests that occupational therapy patients who are able to experience flow state tend to experience the benefits of positive mood, higher self-esteem, and a higher ability to concentrate which are associated with flow state in addition to optimal performance (Harmon, et al., 2012).

The benefits of flow can occur when each action is made worthwhile and a sense of participation in one's own life is created. The benefits can occur through many different aspects of life. Recognizing flow means noting both the physical and mental aspects of one's life from sports to sex as well as the intrinsic enjoyment of thought. The benefits of flow state are applicable whether in sport, art, school, or politics (Csikszentmihalyi, 2000). The concept of flow state can be applied in multiple populations and areas of interest. It has been reviewed for this benefit in sport (Swann, Keegan, Piggot, & Crust, 2012), such that athletes perform at their optimum level, both physically and mentally, when in a state of flow.

Benefits of flow have also been studied with flow's correlation with healthy aging. Payne, Jackson, Noh, and Stine-Morrow (2011) suggest that flow could influence comfort, happiness, and healthy aging in elderly adults capable of entering a flow state. The authors found that older adults with more cognitive resources were more likely to have higher flow states during cognitive tasks. On the other hand, older adults with fewer cognitive resources were more likely to have higher flow states during non-cognitive tasks. The authors suggest that earlier positive educational experiences may encourage more cognitive tasks in older adulthood if they are perceived as more enjoyable and can match the level of the participant (Payne, et al., 2011).

Additional studies have confirmed the benefits of flow even in activities that are not physically active. Such studies include research in a videogame player's ability to enter flow state as well as the importance of flow traits in the enjoyment of playing on new gaming systems (Seger & Potts, 2012; Shafer, Carbonara, & Popova, 2011). Seger and Potts (2012) studied college students' videogame frequency and flow state with the aim to compare these experiences and dispute current research on videogame experience. Flow was measured through self-report items reflecting the experiential components of flow state as well as challenge-skill balance. Additionally, the self-report contained distractor items that did not reflect flow state. After studying 185 participants who reported playing at least one hour of videogames a week and measuring flow state, Seger and Potts (2012) found that a low need for physical activity predicted flow frequency in college videogame players. This study challenges the idea that flow state must be experienced in contexts with physical arousal (Nakamura & Csikszentmihalyi, 2002). While intrinsic motivation is also an important factor in flow states during videogame play, research also confirms the need for challenge-skill balance by comparing hours played with flow state frequency (Seger & Potts, 2012).

Other populations that benefit from flow include performing artists, piano players, and chess players. As suggested by Gruzelier, Inoue, Smart, Steed, and Steffert (2010), performing artists can utilize sensory-motor rhythm (SMR) neurofeedback, which involves EEG feedback of beta and theta waves, to increase flow by reducing their anxiety and learning to better assess their perceived skill level versus the perceived level of challenge (Gruzelier, et al., 2010). Gruzelier et al. (2010) studied 15 students using virtual reality to project an audience and teach slow wave training to students either through SMR and virtual reality, SMR and computer screen audience, or no training control. Experts rated performance of students and found that the virtual reality, SMR group had the highest flow ratings and highest improvement.

Another performing arts group that has been studied is piano players, by exploring the setting in which pianists perform most optimally. By studying 21 professional pianists, de Manzano, Theorell, Harmat, and Ullen (2010) were able to evaluate the physiological state in which pianists enter flow state. This involved measures of heart period, blood pressure, and thoracic respiration as well as self-report measures of flow. de Manzano et al. (2010) reported that optimal states which indicate a likelihood of entering a flow state involve high attention and positive valence (de Manzano, Theorell, Harmat, & Ullen, 2010). Csikszentmihalyi (1992) states that other populations that may have an increase of positive performance due to flow state are chess players and writers (Csikszentmihalyi, 1992). In summary, flow state is beneficial because it increases enjoyment, intrinsic reward, optimal performance, and shows a better response to neurofeedback. These benefits have been shown in research with older adults, college students, performing artists, and athletes (Payne, et al., 2011; Seger & Potts, 2012; deManzano, et al., 2010; Swann, et al., 2012).

Due to the benefits of flow, further exploration of the construct is important. One construct that may correlate with flow state is hypnosis based on transient hypofrontality hypothesis (Dietrich, 2004), which will be explained further following this description of hypnosis and hypnotizability.

Hypnosis and Hypnotizability

The concept of hypnosis dates back over 220 years (Barnier, & Nash, 2008). Hypnosis refers a state of focused attention, heightened ability and response to suggestions, being fully immersed in the experience, and the ability to mentally separate from thoughts that normally occur together (Park, 2013). Recently, the President of APA Division 30 appointed four prominent members of the hypnosis community to create a definition of hypnosis that addresses criticisms of past definitions of hypnosis. These members were a part of the Hypnosis Definition Committee (HDC). In 2014, the HDC defined hypnosis as "a state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion" (Elkins, Barabasz, Council, & Spiegel, 2015, p. 6). A hypnotic induction is described as a procedure which begins with a discussion of the process, such as suggestions for relaxation, between the hypnotherapist and the participant. The participant is guided through the hypnotic induction by the hypnotherapist using suggestions for imagery and altered perceptions. Specific suggestions based on the participants needs may be added as well (Barnier & Nash, 2008). Barnier and Nash (2008) state that there are two components necessary to a hypnotic procedure: the introduction and the initial suggestion (Barnier & Nash, 2008). Features of a hypnosis experienced by the subject include a feeling of time distortion, lack of inhibition, and lack of awareness (Brann, Owens, & Williamson, 2012).

Hypnotizability, as defined by the HDC, is "an individual's ability to experience suggested alterations in physiology, sensations, emotions, thoughts, or behavior during hypnosis" (Elkins, et al., 2015, p. 6). Hypnotizability has been shown to have a broad range of differences in ability levels (Hilgard, 1965) and has been found to be a relatively stable trait over time (Piccione, Hilgard, & Zimbardo, 1989). Piccione, Hilgard, and Zimbardo (1989) found that over a 25-year period, groups did not have significant changes in their hypnotizability.

One approach to measuring hypnotizability is by taking a participant through a hypnotic induction and assessing the participant's ability to perform a standardized set of suggestions. Hypnotizability is usually measured on a scale from 0-12 such as with the Elkins Hypnotizability Scale (EHS) (Elkins, 2014) or the Stanford Hypnotic Susceptibility Scale, form C (SHSS-C) (Weizenhoffer & Hilgard, 1962). It has been proposed by Terhune (2012) that suggestions to measure hypnotizability can be either facilitative or inhibitory types in the domains of motor, perceptual, or cognitive. Examples of facilitative types may be arm raising (motor), positive hallucinations (perceptual), or dissociation (cognitive). Examples of inhibitory types may be arm heaviness (motor), lack of sensory response (perceptual), or post-hypnotic amnesia (cognitive). Administrators of hypnotizability scales can assess the level with which a participant completes the task as well as inquire about the participant's subjective experience of the scale.

It has been suggested, based by Dietrich's (2004) the transient hypofrontality hypothesis and studies using EEG that hypnosis is a state that uses less frontal lobe activity (Halligan & Oakley, 2013; Jensen et al., 2015) and that there is a distinct state in highly hypnotizable participants (Jensen et al., 2015). Notable similarities arise in describing hypnosis and flow state such as transformation of time and focused attention. These similarities have led to a number of theories hypothesizing a significant correlation.

Theories of Flow State and Hypnotizability

Several theorists have noted the potential similarity between flow state and hypnotizability. Dietrich (2004) hypothesizes that flow requires a specific brain state in order to focus one's attention on the task at hand, maximizing skill and maximizing efficiency. This state is commonly associated with hypnosis, meditation, and runners' high (Bruya, 2010; Dietrich, 2003; Dietrich, 2004). Carlstedt (2004), approaches the relationship of hypnosis and flow state from a clinical and sport psychology perspective, suggesting that highly hypnotizable people may have dissociative feelings, such as loss of self-conscious-ness, action-awareness merging, and transformation of time associated with flow and may be able to sustain flow if they can reduce negative self-talk that is associated with neuroticism.

These theoretical associations are supported by Dunlap (2005). Dunlap expands on research by Grove and Lewis (1996) in which pencil and paper measures suggested a relationship between flow-like experiences and hypnotic susceptibility in athletes. Dunlap

(2005) administered the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS: A) (Shor, & Orne, 1962), a group measure of hypnotizability, as well as the Dispositional Flow Scale (DFS) (Jackson & Eklund, 2002) in a college athlete (n = 160) and non-athlete population (n = 171) in order to explore the relationship between these constructs. Dunlap (2005) did not find a significant relationship between hypnotizability and flow state in the non-athlete student population (r= .09, *ns*). Interestingly, when comparing the HGSHS: A and DFS with only the athlete population, Dunlap (2005) found a larger correlation (r = .205, p < .01). This study was limited by the use of a group hypnotic scale where distractions could occur. Further limitations of group hypnotizability are the increased opportunity for results to be influenced by social facilitation. In addition, the HGSHS: A is a screening instrument that does not identify the full range of hypnotizability. Furthermore, the DFS scale requires an experience to follow the statement "When participating in…" The author gives no indication that a similar statement was used across athlete and college student populations. Athletes may have more easily understood a prompt that was related to athletics, whereas non-athlete college students may not have. This may have led to a discrepancy between group experiences. This research suggests a possible similarity between flow and the constructs of hypnosis and absorption, which may indicate a complex relationship. The current study addresses some of these limitations by using a similar sample with a specific task (i.e. "When studying") as well as using an individualized hypnotizability scale instead of the HGSHS:A screening instrument.

Hypnosis Inducing Flow

Consistent with Dietrich's (2004) hypothesis that hypnosis and flow may be similar states, research has suggested that hypnosis may be utilized to induce a state of flow and thereby increase performance. For example, Pates, Oliver, and Maynard (2001) and Pates Cummings, and Maynard studied athletes, finding that a hypnosis intervention increased both performance and flow state from baseline. Both studies utilized the Flow State Scale (Jackson & Marsh, 1996) in order to measure flow. This research suggests that hypnosis is useful for performers who want to increase frequency of flow states, but does not enhance on the field's knowledge of the experiential similarities between hypnotizability and flow state.

Recently, Pates (2013) reported a case study of an elite golfer using hypnosis in order to improve his performance. The golfer used hypnosis to learn to trigger emotions, feelings and thoughts that he associated with his peak performance. The participant was trained in the use of hypnosis prior to performance and it was practiced between sessions. Hypnosis was not used while performing, but rather the study used post-hypnotic suggestion to pair a trigger, such as the golf club, with flow state to induce this experience. Results indicated an improvement in the participant's golf score and an increase in his flow state overall, as measured by the Flow State Scale-2 (Jackson & Eklund, 2002). Several other studies, both case studies and pilot studies, reported on the use of hypnosis to increase flow in athletes with successful results, highlighting the benefit of relating hypnosis to flow with athletes (Pates & Cowen, 2013; Pates, Maynard, & Westbury, 2001; Lindsay, Maynard, & Thomas, 2005).

Studies using this strategy report several stages of treatment in the intervention. The first stage includes a progressive muscle relaxation script followed by the second stage, which is the hypnotic induction. The third stage involves a mental regression to a previous flow state experience, and best competitive performance, using as many sensory cues as the participants can recall. During the next step, a natural trigger, such as a golf club handle, is paired with the performance. Following this, the participant is given suggestions for alertness, followed by training within the field of performance. Results from these studies have shown the utility of using hypnosis to enhance peak performance (Pates, et al., 2001; Pates & Cowen, 2013; Pates, 2013; Lindsay, et al., 2005; Pates, et al., 2002; Pates, et al., 2013). The current study intends to explore the relationship between hypnosis and flow state in an alternate population, namely college students.

Moderating Factors

As previously discussed, Dietrich (2003) suggests that flow and hypnosis may both constitute an altered state of consciousness. While hypnosis may be able to expand our knowledge about the state of flow and provide more information about how the state may be replicated, there are a number of factors that may influence this relationship. Those factors include a person's dispositional flow, or his or her proneness to entering a state of flow, a person's ability to be absorbed in the moment, and a person's neuroticism. The following sections will elaborate on these factors and their relationship with flow and hypnosis.

Dispositional Flow

A state of flow, filled with high immersion in a task that consists of all nine components, is not a state that everyone can enter easily. Flow proneness refers to the tendency of a person to enter into flow states. Initial studies of flow used the experience sampling method (ESM) (Csikszentmihalyi & Larson, 1987; Csikszentmihalyi, 2014) to study people's flow state at various times in the day. The EMS was developed to collect data on patterns of psychological states noting both frequency and intensity of experiences (Csikszentmihalyi & Larson, 1987). This method allowed researchers to explore the construct of flow, but did not explore the proneness that an individual may have to entering a flow state.

Another way that flow state can be measured is by the Dispositional Flow Scale (DFS) (Jackson & Eklund, 2002) or the Flow State Scale (FSS) (Jackson & Eklund, 2002). These self-report measures were created to assess flow disposition as well as a person's current flow state and can be adjusted to many relevant populations (Jackson, Eklund, & Martin, 2010; Gruzelier, Inoue, Smart, Steed, & Steffert, 2010; de Manzano, Theorell, Harmat, & Ullen, 2010; Procci, Singer, Levy, & Bowers, 2012). Additionally, these scales were created to be used in tandem to compare flow proneness to an activity with flow state following an activity. The scales exhibit good reliability ranging from .78-.86 (Jackson, Eklund, & Martin, 2010). The scales have demonstrated a relative normality of the distribution of flow in a sample population of both state and dispositional flow (Jackson, Martin, & Eklund, 2008). It is useful to note that both dispositional and state flow are measured because a person could have a low proneness to flow in a particular domain, but may have an experience of state flow due to other factors, such as the right challenge-skill balance at any given time. Dispositional flow can be measured before an activity reflecting on past experiences and state flow is measured following an activity to assess the experience. Both dispositional flow and state flow are important to the measurement of flow. Flow may fluctuate as people grow in their abilities and the challenges that they face, but their proneness to flow can remain the same within a particular domain (Csikszentmihalyi, 2014). Dispositional flow could impact the ease in which someone may enter a flow state following a hypnotic induction because it may indicate the proneness with which a person already has to flow. A person with high proneness versus low proneness may have different results when hypnosis is applied. By measuring dispositional flow and using it as a moderator, more can be explained about the relationship between hypnosis and state flow.

Absorption

Dietrich (2004) suggests that absorption is another construct that may be related to flow state and hypnosis. Like studies in flow state, investigation into the concept of absorption arose due to a need to describe the experience of hypnosis. With the development of reliable, standardized hypnotizability scales in the late 1950's, researchers were able to attempt to explore the relationship of hypnosis with other constructs. Few constructs were highly associated with hypnotizability. It was suggested that these constructs were not developed with hypnosis in mind. The construct of absorption arose from this period in an effort to create a scale that described the experience of hypnosis or similar phenomena (Tellegen & Atkinson, 1974).

Absorption is defined by the ability to be open and to experience heightened attention in the current task (Roche & McConkey, 1990). Studies on the relationship between hypnotizability and absorption have indicated that there may be a correlation between responses on the Tellegen Absorption Scale (TAS) (Tellegen & Atkinson, 1974) and hypnotizability (r =.30) (Laurence, Beaulieu-Prevost, & duChene, 2008). Numerous studies suggest that there is a relationship between absorption and hypnotizability (Crawford, 1982; Council et al., 1986; de Groot, Gwynn, & Spanos, 1988). Hypnotizability and absorption have also been found to be correlated with gender. Findings indicate that women's absorption scores are better predictors of hypnotic suggestibility (r = .32) than men (de Groot, et al., 1988).

Few studies have examined the relationship between flow and absorption. Koehn, Morris, and Watt (2013) studied the relationship between absorption and flow in a sport context. The authors used the Dispositional Flow Scale-2 (DFS) (Jackson & Eklund, 2002) and the TAS (Tellegen & Atkinson, 1974) to understand the correlation in tennis players ranging in age from 11-18 years. Results failed to find a significant association between the factors. The DFS on the other hand focuses on an area that is chosen by the researchers, such as tennis or other activities, and can be adapted to many populations (Jackson, et al., 2010), making it more flexible. Other methodological weaknesses in Koehn et al. (2013) are the age of the participants and the potential for response bias at a tennis camp (Koehn et al., 2013). Arguello (2009) also studies the relationship between flow and absorption in an athlete population. He did not report a significant relationship between flow and absorption (r = -.065, *ns*). Absorption did however correlate with transformation of time ($r = .254, p < .01$). This study likely had similar limitations in the wording of the questionnaires similar to Koehn et al. (2013) and like Dunlap (2005), did not specify what experience participants were considering when completing the DFS (Arguello, 2009).

Dietrich (2004) suggests a theoretical relationship between flow, hypnosis, meditation and the states of attention and effortlessness that these states all describe. However, specific research in a non-athlete population regarding the potential relationship among flow, hypnotizabililty and absorption has yet to be performed, making it difficult to generalize the minimal knowledge available. Absorption may impact a person's ability to enter a flow state following a hypnotic induction by being an additional factor relating to the experiential component of flow. People more prone to experience absorption may need less impact from hypnosis and therefore may more easily enter a flow state. In addition, Carlstedt (2004) suggests that when looking at peak performance and possible flow states, there may be a relationship between hypnotizability, absorption, and neuroticism in determining someone's ability.

Neuroticism

Of the Big 5 personality characteristics validated by McCrae and Costa (1987), neuroticism is the most correlated with flow state. Neuroticism is defined as emotional instability, including high reactivity to negative stimuli and an overall proneness to negative affect (Ullen et al., 2012). Due to the condition of reduced anxiety in order to enter a flow state, it follows that a person with a tendency towards anxiety will not have high flow state proneness. Ullen et al. (2012) discuss this relationship. The authors found that there was a relationship between neuroticism and flow state. Using the Revised NEO Personality Inventory (NEO-PI-R) (Costa & McCrae, 1992) to measure personality, the authors found that high levels of neuroticism were negatively correlated with the frequency of entering flow states ($\beta = -.41$) in a university population when controlling for gender and age.

Further studies suggest that there is a relationship between flow and neuroticism (Johnson, Keiser, Skarin, & Ross, 2014). Johnson, Keiser, Skarin, and Ross (2014) used the experience sampling method (ESM), as described previously, with an undergraduate population to study flow state, defined by the DFS, and neuroticism, defined by the NEO-PI-R. Results reported a correlation between flow state and neuroticism ($r = -.64$, $p < .01$). This association corresponds with flow theory in that a person who perceives his or her skill level as below the current challenge will be anxious and not have the pre-requisites to enter a flow state (Csikszentmihalyi, 2000). A study that illustrates this concept in practice explores college students' attention and studying. Cermakova, Moneta, and Spada (2010) studied 240 college students' anxiety, approaches to studying, and flow state in order to explore the relationship between them. Levels of perceived anxiety in the task appear to affect a student's ability to study effectively ($r = -.13$, $p < .05$) and enter a state of flow ($r = .20$, $p < .01$), suggesting that reducing anxiety may increase flow (Cermakova, Moneta, & Spada, 2010). Neuroticism may impact the relationship between flow state and hypnosis due to its relationship with the pre-requisites of flow, particularly the challenge-skill balance. A person prone to high neuroticism may alter the impact that hypnosis has on flow with hypnosis reducing anxiety and likely increasing state flow experience. By examining neuroticism as a factor that may influence the relationship between hypnosis and flow state, we can continue to explore the pre-requisites of entering flow.

Summary

In summary, flow is a subjective experience involving engrossment and concentration in a present task. Flow may be beneficial because it increases performance by reducing mental processes and increasing quality of life and happiness. Little is known about the relationship of flow to other constructs or how to predict a flow experience (Nakamura & Csikszentmihalyi, 2002), making it difficult to help increase it in people's lives. Dietrich (2004) suggests that flow is an altered state of consciousness similar to that of hypnosis and absorption, positing a relationship between these factors. Based on previous research and theory (Carlstedt, 2004; Dietrich, 2004; Dunlap, 2005), flow, hypnosis, absorption, and neuroticism may indicate a moderating relationship that may help in continued exploration of the construct of flow. Hypnosis has also been studied in relation to flow, by hypnotically inducing participants to trigger a flow state during sport performance to optimize performance (Pates, 2013), suggesting a relationship.

Hypnotizability has been studied in relation to absorption, or heightened attention, with studies suggesting a correlation near the range of .30 (Laurence, Beaulieu-Prevost, & duChene, 2008). Dietrich (2004) suggested that there are similarities not just in attention and hypnosis, but in flow as well. Carlstedt (2004) suggests that hypnotizability, absorption, and neuroticism all play a factor in a person's ability to perform at peak levels. In addition, due to its relationship with negative affect and anxiety, neuroticism is negatively correlated with flow ($r = -.64$, $p < .01$) (Johnson et al., 2014). This negative correlation likely relates to the inability to enter a flow state while anxious. However, to date, no study has explored the relationship between these combined factors through moderation.

The current study fills this need for further exploration of the construct of flow by exploring the relationship between dispositional flow, state flow, and hypnotizability in order to explore the experiential components of flow. By using multiple regression analysis to study possible moderating relationships, the possible connections between these factors can be examined. In addition, this study explored, through multiple regression analysis, the moderating relationship between neuroticism, hypnotizability, and state flow in order to explore the prerequisite factors related to flow and to expand on the current knowledge about the construct of flow state. By studying flow in relation to hypnosis, absorption, and neuroticism knowledge about flow experience will be expanded which could eventually lead to increasing the benefit of optimal performance as well as increasing well-being and happiness.

Aims of the Study:

Aim 1: Investigate the relationship between flow state and hypnotizability.

H1: There will be a significant positive correlation between Dispositional Flow Scale (DFS) and Elkins Hypnotizability Scale (EHS) scores.

H1 will be tested using a Pearson correlation between scores on the DFS and the EHS.

Aim 2: Investigate the relationship between flow state and absorption.

H2: There will be a significant positive correlation between DFS and Tellegen Absorption Scale (TAS) scores.

H2 will be tested using a Pearson correlation between scores on the DFS and the TAS.

Aim 3: Investigate the relationship between flow state and neuroticism.

H3: There will be a significant negative correlation between DFS and International Personality Item Pool-Neuroticism Domain (IPIP-N) scores.

H3 will be tested using a Pearson correlation between scores on the DFS and the IPIP-N.

Aim 4: Investigate the relationship between dispositional flow state, hypnotizability, and state flow following a hypnotic induction.

H4: It is hypothesized that dispositional flow will moderate the relationship between hypnotizability and state flow so that higher dispositional flow will be associated with a stronger relationship between hypnotizability and state flow.

H4 will be tested using multiple regression using scores on the DFS, CORE, and EHS following Aiken and West (1991)'s recommendations for examining moderation.

Aim 5: Investigate the relationship between absorption, hypnotizability, and state flow following a hypnotic induction.

H5: It is hypothesized that absorption will moderate the relationship between hypnotizability and state flow so that higher absorption will be associated with a stronger relationship between hypnotizability and state flow.

H5 will be tested using multiple regression using scores on the TAS, CORE, and EHS following Aiken and West (1991)'s recommendations for examining moderation.

Aim 6: Investigate the relationship between flow state, hypnotizability, and neuroticism.

H6: It is hypothesized that neuroticism will moderate the relationship between hypnosis and flow state so that lower neuroticism will be associated with a stronger relationship between hypnosis and state flow. H6 will be tested using multiple regression using scores on the IPIP, CORE, and EHS following Aiken and West (1991)'s recommendations for examining moderation.

CHAPTER TWO

Methods

Participants

College students were chosen as the primary population in this study in order to examine a non-athlete population with similar experiences (i.e. studying). This study recruited 179 college age students through Baylor University's online SONA-system, a cloud based participant management system used in psychology courses at Baylor. Students were asked to complete a series of scales and undergo a hypnotic induction. Participants were required to be at least 18 years of age. Prior to recruitment of participants or initiation of the study, approval was attained by the Baylor University Institutional Review Board (IRB).

Procedure

Participants completed the informed consent procedure, then were administered the Dispositional Flow Scale (DFS) (Jackson, & Eklund, 2002), International Personality Item Pool-Neuroticism Domain (IPIP) (Goldberg, 1999), and the Tellegen Absorption Scale (TAS) (Tellegen, 1974). Following the self-report measures, participants received information about hypnosis through the APA Division 30 hypnosis brochure (American Psychological Association Division 30 Society of Psychological Hypnosis, 2014). The participants then underwent a hypnotic induction via the Elkins Hypnotizability Scale (EHS) (Elkins, Marcus, & Rascoe, 2003) administered by trained researchers. Participants then completed the CORE Flow Scale (CORE). Confidentiality was maintained by separating identifying information from the study protocol and coding the study measures with non-identifiable numbers. Identifying information was kept in a locked office and destroyed when no longer necessary.

Measures

Demographics

The Demographic Questionnaire included questions about the individual's age, race, and marital status. Questions from the demographic form can be found in Appendix A. Borderline personality disorder and psychosis were evaluated by self-report.

Dispositional Flow Scale

Frequency of flow states was measured using the Dispositional Flow Scale (DFS) (Jackson & Eklund, 2002). The DFS is a 36–item self-report measurement of a person's ability and frequency of entering a flow state as defined by Csikszentmihalyi's (1990) nine dimensional concept of flow. Answering on a Likert scale ranging from 1, never, to 5, always, respondents indicated the frequency of their flow experiences during the task of "studying." The scale has an estimated reliability between alpha .78-.90 on subscales, namely challenge-skill balance, clear goals, unambiguous feedback, concentration in the task at hand, action-awareness merging, sense of control, transformation of time, loss of self-consciousness, and autotelic experience. Confirmatory factory analysis suggests that the scale has good fit with the model proposed in a sample of physically active Australians (Jackson, et al., 2008). Study experiences were used for the DFS to attempt to include all participants. These were prompted with the phrase: "When you participate in studying."

Elkins Hypnotizability Scale

Hypnotizability was measured using the Elkins Hypnotizability Scale (EHS) (Elkins, 2014). The EHS is a brief measure of hypnotizability which includes a hypnotic induction and takes approximately 20-30 minutes to administer by a trained assessor. The participant is induced using suggestions for relaxation and then guided through a number of hypnotic suggestions. Items range from simple (motor responses) to difficult (post-hypnotic amnesia) including inhibitory motor response (arm heaviness), facilitative motor responses (arm levitation), facilitative cognitive responses (imagery involvement and dissociation), facilitative perceptual responses (olfactory hallucination; visual hallucination), and inhibitory cognitive responses (post-hypnotic amnesia). Responses are scored based on subjective experience of the participant and observation by the assessor on a scale from 0-12. The EHS correlates with the Stanford Hypnotizability Scale, Form C (Weitzenhoffer & Hilgard, 1962) at an r = .82 level and has good test-retest reliability (.93), as well as showing good internal consistency (.85) (Elkins, Fisher, Johnson, 2012; & Elkins, Fisher, & Johnson, 2012; Elkins, 2014; Elkins, Marcus, & Rascoe, 2003). Scoring table for the EHS can be found in Appendix B.

Tellegen Absorption Scale

Absorption was measured using the Tellegen Absorption Scale (TAS) (Tellegen & Atkinson, 1974). The TAS is a 34-item self-report questionnaire that is used to measure a person's ability to become mentally absorbed in day-to-day activities. Absorption can be described as having complete attention on the task at hand. The items are measured along a five point Likert scale between 0, not at all, and 4, completely. The

TAS has shown reliability of alpha = .80 for internal consistency and is correlated with hypnotic susceptibility at the r = .35 level (Tellegen & Atkinson, 1974).

International Personality Item Pool- Neuroticism Domain

Neuroticism was measured using the International Personality Item Pool-Neuroticism Domain (IPIP) (Goldberg, 1999). The IPIP is a pool of personality items that have been correlated with the NEO-PI-R (Costa & McCrae, 1992). The 10-item neuroticism scale from the IPIP was selected to represent the domain of neuroticism. Questions are on a five point Likert Scale ranging from 1, very inaccurate, to 5, very accurate. The scale has an alpha coefficient of .86 and correlates with the neuroticism scales on the NEO-PI-R (Costa & McCrae, 1992) at the r = .92 level (Goldberg, 1999). Items used from the Pool can be found in Appendix C.

CORE Flow Scale

Experience of flow was measured using the CORE Flow Scale (CORE) (Jackson & Eklund, 2002). The CORE is a brief measure of a person's post-event flow state. The scale consists of 10 items that are on a five point Likert scale. Similar to the DFS, respondents indicated their experiences during a specified task. In order to have a similar experience for all participants, the specified task to which participants had reflect on was "hypnosis." It has an alpha coefficient of .93 in a general school sample (Jackson, et al., 2008). CORE flow was measured following hypnosis with the written prompt: "During the event of hypnosis today."

Data Analysis

Due to the lack of comparable research using moderation to determine the relationship between flow and hypnosis, estimates were used to determine sample size. To determine the optimal sample size, a power analysis was performed using G*Power (Buchner, Erdfelder, Faul & Lang, 2009); a conservative estimate of the .15 effect size was chosen due to low statistical relationships found in previous research. Using an alpha of .05 and power of .95, it was determined that a sample size of 170 participants would be optimal to power the study.

Statistical analyses consisted of multiple Pearson product moment correlations between the measures of flow, hypnotizability, absorption, and neuroticism. A correlational matrix was constructed and significant relationships were identified. H1-H3 were assessed through these correlations.

H4, H5 and H6 were investigated through multiple regressions. A hierarchical linear regression was used to test whether dispositional flow moderated the association between hypnotizability and state flow following hypnosis, as well as whether neuroticism moderated the association between hypnotizability and state flow following hypnosis. As recommended by Aiken and West (1991), when testing continuous interaction effects, predictors were initially mean centered and entered simultaneously in Step 1 of the regression. An interaction effect then was computed (calculated as the product of the centered predictors) and entered in Step 2 of the regression. Continuing to follow Aiken and West (1991), graphs and simple regression equations (simple effects) were used to further investigate significant interaction terms.

CHAPTER THREE

Results

Initial Results and Correlations

One hundred and seventy nine participants were recruited in this study. Of the 179 participants, 170 participants' data were analyzed in data analysis. Nine cases were removed from data analysis. In three of the cases a scoring error was detected in the hypnotizability profiles, one was removed for not meeting inclusion criteria of being 18 years of age, and five were removed because scales were incomplete beyond the recommended levels set by Jackson, Eklund , and Martin (2010) in their manual. Analysis of the demographic data suggests that a majority of the sample used in this study were college freshmen (60%), though there was a sample from all four class identifications. The range of ages was from 18-24 years old, with 72.9% of the population reporting an age of 18 or 19. A majority of the sample was female, with approximately 75% (126) of the sample reporting female gender. In regards to ethnicity, a majority of the sample identified as white (68.2%). Other ethnicities represented were Black (12.9%), Asian (9.4), American Indian (2.9%), and "other" (4.7%). In addition to this, 19.4% of the sample reported that they identified as having Hispanic origin. These data suggest that the sample might be a biased sample in regards to classification, age, and ethnicity.

As an initial step in data analysis, descriptive statistics were computed for each variable, and these results are listed in Table 1. Results of Pearson correlations between scales can be reviewed in Table 2. Correlations were examined between the Dispositional

Flow Scale (DFS), CORE Flow Scale (CORE), Elkins Hypnotizability Scale (EHS), Tellegen Absorption Scale (TAS), and International Personality Item Pool, Neuroticism Domain (IPIP) to explore any further relationships between these primary constructs.

Following this, correlations were computed between the subscales of the DFS, including challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience, and the EHS as well as correlations between the subscales of the DFS and the TAS to examine initial relationships. Results are listed in Table 3 and Table 4, respectively. Correlations were also examined between the subscales of the DFS and the International Personality Item Pool, Neuroticism Domain (IPIP). Results are listed in Table 5.

Table 1, Descriptive Statistics

Scale	N	Mean	Standard Deviation
DFS	170	30.90	3.61
EHS	170	5.34	3.09
TAS	170	67.58	21.34
IPIP	170	25.10	7.25
CORE	170	3.45	0.58

Note: DFS represents Dispositional Flow Scale, EHS represents Elkins Hypnotizability Scale, TAS represents Tellegen Absorption Scale, IPIP represents International Personality Item pool, and CORE represents CORE Flow Scale

Results from correlations indicate that there is no significant relationship between hypnotizability, as measured by the EHS, and Dispositional Flow, as measured by the DFS. As expected, there is a significant correlation between the EHS and absorption, as measured by the TAS. The TAS also exhibits a correlation with the subscale of transformation of time on the DFS. For more information see Table 3 and 4.

Table 2, Correlations between Scales

Scale	DFS	CORE	EHS	TAS	IPIP-N
DFS	(.838)				
CORE	.274**	(.757)			
EHS	.105	.415**	(.780)		
TAS	.043	.150	.173*	(.928)	
IPIP	-.424**	-.096	-.086	.059	(.842)

*$p < .05$, **$p < .01$

Note: DFS represents Dispositional Flow Scale total score, CORE represents CORE Flow Scale, EHS represents Elkins Hypnotizability Scale, TAS represents the Tellegen Absorption Scale, IPIP represents the International Personality Item Pool Index- Neuroticism. Scores along the diagonal are Cronbach's alpha for the scales.

Table 3, EHS and Flow Subscale Correlations

Scale	EHS	CSB	AAM	CG	UFB	COT	SC	LOSC	TOT	AE
EHS	--									
CSB	-.094	--								
AAM	-.043	.230**	--							
CG	.108	.390**	.077	--						
UFB	.007	.359**	.112	.278**	--					
COT	.148	.212**	.089	.193*	.201**	--				
SC	.014	.479**	.085	.475**	.346**	.469**	--			
LOSC	.131	.238**	.040	.279**	.056	.284**	.337**	--		
TOT	.085	-.029	.231**	.155*	-.089	-.025	-.084	.164*	--	
AE	.036	.353**	.104	.334**	.113	.237**	.322**	.042	.157*	--

*$p < .05$, **$p < .01$

Note: EHS represents Elkins Hypnotizability Scale. The following represent subscales of DFS: CSB: challenge skill balance, AAM: action-awareness merging, CG: clear goals, UFB: unambiguous feedback, COT: concentration on the task, SC: sense of control, LOSC: loss of self-consciousness, TOT: transformation of time, AE: autotelic experience

Table 4, TAS and Flow Subscale Correlations

Scale	TAS	CSB	AAM	CG	UFB	COT	SC	LOSC	TOT	AE
TAS	--									
CSB	-.076	--								
AAM	.131	.230**	--							
CG	-.009	.390**	.077	--						
UFB	-.015	.359**	.112	.278**	--					
COT	-.024	.212**	.089	.193*	.201**	--				
SC	-.146	.479**	.085	.475**	.346**	.469**	--			
LOSC	.020	.238**	.040	.279**	.056	.284**	.337**	--		
TOT	.277**	-.029	.231**	.155*	-.089	-.025	-.084	.164*	--	
AE	-.010	.353**	.104	.334**	.113	.237**	.322**	.042	.157*	--

*$p < .05$, **$p < .01$

Note:, TAS represents Tellegen Absorption Scale. The following represent subscales of DFS: CSB: challenge skill balance, AAM: action-awareness merging, CG: clear goals, UFB: unambiguous feedback, COT: concentration on the task, SC: sense of control, LOSC: loss of self-consciousness, TOT: transformation of time, AE: autotelic experience

Results for the DFS and neuroticism, as measured by the IPIP, indicate a significant negative correlation between these variables. Specific subscales of the DFS also correlate with the IPIP with significant negative correlations. All subscales but action-awareness merging (AAM) and transformation of time (TOT) negatively correlate with the IPIP. See Table 5 for more information. Also seen in Table 2 is the lack of correlation between the IPIP and flow state following a hypnotic induction, as measured by the CORE.

Table 5, IPIP and Flow Subscale Correlations

Scale	IPIP	CSB	AAM	CG	UFB	COT	SC	LOSC	TOT	AE
IPIP	--									
CSB	-.256**	--								
AAM	.104	.230**	--							
CG	-.208**	.390**	.077	--						
UFB	-.234**	.359**	.112	.278**	--					
COT	-.232**	.212**	.089	.193*	.201**	--				
SC	-.355**	.479**	.085	.475**	.346**	.469**	--			
LOSC	-.385**	.238**	.040	.279**	.056	.284**	.337**	--		
TOT	.009	-.029	.231**	.155*	-.089	-.025	-.084	.164*	--	
AE	-.204**	.353**	.104	.334**	.113	.237**	.322**	.042	.157*	--

*$p < .05$, **$p < .01$

Note: IPIP-N represents International Personality Item Pool- Neuroticism. The following represent subscales of DFS: CSB: challenge skill balance, AAM: action-awareness merging, CG: clear goals, UFB: unambiguous feedback, COT: concentration on the task, SC: sense of control, LOSC: loss of self-consciousness, TOT: transformation of time, AE: autotelic experience

The correlation between dispositional flow and state flow exhibits an expected relationship due to the similarity in the scales. In regards to hypnotizability, while the EHS and the DFS do not show a positive, significant, association, the EHS and CORE do report a significant correlation. Further analysis was completed to evaluate the relationship between these variables.

Moderation Results

As stated in the data analysis, a hierarchical linear regression was used to test whether dispositional flow moderated the association between hypnotizability and state flow following hypnosis. In the regression, the short- State Flow Scale (CORE) was the dependent variable and both the Elkins Hypnotizability Scale (EHS) and Dispositional Flow Scale (DFS) were predictors. As recommended by Aiken and West (1991), when testing continuous interaction effects, predictors were initially mean centered and entered simultaneously in Step 1 of the regression. An interaction effect then was computed (calculated as the product of the centered predictors) and entered in Step 2 of the regression. Continuing to follow Aiken and West (1991), graphs and simple regression equations (simple effects) were used to further investigate significant interaction terms. Two simple regression equations were constructed (using $\pm$ 1 *SD* from the DFS mean) to depict the interaction effect. To plot these equations, two values of the EHS ($\pm$ 1 *SD* from the EHS mean) then were substituted into the equations. Significance of the simple slopes of these regression equations were tested at both low (-1 *SD*) and high (+ 1 *SD*) CORE values to examine hypnotizability associations at different levels of dispositional flow.

Both the EHS (β = .389) and the DFS (β = .230) were significant predictors of the CORE scores in Step 1 (R^2 = .224) of the regression (*p*s < .01). The EHS x DFS interaction (β = -.184) explained additional significant variance (ΔR^2 = .033, $p < .01$) in CORE scores in Step 2 of the regression. Graphs and simple effects indicated that EHS was significantly associated with the CORE scores at low DFS scores (β = .565, $p < .01$) and not associated at high DFS scores (β = .175, *ns*). Simple effects are depicted in Figure 1.

A hierarchical linear regression was also used to test whether absorption moderated the association between hypnotizability and state flow following hypnosis. In the regression, the CORE was the dependent variable and both the TAS and EHS were predictors. As recommended by Aiken and West (1991), when testing continuous

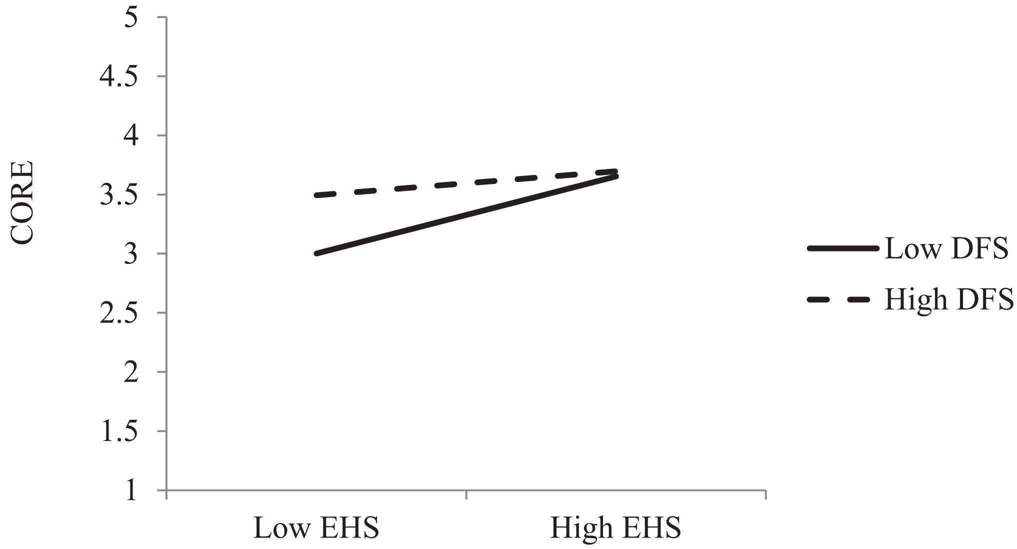

Figure 1, Moderation effects DFS and EHS

interaction effects, predictors were initially mean centered and entered simultaneously in Step 1 of the regression. An interaction effect then was computed (calculated as the product of the centered predictors) and entered in Step 2 of the regression. Continuing to follow Aiken and West (1991), graphs and simple regression equations (simple effects) were used to further investigate significant interaction terms. Two simple regression equations were constructed (using $\pm$ 1 *SD* from the EHS mean) to depict the interaction effect. To plot these equations, two values of the TAS ($\pm$ 1 *SD* from the TAS mean) then were substituted into the equations. Significance of the simple slopes of these regression equations were tested at both low (-1 *SD*) and high (+ 1 *SD*) CORE values to examine absorption associations at different levels of hypnotizability.

The EHS ($\beta = .401$, $p < .01$), but not the TAS ($\beta = .085$, *ns*), was a significant predictor of CORE scores in Step 1 ($R^2 = .179$) of the regression. The TAS x EHS interaction ($\beta = .332$) explained additional significant variance ($\Delta R^2 = .021$, $p < .05$) in

CORE scores in Step 2 of the regression. Graphs and simple effects indicated that EHS was significantly associated with the CORE scores at high TAS scores (β = .255, $p < .05$) and not associated at low TAS scores (β = -.042, *ns*). Simple effects are depicted in Figure 2.

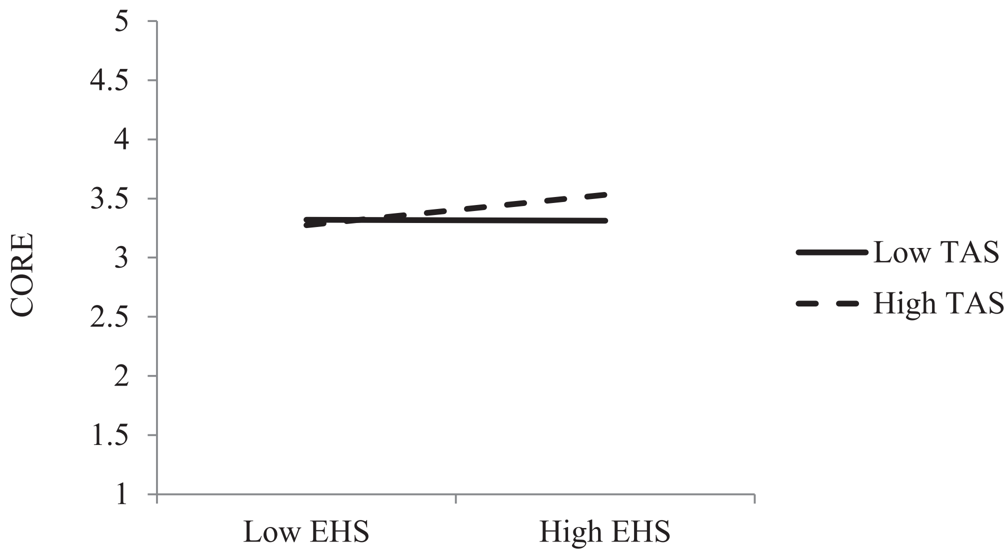

Figure 2, Moderation effects TAS and EHS

A hierarchical linear regression was also used to test whether neuroticism moderated the association between hypnotizability and state flow following hypnosis. In the regression, the CORE was the dependent variable and both the IPIP and EHS were predictors. As recommended by Aiken and West (1991), when testing continuous interaction effects, predictors were initially mean centered and entered simultaneously in Step 1 of the regression. An interaction effect then was computed (calculated as the product of the centered predictors) and entered in Step 2 of the regression. Continuing to follow Aiken and West (1991), graphs and simple regression equations (simple effects) were used to further investigate significant interaction terms. Two simple regression equations were constructed (using $\pm$ 1 *SD* from the EHS mean) to depict the interaction effect. To plot these equations, two values of the IPIP ($\pm$ 1 *SD* from the IPIP mean) then were substituted into the equations. Significance of the simple slopes of these regression equations were tested at both low (-1 *SD*) and high (+ 1 *SD*) CORE values to examine neuroticism associations at different levels of hypnotizability.

The EHS (β = .410, $p < .01$), but not the IPIP (β = -.061, *ns*), was a significant predictor of CORE scores in Step 1 (R^2 = .176) of the regression. The IPIP x EHS interaction (β = .050) did not explain additional significant variance (ΔR^2 = .002, *ns*) in CORE scores in Step 2 of the regression.

CHAPTER FOUR

Discussion

The purpose of this study was to explore the experience of flow state and hypnosis through the constructs of hypnotizability, absorption, and neuroticism. Flow state refers to a state of heightened attention and concentration in the current moment that involves intrinsic motivation and joy in the task at hand (Csikszentmihalyi, 1990). It requires a sense of balance between one's level of ability and the task at hand and is experienced as a loss of self-consciousness, increase in control, and a sense of time distortion (Csikszentmihalyi, 1990). Similar to flow state, hypnosis is described as "a state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion" (Elkins, Barabasz, Council, & Spiegel, 2015, p. 6). Due to these similarities, this study aimed at expanding the knowledge of possible relationships by using an individualized hypnotizability scale to determine possible moderators between flow and hypnosis. Important constructs related to hypnosis included dispositional flow, absorption, and neuroticism. Previous research and theory (Dietrich, 2004; Dunlap, 2005; Carlstedt, 2004) suggest that there is a complex relationship between flow, hypnosis, absorption, and neuroticism, but very little research has been conducted to expand on these theories.

The first aim of this study was to investigate the relationship between flow state and hypnotizability. Correlations between dispositional flow, using the Dispositional Flow Scale (DFS) (Jackson & Eklund, 2002), and hypnotizability, using the Elkins Hypnotizability Scale (EHS) (Elkins, 2014), were not statistically significant ($r = .105$).

This result is similar to results found by Dunlap (2005) who reported that non-athlete populations had a lower correlation (r = .09) between flow state and hypnotizability using a group measure of hypnotizability (Harvard Group Scale of Hypnotic Susceptibility, Form A; HGSHS: A) (Shor, & Orne, 1962). In addition to dispositional flow, state flow following hypnosis was also measured in this study. A significant correlation was found between flow experience, using the CORE Flow Scale (CORE) (Jackson & Eklund, 2002) and hypnotizability (r = .415). This implies that people who have higher hypnotic ability are more prone to report flow-like experiences in hypnosis. A potential implication is that hypnosis evokes flow-like experiences, especially in those who have higher hypnotizability.

The second aim of this study was to investigate the relationship between flow state and absorption. The relationship between dispositional flow and absorption was measured using the DFS and the Tellegen Absorption Scale (TAS) (Tellegen & Atkinson, 1974) respectively, and no statistically significant relationship was found (r = .029) between these constructs. Due to the lack of previous research comparing TAS and flow state in a non-athlete population, this finding adds support to the lack of relationship between TAS and DFS, regardless of the differences of sport language between the scales. Similar to Arguello (2009), the TAS did correlate with the specific component of flow state of transformation of time (r = .277), suggesting that people who enter a state of absorption or of flow may have similar descriptions of alterations in experiences related to time such as slowing down.

The third aim of this study was to investigate the relationship between flow state and neuroticism. The relationship between dispositional flow, using the DFS, and neuroticism, using the International Personality Item Pool- Neuroticism (IPIP-N) (Goldberg, 1999) was measured. Results showed a statistically significant negative relationship between dispositional flow and neuroticism ($r = -.424$, $p < .01$). These results are similar to past research on neuroticism and flow that report a negative relationship between these constructs (Ullen et al., 2012). Particular components of flow that correlated with neuroticism were challenge-skill balance ($r = -.256$), clear goals ($r = -.208$), unambiguous feedback ($r = -.234$), concentration on the task at hand ($r = -.232$), sense of control ($r = -.355$), loss of self-consciousness ($r = -.385$), and autotelic experience ($r = -.240$). All three of the pre-requisites of flow were negatively related to neuroticism, suggesting a difficulty in entering a flow state with high neuroticism. Due to the positive experiential nature of flow, it is not surprising that the pre-requisites of flow negatively correlate with neuroticism. These findings confirm the necessity of reduced anxiety in order to enter a flow state.

There is a lack of a statistically significant relationship between state flow, using CORE, and neuroticism ($r = -.096$). When considering the state of relaxation that the participants were likely to experience following a hypnotic induction that includes relaxation, this may be expected. A study by Malinoski and Lynn (1999) also fails to find a relationship between hypnotizability and neuroticism ($r = .01$) and is supported by further research by Nordenstrom, Council, and Meier (2002) who report no relationship as well ($r = .00$). Varga and Kekecs (2014) report that psychophysiological measures of stress are reduced during hypnosis, such as reduced cortisol in participants who have undergone a hypnotic induction (Varga & Kekecs, 2014). With this in mind, it follows that people following a hypnotic induction, relaxed and less anxious, who then describe a flow state may have less features that correlate with neuroticism.

The fourth aim of this study was to investigate dispositional flow state as a moderating factor of the relationship between hypnotizability and state flow following a hypnotic induction. Results indicate a significant relationship between the CORE and the EHS. This relationship was moderated by the interaction of the EHS and the DFS. This suggests that people who report low dispositional flow and have high hypnotizability may have higher reports of flow state following the hypnotic induction. This might indicate a possible use for hypnosis to develop higher frequency of state flow for someone with low dispositional flow. The clinical implications are for the potential use of hypnosis to encourage flow in a variety of activities. This may include people who desire enjoyment and increased intrinsic motivation for a task. This is similar to Carlstedt's (2004) theory looking at the levels of flow and hypnotizability.

The fifth aim of this study was to investigate absorption as a moderating factor in the relationship between hypnotizability and state flow following a hypnotic induction. Results indicate a small but significant relationship between CORE and the EHS. This relationship was moderated by the interaction of the EHS and TAS suggesting that people who have high absorption scores impact the relationship between hypnotizability and flow state, while low scores do not relate. This expands on the relationship that is found between absorption and hypnotizability to account for the moderating effects when studying flow and hypnotizability.

The final aim of this study was to investigate the relationship between flow state and hypnotizability and neuroticism. Overall there was no moderating effect between neuroticism, as measured by the IPIP-N, hypnotizability, as measured by the EHS, and state flow following a hypnotic induction, as measured by the CORE. As stated earlier, this is likely related to the relaxed state that the participant is in following a relaxation hypnotic induction. This indicates that neuroticism has less impact on state flow when hypnosis is involved and hypnosis may be a good source of training state flow in order to reduce possible effects of neuroticism and overthinking during flow states.

Limitations

This study has several limitations. The first limitation is observed in the sample. This sample was primarily recruited through the Baylor University SONA system, that is psychology students who are required to participate in research for credit. While students have the choice of what research to participate in and whether or not they will do a written project instead of research, the population is still limited in its scope. The sample therefore consisted of a majority of college freshmen (60%), 18-19 years of age (72.9%), female (75%) and identified as Caucasian (68.2%). Due to this small sample, it is possible that these findings will not generalize to a more diverse population.

Another limitation arises within the DFS when students were asked to reflect on their study activities, specifically "when you participate in studying." This prompt could have been interpreted differently by individuals, as there may be variability in the definitions of studying by the students. While participants were encouraged to ask questions about the scales if they did not understand, there is an assumption that if they did not ask questions, then the participants understood the questions in the self-report scales as well as with the hypnotizability scale.

Additionally, one flaw in hypnotizability scales is that, despite standardization of the scales, generalizations may not reflect a clinical population where other induction methods are used (Woody & Barnier, 2008). This means that associations found using a hypnotizability scale, such as this study used, may not be found using hypnosis in a clinical setting. There is also the risk in studies involving hypnosis that participants will have misconceptions about hypnosis and reservations to participating fully, such that relaxation becomes an issue in the hypnotic induction. Steps were taken to minimize misconceptions, such as opening up discussion about hypnosis through the APA Division 30 hypnosis brochure (American Psychological Association Division 30 Society of Psychological Hypnosis, 2014) and discussing common misconceptions about hypnosis, before the induction began. Despite this, there may have been concerns that went unaddressed if not asked by participants, though no evidence exists of these concerns.

Due to the nature of neuroticism as a personality trait, there may be limitations to comparing it within the model of absorption, hypnotizability, and flow. While neuroticism may impact the relationship between hypnotizability and flow, state anxiety may also be a relevant construct. One reason for this can be found in the individual zone of optimal functioning (Hanin, 2000) where different activities may be performed most optimally at differing levels of state anxiety. Therefore, understanding state anxiety may enhance the knowledge of flow state. Further research that measures state anxiety within neuroticism as well as within a specific context may enhance this research by allowing for flexibility in levels of neuroticism based on the task.

Future Studies

Future research that will enhance this line of study includes study of a more diverse population. This population could be a more culturally diverse college student population, either by age, gender, or race. Expanding the college student population across multiple sites will also allow this information to be generalized further. Additionally, targeting a population of students beyond introduction psychology courses by advertising the study in other departments will allow for collection of a more diverse sample.

When using the DFS as well as the CORE, further studies could narrow down the definition of "studying" so that students are all reflecting on a common experience. Such narrowing might include "when reading a textbook" or "when studying for a multiple choice exam." This selectivity will ensure that frequency of flow state will be measured in a narrow area that all students can identify.

In addition, studies could expand on the relationship between hypnotizability, flow state, and anxiety by administering an anxiety scale which focuses on performance anxiety in relation to test taking. This would relate directly to the experience that students will be preparing for and may enhance our knowledge about the associations between these constructs.

Continued research in the area of flow state and hypnosis will allow for further exploration about how hypnosis may be used enhance flow state. The benefits of flow might be within the health psychology or prevention research. The field of occupational therapy is already beginning to look at the benefits of flow within a recovery model and with chronic pain (Rebeiro, & Polgar, 1999), with researchers using the experience sampling method (ESM) to monitor flow in these populations (Harmon, Robinson, & Kennedy, 2012). Research using hypnosis to increase flow experience within a pain or recovery population might improve health outcomes by increasing intrinsic motivation to complete exercises during and after occupational therapy.

Further research on neuroticism along with absorption and hypnotizability might include research that includes state anxiety to account for models of the individual zone of functioning for specific activities. Research within a specific population such as athletics or with musicians will help to expand this research and may account for some of the limitations within this study's design.

Conclusions

While dispositional flow, as measured by the DFS, does not correlate with hypnotizability, as measured by the EHS, state flow following hypnosis, as measured by the CORE Flow Scale (CORE), particularly when moderated by dispositional flow, does correlate with hypnotizability. Though the effect of this moderation is small, the implications for clinical practice include the possibility that hypnosis could be used on people with low dispositional flow in order to increase opportunities to enter flow state in a particular event through the use of hypnosis. More research on the model of anxiety, absorption, and hypnotizability and their relationship to flow needs to be conducted to determine the relationship of these factors and expand upon the results of this study.

APPENDICES

APPENDIX A

Demographic Questionnaire

1. Date of Birth (MM/DD/YYYY)_____________
2. What is your current age ___________________
3. Do you consider yourself to be Hispanic, Latino, or Spanish? Yes___ No___

   If yes, please select one or more of the following:

   ___ Mexican ___ South or Central American

   ___ Puerto Rican

   ___ Other Spanish culture or origin (*please specify*:___________)

4. What race do you consider yourself to be? *Select one of the following*:

   ___ American Indian or Alaska Native ___ Asian

   ___ Black or African American ___ White

   ___ Native Hawaiian or Other Pacific Islander

   ___ Other (*please specify*:_______________)

5. Are you employed? Yes___ No ___
6. What is your current Classification?

   ___ Freshman ___ Sophomore

   ___ Junior ___ Senior

   ___ Graduate Student

7. Marital Status: Please mark only one

   ___ Single ___ Married ___ Separated or Divorced ___ Widowed

8. Have you ever been diagnosed with a psychological condition (anxiety, depression, etc.) Yes___ No___
   a. If yes, what was/were your diagnosis/diagnoses?_____________________
9. Have you ever been hospitalized for treatment of a psychiatric problem of any kind? Yes___ No___
   a. If yes, please specify:____

10. Are you fluent in English? Yes___ No___

APPENDIX B

EHS Scoring Table

Item	Criteria	Score
Arm Heaviness/ Immobilization	No heaviness.	0
	Subjective report of heaviness.	1
	Heaviness. Immobilization occurred.	2
Arm Levitation	No weightlessness.	0
	Subjective report of lightness.	1
	Subjective report of lightness and effortless arm levitation.	2
	Effortless elbow lift.	3
Imagery Involvement/ Dissociation	No experience – Just listening.	0
	Experienced clear imagery, but no dissociation.	1
	Experienced clear imagery and dissociation.	2
Rose Olfactory Hallucination	No experience.	0
	Reports faint smell.	1
	Reports distinct smell.	2
Positive Hallucination	Negative report.	0
	Describes vague hallucination only.	1
	Reports clear hallucination of block.	2
Amnesia	Recalls 2 or more items.	0
	Recalls 1 item or less.	1
Total		

APPENDIX C

IPIP-N Questions

Indicate for each statement whether it is 1. Very Inaccurate, 2. Moderately Inaccurate, 3. Neither Accurate Nor Inaccurate, 4. Moderately Accurate, or 5. Very Accurate, as a description of you.

	Very Inaccurate	Moderately Inaccurate	Neither Accurate nor Inaccurate	Moderately Accurate	Very Accurate
Dislike myself					
Seldom feel blue					
Am often down in the dumps					
Feel comfortable with myself					
Have frequent mood swings					
Am not easily bother by things					
Panic easily					
Rarely get irritated					
Often feel blue					
Am very pleased with myself					

*Items 2, 4, 6, 8, & 10 are reverse scored

Goldberg (1999)

REFERENCES

American Psychological Association Division 30 Society of Psychological Hypnosis. (2014). Hypnosis: What it is and how it can help you feel better? Retrieved November, 20, 2014, from http://www.apa.org/divisions/div30/forms/hypnosis_brochure.pdf

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. London, UK: Sage Publications.

Allison, M. T., & Duncan, M. C. (1988). Women, work, and flow. In M. Csikszentmihayli, & I. S. Csikszentmihayli (Eds.), *Optimal experience: Psychological studies of flow in consciousness* (pp. 118-137). New York, NY: Cambridge University Press.

Arguello, E. D. A. (2009). Flow, empathy, and absorption among NCAA division I swimmers, divers, volleyball, tennis, and baseball players. *ProQuest Dissertations & Theses*.

Barnier, A. J. & Nash, M. R. (2008). Introduction: A roadmap for explanation, a working definition. In M. R. Nash, & A. J. Barnier (Eds.), *The Oxford Handbook of Hypnosis* (pp. 21-52). New York, NY: Oxford University Press.

Brann, L., Owens, J., & Williamson, A. (2012). *The handbook of contemporary clinical hypnosis: Theory and practice*. Chichester, West Sussex, UK: Wiley-Blackwell.

Bruya, B. (2010*). Effortless attention: A new perspective in the cognitive science of attention and action*. Cumberland, RI: MIT Press.

Buchner, A., Erdfelder, E., Faul, F., & Lang, A. (2009). G*Power (Version 3.1.2) [Computer program]. http://www.psycho.uni-duesseldorf.de/aap/projects/gpower/

Carlstedt, R. A. (2004). *Critical moments during competition: A mind-body model of sport performance when it counts the most*. New York, NY: Psychology Press.

Cermakova, L., Moneta, G. B., & Spada, M. M. (2010). Dispositional flow as a mediator of the relationships between attentional control and approaches to studying during academic examination preparation. *Educational Psychology: An International Journal of Experimental Educational Psychology, 30*(5), 495-511.

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory: Professional Manual*. Odessa, FL: Psychological Assessment Resources.

Council, J. R., Kirsch, I., Hafner, L. P. (1986). Expectancy versus absorption in the prediction of hypnotic responding. *Journal of Personality and Social Psychology, 50*(1), 182-189.

Crawford, H. J. (1982). Hypnotizability, daydreaming styles, imagery vividness, and absorption: A multidimensional study. *Journal of Personality and Social Psychology*, *42*, 915-926.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety: The experience of play in work and games*. San Francisco, CA: Jossey-Bass.

Csikszentmihalyi, M. (1988). Introduction. In M. Csikszentmihayli, & I. S. Csikszentmihayli, (Eds). *Optimal experience: Psychological studies of flow in consciousness* (pp. 3-14). New York, NY: Cambridge University Press.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York, NY: HarperPerrennial.

Csikszentmihalyi, M. (1992). The flow experience and its significance for human psychology. In M. Csikszentmihalyi,& I. S. Csikszentmihalyi (Eds). *Optimal Experience: Psychological Studies of Flow in Consciousness* (pp. 15-35). New York, NY: Cambridge University Press.

Csikszentmihalyi, M. (2000). The contribution of flow to positive psychology. In M. E. P. Seligman, & J. Gillham (Eds.), *The science of optimism and hope* (pp. 387-398). Philadelphia, PA: Templeton Foundation Press.

Csikszentmihalyi, M. (2014). *Flow and the Foundations of Positive Psychology: The collected works of Mihaly Csikszentmihalyi*. New York, NY: Springer Publishing.

Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of the experience sampling method. *Journal of Nervous and Mental Disease, 175*, 526-536.

Csikszentmihalyi, M., & LeFevre, J. (1989). Optimal experience in work and leisure. *Journal of Personality and Social Psychology, 56*(5), 815-822.

Davis, J. K., & Green, J. M. (2009). Caffeine and anaerobic performance: Ergogenic value and mechanisms of action. *Sport Medicine, 39*(10), 813-832.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum Press.

deCharms, R., & Muir, M. S. (1978). Motivation: Social approaches. *Annual Review of Psychology, 29*, 91-113.

de Groot, H.P., Gwynn, M.I. & Spanos, N.P. (1988). The effects of contextual information and gender on the prediction of hypnotic susceptibility. *Journal of Personality and Social Psychology, 54*, 1049-1053.

de Manzano, O., Theorell, T., Harmat, L., & Ullen, F. (2010). The psychophysiology of flow during piano playing. *Emotion, 10*(3), 301-311.

Dietrich, A. (2003). Functional neuroanatomy of altered states of consciousness: The transient hypofrontality hypothesis. *Consciousness and Cognition, 12*, 231–256.

Dietrich, A. (2004). Neurocognitive mechanisms underlying the experience of flow. *Consciousness and Cognition, 13*, 746–761.

Dunlap, E. M. (2005). Hypnotizability among division I athletes. *ProQuest Dissertations and Thesis.*

Elkins, G. (2014). *Hypnotic relaxation therapy: principles and applications.* New York, NY: Springer Publishing.

Elkins, G. E., Barabasz, A.F., Council, J. R., & Spiegel, D. (2015). Advancing research and practice: The revised APA division 30 definition of hypnosis. *International Journal of Clinical and Experimental Hypnosis, 63*(1), 1-9.

Elkins, G., Fisher, W., & Johnson, A. (2012). P02.30. Assessment of hypnotizability in clinical research: Development, reliability, and validation of the Elkins Hypnotizability Scale. *BMC Complementary and Alternative Medicine, 12,* 86. doi: 10.1186/1472-6882-12-S1-P86.

Elkins, G., Fisher, W., & Johnson, A. (2012, August). *Factor structure of a new brief measure of hypnotizability*. American psychological association 2012 convention presentation, Orlando, FL.

Elkins, G.R., Marcus, J., & Rascoe, T. (2003, April). *Development of a new scale to measure hypnotizability in clinical research*. Paper presented at the annual meeting of the American Society of Clinical Hypnosis, Arlington, VA.

Fullagar, C. J., Knight, P. A., Sovern, H. S. (2013). Challenge/skill balance, flow, and performance anxiety. *Applied Psychology: An International Review, 62*(2), 236-259.

Goldberg, L. R. (1999). A broad-bandwidth, public-domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality Psychology in Europe, Vol. 7* (pp. 7-28). Tilburg, Netherlands: Tilburg University Press.

Grove, J. R., & Lewis, M. A. (1996). Hypnotic susceptibility and the attainment of flow-like states during exercise. *Journal of Sport and Exercise Psychology, 18*(4), 380-391.

Gruzelier, J., Inoue, A., Smart, R., Steed, A., & Steffert, T. (2010). Acting performance and flow state enhanced with sensory-motor rhythm neurofeedback comparing ecologically valid immersive VR and training screen scenarios. *Neuroscience Letters, 480*, 112-116.

Halligan, P. W., & Oakley, D. A. (2015). Hypnosis and cognitive neuroscience: Bridging the gap. *Cortex, 49*, 359-364.

Hanin, Y. L. (2000). Individual zones of optimal functioning (IZOF) model: Emotion-performance relationships in sport. In Y. L. Hanin (Ed.), *Emotions in sport* (pp. 65-89). Champaign, IL: Human Kinetics.

Harmon, D., Robinson, K., & Kennedy, N. (2012). The flow experience of people with chronic pain. *OTJR: Occupation, Participation and Health, 32(3*), 104-112.

Hilgard, E. R. (1965). *Hypnotic susceptibility*. New York, NY: Harcourt Brace.

Jackson, S. A., & Eklund, R. C. (2002). Assessing flow in physical activity: The flow state scale-2 and dispositional flow scale-2. *Journal of Sport and Exercise Psychology, 24*, 133-150.

Jackson, S., Eklund, R., & Martin, A. (2010). *The flow manual: The manual for the flow scales.* Menlo Park, CA: Mind Garden Inc.

Jackson, S. A., & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The flow state scale. *Journal of Sport and Exercise Psychology, 18*, 17-35.

Jackson, S. A., Martin, A. J., & Eklund, R. C. (2008). Long and short measures of flow: The construct validity of the FSS-2 and the DFS-2 and new brief counterparts. *Journal of Sport and Exercise Psychology, 30*, 561-587.

Jensen, M. P., Adachi, T., Tome-Pires, C., Lee, J., Osman, Z. J., & Miro, J. (2015). Mechanisms of hypnosis: Toward the development of a biopsychosocial model. *International Journal of Clinical and Experimental Hypnosis*, *63*(1), 34-75.

Johnson, J. A., Keiser, H. N., Skarin, E. M., & Ross, S. R. (2014). The dispositional flow scale-2 as a measure of autotelic personality: An examination of criterion-related validity. *Journal of Personality Assessment*, *96*(4). DOI: 10.1080/00223891.2014.891524

Koehn, S., Morris, T., & Watt, A. P. (2013). Correlates of dispositional and state flow in tennis competition. *Journal of Applied Sport Psychology, 25*(3), 354-369.

Laurence, J. R., Beaulieu-Prevost, D., & du Chene, T. (2008). Measuring and understanding individual differences in hypnotizability. In M. R. Nash, & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis* (pp.21-52). New York, NY: Oxford University Press.

Levin, J., & Steele, L. (2005). The transcendent experience: Conceptual, theoretical, and epidemiologic perspectives. *Explore, 1*(2), 89-101.

Lindsay, P., Maynard, I., & Thomas, O. (2005). Effects of hypnosis on flow states and cycling performance. *The Sport Psychologist, 19*, 164-177.

Malinoski, P. T., & Lynn, S. J. (1999). The plasticity of early memory reports: Social pressure, hypnotizability, compliance, and interrogative suggestibility. *International Journal of Clinical and Experimental Hypnosis, 47*(4), 320-345.

Maslow, A. (1965). Humanistic science and transcendent experience. *Journal of Humanistic Psychology, 5*(2), 219-227.

McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology, 52*(1), 81-90.

Nakamura, J., & Csikszentmihalyi, M. (2002). The concept of flow. In C. R. Snyder, & S. J. Lopez (Eds.), *Handbook of positive psychology* (89-105). New York, NY: Oxford University Press.

Nordenstrom, B. K., Council, J. R., & Meier, B. P. (2002). The "Big Five" and hypnotic suggestibility. *International Journal of Clinical and Experimental Hypnosis, 50*(3), 276-281.

Park, C. (2013). Mind-body CAM interventions: Current status and considerations for integration into clinical health psychology. *Journal of Clinical Psychology, 69*(1), 45-63.

Pates, J. (2013). The effects of hypnosis on an elite senior European tour golfer. *International Journal of Clinical and Experimental Hypnosis, 61*(2), 193-204.

Pates, J., & Cowen, A. (2013). The effect of a hypnosis intervention on performance and flow state of an elite golfer: A single subject design. *International Journal of Golf Science, 2,* 43-53.

Pates, J., Cummings, A., & Maynard, I. (2002). The effects of hypnosis on flow states and three-point shooting performance in basketball players. *The Sport Psychologist, 16*, 1-15.

Pates, J., Maynard, I., & Westbury, T. (2001). An investigation into the effects of hypnosis on basketball performance. *Journal of Applied Sport Psychology, 13*(1), 84-102.

Pates, J., Oliver, R., & Maynard, I. (2001). The effects of hypnosis on flow states and golf-putting performance. *Journal of Applied Sport Psychology, 13*, 341-354.

Payne, B. R., Jackson, J. J., Noh, S. R., & Stine-Morrow, E. A. L. (2011). In the zone: Flow state and cognition in older adults. *Psychology and Aging*, *26*(3), 738-743.

Piccione, C., Hilgard, E. R., & Zimbardo, P. G. (1989). On the degree of stability of measured hypnotizability over a 25-year period*.* *Journal of Personality and Social Psychology, 56*(2), 289-295.

Procci, K., Singer, A. R., Levy, K. R., & Bowers, C. (2012). Measuring the flow experience of gamers: An evaluation of the DFS-2. *Computers in Human Behavior, 28*, 2306-2312.

Rebeiro, K., & Polgar, J. M. (1999). Enabling occupational performance: Optimal experiences in therapy. *Canadian Journal of Occupational Therapy, 66*(1), 14-22.

Roche, S. M., & McConkey, K. M. (1990). Absorption: Nature, assessment, and correlates. *Journal of Personality and Social Psychology, 59*(1), 91-101.

Seger, J., & Potts, R. (2012). Personality correlates of psychological flow states in videogame play. *Current Psychology, 31*, 103-121.

Shafer, D. M., Carbonara, C. P., & Popova, L. (2011). Spatial presence and perceived reality as predictors of motion-based video game enjoyment. *Presence, 20*(6), 591-619.

Shor, R. E., & Orne, E. C. (1962). *Harvard group scale of hypnotic susceptibility, form A.* Palo Alto, CA: Consulting Psychologists Press.

Swann, C., Keegan, R. J., Piggott, D., & Crust, L. (2012). A systematic review of the experience, occurrence, and controllability of flow states in elite sports. *Psychology in Sport and Exercise, 13*, 807-819.

Tellegen A, & Atkinson G. (1974). Openness to absorbing and self-altering experiences ('absorption'), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, *83*, 268-277.

Terhune, D. B. (2012, October). *Toward the next generation of measures of hypnotic responding*. Paper presented at the International Congress of Hypnosis, Bremen, Germany.

Ullen, F., de Manzano, O., Almeida, R., Magnusson, P. K. E., Pederson, N. L., Nakamura, J., … & Madison, G. (2012). Proneness for psychological flow in everyday life: Associations with personality and intelligence. *Personality and Individual Differences, 52*, 167-172.

Varga, K., & Kekecs, Z. (2014). Oxytocin and cortisol in the hypnotic interaction. *International Journal of Clinical and Experimental Hypnosis, 62*(1), 111-128.

Weitzenhoffer, A. M., & Hilgard, E. R. (1962). *Stanford hypnotic susceptibility scale, form C*. Palo Alto, CA: Consulting Psychologists Press.

Woody, E. Z., & Barnier, A. J. (2008). Hypnosis scales for the twenty-first century: What do we need and how should we use them? In M. R. Nash, & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis* (pp.21-52). New York, NY: Oxford University Press.