Reconceptualizing Flow Theory from a Self-Regulatory Framework

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ABSTRACT

The flow experience refers to a state characterized by complete involvement in a task. According to flow theory, the flow state is preceded by three antecedents, skill-task match, goals, and feedback. These antecedents lead to a flow state, which consists of six components, merging of action and awareness, centering of attention, loss of self-consciousness, temporal distortion, sense of control, and autotelic nature. In a flow state, individuals persist on a task without regard for themselves or awareness of their surroundings. Currently, flow is a two-stage model in which the three antecedents lead to a flow state. Flow theory is severely limited as no mediating processes have been specified between flow antecedents and the flow state. The missing mediating processes in flow theory do not allow for empirically examining testable a priori predictions. Further, failure to specify a mediator brings into question the current flow antecedents and components. The aim of this study was to recast flow theory within a self-regulation framework to ameliorate these issues.

I borrow from the self-regulation literature and propose that “feeling right” mediates the relationship between flow antecedents and components. Feeling right is a positive cognitive experience that arises from successful regulatory fit. I further posit that the antecedents of flow are the antecedents of feeling right, motivational orientation and goal pursuit strategies. I also propose that the flow state only be characterized by four components, merging of action and awareness, centering of attention, loss of self-consciousness, and temporal distortion. Thus, in my revised model of flow, alignment between motivational orientation and goal pursuit will lead to feeling right, which will then lead to a flow state, characterized by the four aforementioned
components. A secondary goal of this study was to examine the relationship between flow and task performance. I hypothesized that individuals in a state of regulatory fit would experience flow, operationalized by intense concentration, time distortion, and loss of self-consciousness. I further hypothesized that flow would mediate the relationship between regulatory fit and performance and that type of fit would influence performance quality or quantity. I utilized an experiment design to test this revised flow model in the context of a computer game. A path model was conducted to test these predictions.

Results revealed that individuals in a state of regulatory fit exhibited greater time distortion and loss of self-consciousness. However, flow did not mediate the relationship between fit and performance. Based on these results, flow can successfully be applied to a self-regulatory framework. There was initial evidence that motivational orientation and goal pursuit strategies, i.e., regulatory fit, were causal antecedents to a flow state. There was stronger evidence for the relationship between regulatory fit and flow when behavioral flow indicators were used. Future research should focus on identifying behavioral flow indicators and continue to explore the flow construct within a self-regulatory framework.
Reconceptualizing Flow Theory from a Self-Regulatory Framework

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GENERAL AUDIENCE ABSTRACT

Flow is a subjective experience that is characterized by deep immersion in the present moment. Flow theory was initially conceptualized to explain intrinsically motivated behavior, and since its conception in the 1960s, it has been applied to various domains, such as work, sports, and leisure activities. In this study, I critiqued flow theory and proposed a revised model of flow that applies self-regulation principles to help ameliorate the current issues regarding flow. The revised model was tested in the context of a computer game. Results revealed that in this context, regulatory fit is a causal precursor to flow. Further, flow did not lead to better task performance.
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Introduction

Flow refers to a state of “optimal experience” during engagement of a task (Csikszentmihalyi, 1975). Imagine an instance where a musician is composing music. He is fully engaged and does not feel the need for extra effort to maintain his concentration. As he works, he loses track of his environment and his actions feel natural. According to flow theorists, this musician is in a state of flow. Flow theory is embedded in humanistic psychology (Nakamura & Csikszentmihalyi, 2002) in that it deals with individuals’ need for self-fulfillment. As with other humanistic constructs, the validity of flow theory is limited by its imprecision, making it difficult to generate falsifiable predictions (Shiraev, 2015). In this study, I will critique current models of flow, propose a self-regulatory framework approach to flow, and test the validity of the proposed self-regulatory model.

Flow

Flow theory evolved from Csikszentmihalyi’s research on creative processes in the 1960s. Csikszentmihalyi noticed instances of individuals performing activities they were interested in, with utmost dedication without regard for any discomfort or fatigue. Individuals who were studied had varying backgrounds: painters, rock climbers, surgeons, chess players, musical composers, dancers, and basketball players whose abilities ranged from beginner level to experts in their respective fields. These individuals undertook tasks for the sole purpose of enjoyment. Flow is considered to be a positive state of being that occurs during task engagement. It is associated with positive outcomes, such as higher motivation (Schuler & Brunner, 2009), feelings of enjoyment, and higher performance during task engagement (Engeser & Rheinberg, 2008).

Flow theory originally was integrated with intrinsic motivation (Nakamura &
Csikszentmihalyi, 2009), and although flow and intrinsic motivation are related, there are important distinctions. When an individual is intrinsically motivated, he/she engages in an activity because there is something “inherently interesting or enjoyable” about the activity (Deci & Ryan, 2000). At its core, intrinsic motivation reflects natural tendencies for curiosity and learning. Flow theory was created to explain why individuals are intrinsically motivated over long periods of time. Early flow research (e.g., Getzels & Csikszentmihayli, 1976) described that individuals want to be intrinsically motivated to work, and this “intrinsicity” over time coupled with other components allows the individual to attain flow.

Elements of Flow

Flow has been defined as a second-order construct represented by six first-order sub-facets: 1) merging of action and awareness, 2) centering of attention, 3) loss of self-consciousness, 4) temporal distortion, 5) feeling of control, and 6) autotelic nature (Nakamura & Csikszentmihaly, 2002). Four of the sub-facets, merging of action and awareness, centering of attention, loss of self-consciousness, and temporal distortion accurately characterize the flow state (Engeser & Schiepe-Tiska, 2012). Merging of action and awareness refers to a state in which a person is aware of their actions and behaviors, but they are unaware of the awareness itself (Csikszentmihalyi, 1975). For example, different athletes have described this component as being so involved in the activity that they don’t separate themselves from the activity itself, i.e., they see themselves as a part of the task. One interview with a marathon swimmer revealed that during a race, she was aware of how to make each stroke efficient, but each stroke felt like an extension of her. She was unaware of her awareness, meaning she was not thinking about how to execute each stroke. Centering attention toward the task, the second component of flow, refers to intense concentration. When experiencing loss of self-consciousness, individuals either choose to
ignore or do not consciously recognize internal states, such as hunger or fatigue, that are unrelated to task performance. Thus, during task engagement, anything outside the purview of the task is ignored (Nakamura & Csikszentmihalyi, 2009). Temporal distortion refers to the fact that when an individual is in a state of flow, their sense of how much time has passed is distorted. Csikszentmihalyi considers an individual’s perceived control over the situation and their actions a necessary condition for flow (Nakamura & Csikszentmihalyi, 2009; 2002; Keller & Bless, 2008). Finally, the autotelic nature of a task refers to a task being intrinsically rewarding.

Antecedents of Flow

There are currently three widely accepted antecedents to flow (Nakamura & Csikszentmihaly, 2002). The first antecedent is the match between individual skill level and task challenge. The task must match the individual’s skills, yet the task must present enough of a challenge so as to allow an individual to grow and develop his/her skills. The second antecedent is clear goals. Goals structure an individual’s experience by directing attentional resources (Csikszentmihalyi, Abuhamdeh, & Nakamura, 2005). The third antecedent is immediate task feedback so as to enable regulatory processes.

Flow theory is currently specified as a two-stage causal model, such that the experience of flow is thought to be predicated on the presence of the three antecedents, skill-task match, clear and non-contradictory task demands (i.e., goals), and the receipt of feedback regarding performance (See: Figure 1; Csikszentmihalyi, 1975).

The Link between Self-Regulation and Flow

Goals and feedback, two antecedents of flow, are also critical variables in models of self-regulation (Latham & Locke, 1991). Self-regulation involves goal-directed behavior, as “goals
are internally represented desired states” (Vancouver & Day, 2005). A self-regulatory process involves within-person “self-corrective adjustments” to stay on track to achieve a goal. An individual engaged in a self-regulatory process continuously uses feedback to move toward a goal.

Regulatory fit is theory of self-regulation that posits individuals have different motivational orientations and different means of pursuing goals (Higgins 2000). To attain fit, there must be congruence between an individual’s motivational orientation and the goal pursuit strategies used to achieve the goal (Higgins 2000). Successful alignment of motivational orientation and goal pursuit strategies provides the individual with a sense of “feeling right”, wherein individuals feel that their chosen goal pursuit strategy is “correct and fitting” with their motivational orientation (Appelt, Zou, & Higgins, 2010). Feeling right has been used to explain regulatory fit effects across a wide array of outcomes, such as increased strength of value on a task, increased engagement to the decision or goal, and behavior change (Higgins, 2005). I believe that applying a self-regulatory framework using regulatory fit to flow theory will help ameliorate the issues with the flow construct.

Concerns with the Flow Construct

Flow theory is better at providing post-hoc explanations of behavior than testable a priori predictions. The primary limitation of flow theory in terms of producing testable hypotheses is the failure to specify mediating processes. Instead, similar to trait theorists, flow theory researchers emphasize structural variables. Any personality theory that applies the trait approach (e.g., Eysenck’s Three-Factor Model, the Big Five) focuses heavily on the personality structure but downplays the process through which the structure affects outcome behaviors (Mischel & Shoda, 1998). For example, the Big Five represents the structure of personalities expressed as the
five factors, but as a result of the underspecified meditational processes through which these factors affect outcomes, links between the Big Five factors and behavioral outcomes are unimpressive. Similarly, flow theory is a two-stage causal model whereby no mediating process explanation exists for how the causal antecedents produce a state of flow, i.e., flow theory posits that skill-task match, goals, and feedback directly influence a flow state.

I believe the failure to specify the mediating processes have led to misspecification of the antecedents and sub-facets of flow. To address this concern, I borrow from the self-regulation literature and posit that “feeling right” is the critical mediating variable between flow antecedents and consequences (Higgins 2006; 2000). Feeling right is a subjective experience resulting from successful regulatory fit (Higgins, 2000). The antecedent conditions of feeling right are similar to but different than those identified in flow theory. Given that feeling right is hypothesized as the mediating variable, I argue that the antecedents of flow are fundamentally the same as the antecedents of regulatory fit. Finally, recasting flow theory in terms of self-regulatory processes also raises concerns about the specification of flow as an outcome. To this end, I propose modifications to the specification of the six sub-facets of flow.

Reconceptualizing Flow Theory

Antecedents Revisited. If “feeling right” is presumed to mediate flow, then logic dictates the antecedents of feeling right must be incorporated into the antecedents of flow. In my application of self-regulation, specifically “feeling right”, to the flow construct, I posit that there are three causal antecedents in the revised flow model: motivational orientation, goal pursuit strategies, and feedback (See: Figure 2). The alignment of motivational orientation (MO) and goal pursuit strategies (GPS), i.e., regulatory fit, is the antecedent of feeling right, and therefore,
MO and GPS replaces skill match and clear goals as causal antecedents of flow in the revised model.

Motivational orientation. An individual’s motivational orientation is a regulatory system that influences one’s intentions to strive toward a particular type of goal (Scholer & Higgins, 2010). Goal orientation is among the most popular motivational orientation constructs, and there are two classes of goal orientation: mastery and performance orientation (VandeWalle, Brown, Cron, & Slocum, 1999). An individual in a state of mastery orientation seeks to gain new knowledge and acquire and improve their skills. Those in a state of performance orientation seek to portray a positive image of themselves. The primary differences between current flow theory and the proposed revision of flow theory are the addition of motivational orientation as a causal antecedent and the rejection of skill-match as a causal antecedent. Current flow theory dictates that flow can only be attained when individual skill matches task challenge, but it is unlikely that skill-task match will lead to experiencing flow intensely (Keller & Landhauber, 2012). The skill-task match antecedent refers to measuring individual skill and task demands separately and then ensuring the match between them. However, to evaluate task challenge requires reference to individual skills, and as these two constructs are confounded with each other, measuring individual skill and task demands separately is not meaningful (Keller & Landhauber, 2012). More fundamentally, the skill-match notion is inherently linked to intrinsic motivation; if skill match is absent, the intrinsic interest to perform better on the task better is lost. Granted, when a task is too challenging for an individual it precludes the achievement of flow. However, when a task is easy relative to the individual’s skill, research has shown that an individual can still achieve a state of flow (e.g., Haworth & Evans, 1995). The key for mundane tasks is the presence of an external incentive to reinforce repetition of the task. So long as the task provides
fair external incentive, individuals will remain motivated to engage in the task and can achieve a flow state. Also, an over-skilled individual can attain flow through automaticity of behaviors (Csikszentmihalyi, 2014). As the task becomes easier and more familiar, an individual’s behaviors on the task become increasingly automatic and robotic in nature.

**Goal pursuit strategies.** From the social cognitive perspective, it is widely accepted that all behavior is motivated and directed by an individuals’ goals and expected outcomes (Bandura, 2001; Beach, 1985). Further, from a regulatory fit perspective, the critical issue is the alignment of motivational orientation and goal pursuit instead of the goal itself. In my revised theory of flow, goal pursuit strategies replace clear goals as a causal antecedent. An individual holding a particular goal orientation using the corresponding goal-pursuit strategy can sustain the current motivational orientation state (Higgins, 2000). Goal pursuit strategies provide an individual with direction on the behavioral, strategic means to use to achieve a goal. For instance, a mastery-oriented individual is likely to use learning goal pursuit strategies, which are behaviors geared toward learning information and gaining skills. Alternatively, a performance-oriented individual is likely to use impression-management goal pursuit strategies, or behaviors geared toward portraying a positive impression of oneself or improving one’s standing in a group.

**Feedback.** Feedback is retained as a causal antecedent in my revised flow theory because it is a necessary component to successful task engagement (Carver & Scheier, 1981). Feedback that is specific and timely provides the target with knowledge of results, which is necessary for effective self-regulation (Karoly, 1993). Stated differently, feedback provides information about discrepancies between goals and behaviors necessary to adjust behaviors (or goals).

**Elements of flow revised.** Incorporating feeling right as the mediating variable also requires the reconsideration of flow components. It is clear that the sub-facets, merging of action
and awareness, centering of attention, loss of self-consciousness, and temporal distortion, should follow from the feeling right experience. I further argue that sense of control and autotelic nature of the activity should not be included as sub-facets of flow. Sense of control refers to having a high degree of control over the demands of the task. Without possessing a perceived sense of control, it is difficult to attain flow (Keller & Bless, 2008). Keller & Bless manipulated the fit between individual skills and task demand in a computer game to dictate players’ perceived control. Flow experiences differed based on individuals’ perceived control over the game. Individuals who perceived that they had no control over the task at hand were unable to get into a state of flow; they were less involved in the task, felt like they spent more time on the task, and performed poorly. It appears that rather than serving as a characteristic of flow, sense of control is a necessary condition for flow.

Further, autotelic nature of an activity refers to intrinsically motivating aspects of the activity that help keep an individual invested in a task. However, intrinsic motivation or engaging in an inherently interesting task (i.e., autotelic nature) is not necessary to attain flow when conceptualizing flow as an outcome of regulatory fit. The subjective experience of “feeling right” eliminates the necessity to include intrinsic motivation or autotelic nature as an identifier of flow. Further, Engeser & Schiepe-Tiska (2012) point out that because flow theory was created to explain intrinsically motivated behavior, incorporating intrinsic motivation as part of the sub-facets of flow is circular logic.

To sum, I draw from the self-regulation literature to propose a revision to the current flow model. In the revised model, I posit that there are three causal antecedents (MO, GPS, and feedback) that will lead to four components of flow (merging of action and awareness, centering
of attention, loss of self-consciousness, and temporal distortion) through two mediating processes (feeling right and knowledge of results) (See: Figure 2).

**Flow and Performance**

Flow researchers postulate a positive relationship between a flow state and task performance (Landhauber & Keller, 2012). This is primarily because two of the currently specified sub-facets of flow, centering of attention and sense of control, enable high performance. Further, as noted, the skill-task match antecedent of flow is linked to intrinsic motivation. Therefore, experiencing flow is theorized to imply growth in any activity, wherein an individual will continually seek out more challenges as their skill and familiarity with the activity increases. Since flow experiences are said to be intrinsically rewarding, individuals will attempt to progressively seek out the flow state. This behavior, through practice, may be linked to higher performance.

To date, most of the current flow research is correlational, thus making the direction of the flow-performance relationship unclear. Some studies do show a positive correlation between flow and performance (e.g., Schuler, 2007). However, these correlations tend to be small, and it is unknown whether flow experiences facilitate good performance or whether good performance leads to a flow state. Further, studies that directly manipulate flow to measure performance have found no correlation between flow and performance (Keller & Blomann, 2008; Schiefele & Roussakis, 2006). Thus, the relationship between flow and performance is still largely unknown as a result of limited experimental research.

In recasting the flow model through a self-regulatory lens, I posit that task performance will differ based on an individual’s flow experience. In the revised model, the flow state is attained when there is congruence between an individual’s motivational orientation and goal
pursuit strategies (i.e., regulatory fit). Thus, I speculate that type of fit will influence task performance. More specifically, individuals in a state of mastery orientation who use learning goal pursuit strategies will be more focused on improving their skills. Therefore, it is logical that these individuals are more likely to focus on the quality of their performance (See: Figure 3). Individuals in a state of performance orientation using impression-management goal pursuit strategies are more focused on image and improving their standing, making it more likely for them to focus on the quantity of their performance (See: Figure 4). Reconceptualizing flow in terms of motivational orientation and goal pursuit may also ameliorate the ambiguity of the direction of these relationships.

Current Study

For flow theory to produce falsifiable hypotheses, it is necessary to separate the humanistic element of personal growth and development (e.g., autotelic nature) from the self-regulatory mechanisms of flow. The purpose of this study is to test my revised theory of flow based on self-regulatory processes as specified by regulatory fit. Alignment between motivational orientation and goal pursuit strategies (i.e., regulatory fit) results in “feeling right”, and feeling right facilitates attainment of flow. However, a misalignment between motivational orientation and goal pursuit strategies resulting in feeling not right inhibits attainment of flow. Beyond regulatory fit, receipt of immediate feedback is necessary to achieve flow. Immediate feedback generates knowledge of results necessary to self-regulate task performance. The purpose of the current study is to test predictions about the effects of regulatory fit on both flow and performance (See: Figure 5). As such, veridical task feedback will be made available to all participants and there will be no hypotheses about the effects of feedback on flow.

The revised flow model will be tested in the context of a computer game. I propose that
sustaining fit between goal orientation and goal pursuit (i.e., mastery-learning or performance-impression management) and receiving immediate feedback on game performance, will lead to “feeling right” and knowledge of results, respectively, which in turn will lead to flow, comprised of four sub-facets, merging of action-awareness, centering of attention, loss of self-consciousness, and temporal distortion.

**Literature Review**

*Flow*

Flow is a subjective experience that is characterized by complete absorption in an activity. The concept of flow manifested in the 1960s when Csikszentmihalyi was examining individuals perform self-motivating activities, such as painting, rock climbing, and even surgery (Getzels & Csikszentmihalyi, 1976; Csikszentmihalyi, 1975). These individuals exhibited a one-track mind and persisted on the task, without regard for hunger, discomfort, or conscious awareness about the amount of time passed (Nakamura & Csikszentmihalyi, 2009). Since the origin of flow theory began in an attempt to understand intrinsically motivating activities, Csikszentmihalyi first examined the nature of flow in activities that are considered inherently rewarding and enjoyable, such as gaming and play activities. These included activities like chess, dancing, and rock climbing. Eventually, flow was considered in the work context, specifically surgery; in a work activity, rather than being motivated by an intrinsic activity, individuals may be more motivated by external rewards, like prestige or monetary incentives. Through interviews of individuals engaging in a variety of play and work activities, Csikszentmihalyi found that flow is experienced similarly across different contexts. The flow experience emerges during deep involvement in a skill-related task, under conditions of individual skill–task challenge match, clear goals, and immediate feedback (Csikszentmihalyi, 1975; 2000).
Models of Flow

As flow theory developed, different measurement techniques gave rise to the emergence of different models of flow. The objective of these models was to describe differences in individuals’ subjective experience (of flow) during task engagement. Flow measurement techniques and graphical representations of flow, i.e., flow models, have been developed in tandem (Moneta, 2012). Two such measurement methods, the Flow Questionnaire and the experience sampling method, have been used to develop the First Model and the Quadrant Model of Flow, respectively (Csikszentmihalyi, 1975; 2000; Csikszentmihalyi & Larson, 1984).

Flow Questionnaire and the First Model of Flow. The Flow Questionnaire (FQ) is a paper-and-pencil questionnaire that provides quotes and descriptions of the flow state and asks respondents to describe: 1) if they recognize the experience, 2) in what contexts/activities they have experienced flow, and 3) how often (Nakamura & Csikszentmihalyi, 2014; Moneta, 2012; Csikszentmihalyi & Csikszentmihalyi, 1988). It was created using descriptions of the flow state obtained from qualitative interviews regarding the positive subjective experience across different contexts (Nakamura & Csikszentmihalyi, 2014; Csikszentmihalyi & Csikszentmihalyi, 1988). The FQ has been used to identify the prevalence and depth of individuals’ flow experiences across different contexts, such as sports (Jackson & Marsh, 1996) and psychotherapy (Parks, 1996; Nakamura & Csikszentmihalyi, 2014). The use of the FQ made way for the first graphic representation of the flow state, called the First Model of Flow (Csikszentmihalyi, 1975).

According to the First Model, an individual is likely to experience one of three subjective states during task engagement: boredom, anxiety, or flow (Csikszentmihalyi, 1975). This model assumes that the task will present clear goals and immediate feedback. Experience of one of the subjective states is dependent upon level of individual skill and level of task challenge. The
boredom state is conceived to arise when an individual’s skill level exceeds the challenge afforded by the task. The anxiety state is thought to occur when perceived task challenge is greater than the individual’s skill level. The optimal state for flow is when the ratio of perceived task challenge and individual skill are equal. Thus, close fit between individual skill and task challenge is posited to be necessary for flow. According to this model, flow can be attained at any level of skill and challenge match, meaning the flow state can be attained at low skill-low challenge and at high skill-high challenge.

*Experience Sampling Method and the Quadrant Model of Flow.* The experience sampling method (ESM) has helped to measure flow experiences in real time in everyday life (Csikszentmihalyi & Larson, 1987). A study employing the ESM provides participants with pagers and signals them at specific times to complete a 42-item questionnaire describing the current moment. Items inquire about the activity (e.g., content of the task), the context (e.g., time, place, etc.), motivation and interest in the activity (Moneta, 2012; Csikszentmihalyi & Larson, 1987).

The data obtained from the ESM was used to update the original First Model of flow primarily because Csikszentmihalyi noted that differences in the level of skill-task match affects flow experiences. More specifically, the flow state is experienced as more intense, complex, and ordered for those who experience high skill-high challenge match (Csikszentmihalyi, 1987). Alternatively, for those with low skill-low challenge match, flow is less intense, complex, and ordered (Csikszentmihalyi, 1987). The ESM gave rise to the Quadrant Model, in which apathy was added to boredom, anxiety, and flow as a possible subjective experience during task engagement (Csikszentmihalyi & Larson, 1987). Apathy is posited to occur when an individual
with low skill engages in a task with low challenge. The Quadrant Model refined the notion of skill-task match, and to date, it is the model used most often in flow research.

_Elements of Flow_

**Components of Flow**

According to flow theory, the subjective state of flow is characterized by six primary components: merging of action and awareness, centering of attention, loss of self-consciousness, temporal distortion, sense of control, and autotelic nature of the activity (Csikszentmihalyi, 1975; 2000). These components characterize an individual’s state when experiencing flow during task engagement (Moneta, 2012).

_Merging of Action and Awareness._ Merging of action and awareness is one of the clearest signs of flow. An individual in flow is aware of their actions, but they are unaware of the awareness itself (Csikszentmihalyi, 1975). Individuals see themselves as part of the task. Csikszentmihalyi uses this quote from a rock climber to illustrate merging of action and awareness, “You are so involved in what you are doing, you aren’t thinking of yourself as separate from the immediate activity… you don’t see yourself as separate from what you are doing…” (2014, pp. 139).

_Centering of Attention._ Centering of attention, or intense concentration, refers to high degree of concentration on the specific task (Engeser & Schiepe-Tiska, 2012; Csikszentmihalyi, 1975). Interestingly, descriptions of flow states are similar to descriptions of individuals’ subjective experiences during a hypnotic state (Lindsay, Maynard, & Thomas, 2005). In fact, one study showed that athletes who are readily susceptible to entering a hypnotic state find it easier to attain a flow state (Edgette & Rowan, 2003). Hypnosis operates by eliminating distractive and competing thoughts and replacing them with one singular goal, or thought (Lindsay et al., 2005),
thereby centering attention and increasing concentration. Both intrinsic and extrinsic involvement in a task can result in centered attention and increased concentration (Csikszentmihalyi, 2014). For instance, an activity with a competitive element or monetary incentives can increase concentration toward the activity (Csikszentmihalyi, 2014).

**Loss of Self-Consciousness.** Loss of self-consciousness is the feeling of “self-forgetfulness.” As the task takes over and flow is experienced, the individual is less affected by self-concerns, such as hunger or fatigue (Csikszentmihalyi, 1975). An individual in flow is completely immersed in an activity, and discounts any considerations about the self, which become irrelevant (Csikszentmihalyi, 2014).

**Temporal Distortion.** Temporal distortion, or time transformation, refers to a perception wherein an individual loses track of time, and long periods of time are perceived as much shorter (Jackson & Marsh, 1996). This is thought to occur because an individual in flow is so cognitively invested in the activity that resources are unavailable to internally monitor time spent on the task (Csikszentmihalyi, Abuhamdeh, & Nakamura, 2014; Friedman, 1990). Thus, an individual in a flow state perceives time as passing very quickly.

**Sense of Control.** Experiencing a high sense of control over the task demands is another component of flow. Complete mastery of the task or situation is not required for control. Rather, sense of control fundamentally refers to being unconcerned with lacking control during task engagement (Csikszentmihalyi, 2014). Individuals can report control for daily activities, as well as activities that are inherently dangerous, such as rock climbing or racecar driving (Csikszentmihalyi, Abuhamdeh, & Nakamura, 2014). For example, some expert rock climbers believe climbing to be less dangerous than crossing a busy street, because they feel in complete control when they are on the rock, and they feel like they can foresee the outcomes
(Csikszentmihalyi, 1975). Alternatively, crossing a busy street presents greater entropy and a lowered sense of control. Keller and Bless manipulated individuals’ sense of control in a computer game task, wherein the game either adapted to players’ skill level or became progressively more difficult regardless of players’ skill (2008). When the game adapted to the player’s skill, they felt more in control and were more likely to report a flow state. As stated above, I treat sense of control as a necessary condition for flow, i.e., if sense of control is absent, the flow state cannot be achieved.

**Autotelic Nature.** Finally, autotelic nature of the activity refers to an activity that is inherently enjoyable and rewarding (Csikszentmihalyi, 1990). As a result of engaging in such an activity, individuals are intrinsically motivated and feel little need for external rewards. It is posited that the experience of flow is rewarding and individuals seek to attain this state. This occurs as a result of the “autotelic or intrinsically rewarding experience” (Engeser & Schiepe-Tiska, 2012; Csikszentmihalyi, 1990). Again, as stated above, I exclude the autotelic nature of tasks because it creates circular logic, i.e., to achieve the flow state, the task must be intrinsically motivating, and one of the elements of flow is that the task is intrinsically motivated.

**Antecedents of Flow**

These six sub-facets are preceded by the three generally accepted antecedents of flow, which are skill-task match, clear goals, and immediate feedback (Csikszentmihalyi 1975; 1978; 1982; Csikszentmihalyi & Nakamura, 1989; Csikszentmihalyi & Csikszentmihalyi, 1988).

**Skill-Task Match.** The relationship between individual skill and task challenge is the “central axiom of flow theory” (Csikszentmihalyi 1975; Csikszentmihalyi 1982). The task must be skill-based for flow to occur, so an activity requiring no skill (e.g., collecting pennies) will not be conducive to a flow state. An activity can be initially captivating if the challenges afforded by
the activity match the individual’s skill level. Through experience and practice, as skill level increases, the activity will cease to provide an opportunity for flow unless the individual seeks out greater challenges and sets higher goals.

*pClear Goals.* Clear goals refer to clarity in the task structure. Goals may arise from immediate experience or anticipation for a future desired state. Goals that emerge from immediate experience are thought to aid more in the experience of flow (Csikszentmihalyi & Nakamura, 1989; Csikszentmihalyi & Csikszentmihalyi, 1988; Csikszentmihalyi 1975). When an individual is in flow, they are fully absorbed in their immediate, or present, experience during task engagement. Thus, a task must continually provide clear goals, so that one’s attention will continue to be focused on the task at hand. (Csikszentmihalyi & Nakamura, 2014). Activities that have a clear structure, like sports competitions, computer games, or musical performances, will constantly provide clear goals.

*pImmediate Feedback.* Immediate feedback refers to diagnostic information received about progress or success in task execution (Goodman, 1998). Receipt of feedback allows individuals to adjust their behaviors to maintain or improve performance (London & Smither, 2002). On a higher level, feedback is also theorized to serve another, more long-term purpose. Feedback provided by flow activities resembles feedback loops of cybernetics (Csikszentmihalyi & Nakamura, 2014; Carver & Scheier, 1981). Here, future behavior is regulated based on feedback of experiential states (e.g., flow). Feedback on experiential states, in the form of affect (e.g., experiencing flow makes an individual feel good), allows individuals to compare the present subjective experience with past experiences, which can motivate them to continue to seek out flow experiences.

*Domain-Specific Flow Antecedents*
Researchers from various domains have examined other antecedents to flow, which appear to be distinct between subject areas. Two such fields are organizational science research (Kuo & Ho, 2010; Demerouti, 2006; Bakker 2005) and sports psychology (Jackson, 1995).

**Organizational Science.** Flow in the workplace is an optimal, short-term experience; to experience flow, employees must have complete immersion in work, take pleasure in performing work activities, and be intrinsically motivated to complete work (Bakker, 2005). Organizational research has indicated that person, job, and organizational characteristics all influence the experience of flow. Kuo and Ho (2010) studied the effect of person factors (gender, length of employment, and meditation experience) and job characteristics (skill variety, task significance, task identity, autonomy, and feedback components) on the flow experience. Both person factors and job characteristics, specifically meditation experience, autonomy, feedback, and skill variety were significant predictors of flow for the dimensions of centered attention, sense of control, and feeling curiosity and having intrinsic interest, i.e., autotelic nature. In a study of flow in music teachers, Bakker found that job resources, such as autonomy, performance feedback, social support, and supervisor coaching, all positively influence employee skill–task challenge match, which in turn, contributed to the flow experience (2005). On the organizational level, a company that stimulates a socially supportive climate and provides clear goals for their employees will foster an environment that, over time, facilitates employees’ experience of flow (Salanova Bakker, & Llorens, 2006).

Flow in the context of work has also been linked to Hackman and Oldham’s (1975) classic job characteristics model (Demerouti, 2006). Feedback and sense of control are critical variables in both models. Further, the flow antecedent, clear goals, has been linked to task identity in the job characteristics model. Demerouti found that job characteristics, skill variety,
task identity, task significance, autonomy, and performance feedback were significantly related to flow.

*Sports Psychology.* Much of the research on flow antecedents in sports psychology is conducted using interviews of elite athletes, who are asked a series of questions about flow and are asked to identify factors that they perceive generally help them to get into flow (e.g., Jackson, 1995). A few commonly identified antecedents to flow include the motivation to perform, achieving optimal arousal level before competition, confidence, and physical readiness (Jackson, 1995; Jackson & Roberts, 1992).

Goals, perceived competence, and self-efficacy have also been examined as potential antecedents to flow during engagement in sporting activities. Stein, Kimiecik, Daniels, and Jackson (1995) hypothesized that individuals with a mastery (as opposed to performance) goal orientation, perceived competence, and self-efficacy would experience flow more frequently. Mastery goal oriented individuals focus on learning and self-improvement, whereas performance oriented individuals focus on outperforming others (Nicholls, 1989). Further, Stein et al. posited that perceived competence and self-efficacy aids in intrinsic motivation and centering attention to the task (Bandura 1986; Deci & Ryan, 1985). However, examination of tennis players, basketball players, and golf players revealed no relationship between the flow experience and mastery goals, performance-goals, perceived game ability, and self-efficacy (Stein et al., 1995).

The flow antecedents in the sports context are vague. Each antecedent named appears to be too narrow, such that it is limited solely to the context of athletic competition (e.g., optimal physical preparedness) or it is so broad (e.g., positive attitude) that it can apply to activities that don’t even need the application of one’s skills/abilities, which is said to be necessary to flow. These antecedents cannot be causal antecedents to the flow state if they vary so widely in terms
of specificity. Further, as stated, domain specific antecedents are identified through personal interviews, but no further action is taken to validate these responses to see if they apply to a larger sample. Thus, the flow antecedent research remains incomplete.

**Critique of Flow Theory**

Flow theory places considerable focus on the measurement structure of flow and the proposed causal model is a simple, two-stage model, i.e., antecedents cause flow. Flow theory is underspecified because the mediating processes through which flow antecedents lead to a state of flow are largely ignored. My revised model of flow is intended to reduce underspecification of flow theory by applying regulatory fit as the causal antecedent to flow. Arguing that regulatory fit is antecedent psychological state to attaining a state of flow results in the argument that flow theory is also misspecified. As a result of these issues, at its current stage, flow theory is not conducive to producing testable hypotheses and this has led to a plethora of descriptive studies of flow (Moneta, 2012).

**Underspecification of Flow Model**

Causal models must include antecedent conditions, mediating processes, and outcomes of mediating processes. The flow model has identified flow antecedents and sub-facets (i.e., outcomes) but has overlooked identifying any mediating processes. Without identification of mediators, the flow causal model is underspecified.

It is theorized that to attain flow, an individual must attach subjective value to the task at hand, and the greater the value assigned to the activity, the more intensely flow is experienced (Keller & Landhauber, 2012). First, no mediators are present in the flow model to help foster this subjective value. Second, the three currently specified antecedents to flow, skill-task match, clear goals, and feedback, do not provide an individual with means of assigning value to a task. Skill-
task match, clear goals, and feedback provide an individual with information to successfully engage in an activity, but provide no system through which they can feel strongly invested in the activity. If these antecedents cannot provide value, and value is necessary to get into a state of flow, then these antecedents can logically be brought into question.

**Misspecified Flow Antecedents**

Skill-task match and clear goals, in particular, are problematic as antecedents to flow. There are two main issues with skill-task match. First, most claims for skill-task match are still theoretical in nature, as there is very limited empirical evidence to support this antecedent. Although it is likely that low skill level and high task challenge inhibits flow, an over-skilled individual can achieve a flow state, especially if external incentives are present (Haworth & Evans, 1995). Second, asking about an individual’s perceived skill level on an activity is ambiguous. Without reference to a specific aspect of the task, the manner in which the individual interprets the ambiguity will affect how he/she responds. In a computer game, for example, the respondent may refer to skill level on one aspect on the game, skill level on the current level being played, or skill level of gaming in general.

The second antecedent to flow refers to the fact that an individual must be guided by clear goals. However, as stated, research in social psychology has indicated that all behaviors are goal-directed (Bandura, 2001; Beach, 1985). The clear goals antecedent needs greater specificity to add explanatory power to the flow model, and expressing clear goals as goal pursuit strategies provides this. Goal pursuit strategies refer to specific strategic means that guide an individual toward a desired outcome. It appears that a skill task match and clear goals may not directly be causally necessary to attain flow.

**Misspecified Flow Components**
If the flow antecedents and mediating processes are to be specified differently, then flow outcomes, i.e., sub-facets, must also be reconsidered. Of the six flow components, only merging of action and awareness, intense concentration, loss of self-consciousness, and time distortion seem to characterize the concept of flow and the automaticity of behavior it implies. However, sense of control is a necessary precondition for flow and autotelic nature appears to be a misspecified component of flow.

The sense of control component refers to an individual’s perception that they are in control of the task. An individual must feel that their behaviors and the present situation are under their control to attain flow. If this perceived control is lost, then flow is inhibited. However, rather than characterizing the flow state, perceived sense of control appears to be necessary condition to attain flow. That is, without perceived control, such as if the task proves to be too difficult and the individual feels that they have no governance over task level/difficulty, they will not be able to get into a state of flow (e.g., Keller & Bless, 2008).

There are a few problematic aspects of the autotelic nature sub-facet of flow. First, the flow construct originated as an explanation for intrinsically motivated behavior (Csikszentmihalyi, 1975), so including intrinsically motivated behavior as part of the definition of flow is a circular explanation (Engeser & Schiepe-Tiska, 2012). Second, it is not necessary for the task to be intrinsically rewarding to attain flow (Csikszentmihalyi, 1975), so it is flawed to include this component as a defining component of flow. According to Csikszentmihalyi, “In calling an experience ‘autotelic,’ we implicitly assume that it has no external goals or external rewards; such an assumption is not necessary for flow” (emphasis added) (1975, pg. 36). This implies that to experience flow, the task need not have an intrinsically motivating component.
Intrinsically motivated individuals will be able to attain flow and perform an activity for the sake of personal growth/development or the sheer enjoyment of the activity. Further, since individuals are thought to be more likely to experience flow as a result of their autotelic personality (Csikszentmihalyi, 1990), an intrinsically motivated person may be able to attain flow with greater ease, however this doesn’t preclude extrinsically motivated individuals from attaining flow. An individual can easily attain flow in an extrinsically rewarding task if their skills are greater than the task challenge, such that their behavior becomes automatic, or almost robotic in nature. There are two ways in which an extrinsically motivated individual can experience flow. First, when performing the task, an extrinsically motivated individual can create a self-reinforcing system, such as a game, to make it inherently motivating. For example, “how many parts can I assemble in one minute?”, and “can I do it faster than last time?” This self-reinforcing system may increase the frequency or intensity of flow experienced, but it is not a necessary condition for attainment of flow. Second, an individual can be solely extrinsically motivated and still be able to achieve a flow state. Extrinsic motivation should not hamper the experience of flow as long as there continue to be extrinsic rewards associated with the task. Once the task offers no extrinsic rewards, the individual is likely to lose motivation to engage in the task at all, and as a result will no longer be in flow.

Based on the current definition and the components outlined for flow, the flow state can be thought of as manifesting as automatized behavior and less effortful processing. If flow, at its basic foundation, refers to automatic behavior, autotelic nature of the task or the individual should not matter. I posit that sense of control is a precondition for flow and autotelic nature is a misspecified sub-facets of flow. Therefore, control and autotelic nature should not be characterized as components of flow.
Flow as a Self-Regulatory Process

Motivation and self-regulation are driven by individuals’ choices about goals, actions, and expended effort (Bandura 1991). Self-regulation is a process referring to purposeful behavioral adjustments used to continually move toward a goal representation (Carver & Scheier, 2012). According to Vancouver and Day, self-regulatory processes include managing and advancing goals (2005). Goals are viewed as desirables “states” that individuals strive for. Feedback plays a key role in self-regulation, such that goal directed behavior is driven by individuals’ reaction to feedback about progress toward goals (Locke & Latham, 2002). Thus, a core self-regulatory framework includes adopting a goal that is important to the self, execution of purposeful behavior to move toward the goal, and modification of behavior to aid in goal attainment based on feedback.

Regulatory Fit

Regulatory fit is a principle of motivation that focuses on the relationship between an individual’s motivational orientation and the method through which their goal is attained (Higgins 2000). Motivational orientation refers to different regulatory systems that individuals operate when striving to attain a goal. There are preferred or associated goal pursuit (behavioral) strategies for each orientation. Alignment of motivational orientation and strategic means gives rise to feelings of rightness that influences individuals’ decisions to continue expending effort toward goal pursuit (Scholer & Higgins, 2010; Vaughn, Malik, Schwartz, Petkova, & Trudeau, 2006). When an individual experiences feeling right, there is an indication that the behavioral strategic means employed are allowing for advancement toward goals without any incongruity to current motivational orientation (Koenig, Cesario, Molden, Kosloff, & Higgins, 2009). Regulatory focus theory (Higgins 1998) is most commonly used orientation variable with
regulatory fit. Regulatory focus theory identifies two orientations: promotion focus and prevention focus (Higgins 2000). A promotion-focused individual is concerned with hopes and aspirations, and is oriented toward gains (presence or absence of positive outcomes). A prevention-focused individual is concerned with duties and responsibilities, and is oriented toward losses (presence or absence of negative outcomes). To produce fit, a promotion/prevention orientation implies eager/vigilant strategic means. Regulatory fit can be applied to any theory of motivational orientation (Cesario, Higgins, & Scholer, 2008), such as goal orientation, a theory of achievement motivation.

Goal Orientation

According to goal orientation theory, individuals are motivated by different types of goals, specifically mastery and performance goals. When an individual adopts a mastery orientation, they are focused on building their knowledge and skill base and are motivated by opportunities through which they can learn something new and improve their competence (Button et al., 1996). Those with a performance-approach orientation are focused on attaining favorable judgments relative to others. They are motivated by a desire to project high levels of ability (Radosevich, Radosevich, Riddle, & Hughes, 2008). Generally, goal orientation has not been thought of as distinct from goal pursuit strategies. However, in applying goal orientation to regulatory fit, it is clear that goal orientation implies its own strategic means.

Fit can be attained with goal orientation when an individual with a mastery/performance-approach orientation uses learning/impression-management goal pursuit strategies. Learning strategic means lead an individual to actively focus on seeking out information to gain knowledge and improve their skills. Impression-management strategic means lead an individual to seek out ways to improve their own image and improve their rank in a group. Alignment
between motivational orientation and goal pursuit strategies (i.e., mastery-learning; performance-impression management) will result in “feeling-right,” and consequently, the outcomes of fit.

All individuals possess some degree of learning and competition (goal orientation) (Cesario et al., 2008). Individuals can rely on their preferred, chronic orientation (Button et al., 1996; VandeWalle, 1996) or can temporarily adopt one depending on the characteristics of the situation (e.g., Fransen, Fennis, Pruyn, & Vohs, 2011; Forster, Higgins, & Idson 1997).

The Link Between Feeling Right and Flow

According to flow theory, when performing a task, an individual is constantly evaluating themselves and the situation. If task engagement sustains a flow state, they are likely to continue because flow is an intrinsically rewarding experience. According to Aaker and Lee (2006), the experience of flow may be comparable to the regulatory fit experience of feeling right. Feeling right allows an individual to have greater concentration, or center one’s attention toward the task, which can lead to greater task engagement (Higgins, 2005). Experiencing strong engagement on a task leads individuals to be more “involved, occupied, interested, and attentive to [the task]; they are absorbed or engrossed with it” (Avnet & Higgins, 2006). This is similar to a flow experience in that flow is characterized by successful task engagement.

Feeling right, and in turn increased task engagement, also leads an individual to ascribe greater value to the task. This value goes beyond anticipation of potential positive outcomes, and it leads to attitudinal and behavioral changes that aid in goal attainment (Higgins, 2006). As stated, an individual must assign subjective value to a task to be able to experience flow (Keller & Landhauber, 2012). This value can arise from the mechanism behind regulatory fit, feeling right. Assigning value to a task can motivate individual through a combination of the experience
of pleasure and pain (i.e., hedonic experience) and the experience of motivational force, or attraction to an activity (Higgins 2006; 2010).

Regulatory fit research can be applied to understand the flow state. The experience of fit and feeling right has been linked to different flow components. For example, merging of action and awareness primarily refers to an individual being aware of his/ her actions but unaware of the awareness itself. The process of merging of action and awareness can be thought as being similar to processing fluency. Processing fluency refers to how easily, or readily, an individual can process information. Lee and Aaker (2004) examined the effects of regulatory fit on processing fluency. Individuals in a state of fit experience greater processing fluency. More specifically, those in a state of fit were able to identify target words that reflected their present state of motivational orientation. Individuals in a state of promotion/ prevention fit were more readily able to identify words related to promotion/ prevention orientation. Lee and Aaker (2004) argued that participants subconsciously processed information consistent with their type of regulatory fit.

The consequences of fit and feeling right appear to be conducive to a flow state. Regulatory fit has been linked to greater task enjoyment, better task performance, and greater intentions to improve performance (Appelt, Zou, & Higgins, 2010; Cesario & Higgins, 2008; Freitas & Higgins, 2002). Each of these consequences of fit – expecting to enjoy the activity and performing well, and wanting to improve on that performance – likely aid in achieving a state of flow. Further, through the mechanism of “feeling right” and assigning subjective value to a task, individuals in a state of fit have greater intentions to finish an activity that leads to greater displays of interest and increased task engagement (Higgins, Cesario, Hagiwara, Spiegel, & Pittman, 2010; Higgins, 2005; Spiegel, Grant-Pillow, & Higgins, 2004).
Individuals derive value from fit, because when experiencing fit, they “feel right” about their actions and engage more strongly in the activity, which influences strength of value experienced. Thus, if the experience of flow requires assignment of subjective value to a task, and value comes from the process of “feeling right,” then it can be argued that feeling right is the mediating process that leads to flow.

**Flow and Performance**

Flow theorists have speculated a close relationship between flow and performance (Landhauber & Keller, 2012). It is assumed that flow both directly and indirectly affects performance. First, there may be a direct relationship between flow and performance because high concentration and sense of control, both present in a flow state, can help facilitate high performance (Eklund, 1996). Flow can also have an indirect positive effect on performance. The rewarding nature of a flow state is thought to motivate individuals to repeatedly seek out the flow experience (Nakamura & Csikszentmihalyi, 2009; Csikszentmihalyi, 1975). As a result of replicating their experiences, individuals can further develop their skills and master increasingly difficult activities. Thus, a flow state can foster growth, which will keep individuals motivated to further engage in the activity, leading to better performance.

Demerouti examined the effect of a flow state on performance in the work context (2006). Results revealed that the relationship between flow and performance (in role and extra role) was moderated by personality characteristics, such as conscientiousness. Frequent flow experiences were beneficial in terms of performance for highly conscientious employees. In the sports context, athletes report experiencing flow when they perform at their best (Jackson & Roberts, 1992).

Although flow and performance may be closely related, the direction of this relationship
remains unclear. Given that much of the data on the flow-performance relationship is correlational, the nature of the flow-performance relationship is largely unknown, as to whether flow influences performance, whether good performance fosters a flow state, or whether the relationship is reciprocal.

Much of the correlational research on flow and performance have yielded mixed results. Few experimental studies (e.g., Keller & Bless, 2008; Keller & Blomann, 2008; Schiefele & Roussakis, 2006) have been conducted to examine the relationship between flow and performance. These three studies measured performance and flow in the context of computer games, such as Tetris and Roboguard, but found no effect of flow on performance. According to Engeser & Rheinberg (2008), the lack of an effect between flow and performance may be because the activity wasn’t perceived as important or individuals ascribed no value to the task during task engagement.

Landhauber & Keller (2012) note that experimental designs that have been used to test the flow-performance relationship do not directly test flow theory. They cannot test the assertion that flow causes greater performance because flow is induced by manipulating task difficulty. Task difficulty is manipulated in an attempt to create conditions for the skill-task match antecedent. For example, in a computer game task, if the game is rigged to only permit the participant to play at the most difficult level, this is thought to create a situation wherein task difficulty is greater than the individual’s skill level. However, if flow is the result of alignment between motivational orientation and goal pursuit, there is no utility in manipulating task difficulty. I posit that differences in the interaction of goal orientation and goal pursuit strategies will lead to differences in the type (e.g., quality or quantity) of performance. More specifically, individuals in a state of mastery orientation who use learning goal pursuit strategies (i.e., mastery
fit) will be more likely to focus on the quality of their performance because mastery-state individuals are concerned with gaining knowledge so as to improve their skills. Alternatively, individuals in a state of performance orientation using impression-management goal pursuit strategies (i.e., performance fit) will be more likely to focus on the quantity of their performance because performance-state individuals may be less attentive to game feedback and be primarily concerned with projecting a positive impression and relative standing in a group. Focusing on the quantity of performance is conducive to making normative comparisons with other people.

**Current Study**

In the current study, I use an experimental design to test my revised flow theory. Goal orientation is used as the motivational orientation variable, so interaction of mastery/performance goal orientation and learning/impression management goal pursuit strategies will lead to the subjective experience of feeling right. Feeling right is hypothesized to mediate the relationship between the interaction of motivational orientation and goal pursuit and the flow sub-facets. This mediating process works on two principles. First, feeling right leads individuals to attach value to the task at hand, which is theorized to be necessary for a flow state. Second, feeling right increases strength of engagement on the task, which leads to deeper task immersion, two fundamental characteristics of a flow state.

I further posit that the type of flow experience will be contingent upon whether the individual is in a state of mastery fit or performance fit, and this will lead to differences in task performance. More specifically, individuals experiencing mastery fit will focus on the quality of their performance, whereas individuals experiencing performance fit will focus on the quantity of their performance. This model will be tested in the context of a strategy, bridge-building computer game.
Hypotheses

Overall, I hypothesize that individuals experiencing a match between motivational orientation and goal pursuit, i.e., regulatory fit, will attain flow, whereas individuals in a state of non-fit will not attain flow. I further hypothesize that regulatory fit and the experience of flow will positively influence type of task performance.

Hypothesis 1: Alignment/ misalignment between motivational orientation and goal pursuit strategies will lead to higher/ lower levels of concentration during game play.

1a: Individuals in a state of mastery-orientation will display greater concentration on the game when game strategies are framed using a learning goal-pursuit as opposed to an impression-management goal pursuit.

1b: Individuals in a state of performance-orientation will display greater concentration on the game when game strategies are framed using an impression-management goal-pursuit as opposed to a learning goal pursuit.

Hypothesis 2: Alignment/ misalignment between motivational orientation and goal pursuit strategies will lead to greater/ lower levels of time distortion during game play.

2a: Individuals in a state of mastery-orientation will display estimate that they spent less time playing the game than they actually spent when game strategies are framed using a learning goal-pursuit as opposed to an impression-management goal pursuit.

2b: Individuals in a state of performance-orientation will display estimate that they spent less time playing the game than they actually spent when game strategies are framed using an impression-management goal-pursuit as opposed to a learning goal pursuit.

Hypothesis 3: Alignment/ misalignment between motivational orientation and goal pursuit strategies will lead to greater/ lower levels of loss of self-consciousness during game play.
3a: Individuals in a state of mastery-orientation will be less aware of any surrounding distractions when game strategies are framed using a learning goal-pursuit as opposed to an impression-management goal pursuit.

3b: Individuals in a state of performance-orientation will be less aware of any surrounding distractions when game strategies are framed using an impression-management goal-pursuit as opposed to a learning goal pursuit.

Hypothesis 4: Flow will fully mediate the relationship between regulatory fit/feeling right and overall task performance when type of fit aligns with the performance indicator.

Hypothesis 5: Type of fit will differentially affect task performance indicators.

5a. For quality of performance, individuals in a state of mastery-fit will outperform individuals in a state of performance-fit.

5b. For quantity of performance, individuals in a state of performance-fit will outperform individuals in a state of mastery-fit.

Methods

Participants

The participants in this study were undergraduate psychology students recruited via the Virginia Tech SONA System, the online experiment management system. Participants were required to be at least 18 years of age and proficient English speakers. As compensation, participants received 3 points of extra credit that could be added to any undergraduate psychology course.

Computer Game

Ratventure is a strategy game where participants are required to construct bridges. The main aim of the Ratventure game is to build bridges to allow two rats to reach one or more
blocks of cheese. The Ratventure game has 6 levels and 12 different bridge building environments in each level. Within each level (e.g., level 1), task difficulty increases from one environment to the next. There is no time limit on completing a level. There are two actions in each bridge building environment: 1) building the bridge, and 2) moving the rats across the bridge. There are two buttons on the screen that players press to switch between the two actions. Each environment starts with the action of building the bridge, and the player can then switch the action to move the rats across. The full bridge need not be constructed to move the rats. Some environments have multiple blocks of cheese. In these environments, players can construct part of the bridge to reach the first block of cheese, move the rats to the first cheese, and then continue construction on the bridge to reach the next block of cheese. Each environment specifies a maximum number of nodes/links that can be used to construct the bridge. If the bridge falls or gets destroyed when the rats are moving or if the player runs out of nodes, this results in a failed environment. Players must repeat this environment until they succeed before being allowed to proceed to the next environment. Ratventure does not allow players to transition to a more difficult environment until the preceding environments have been successfully completed. Further, the game does not allow for progression to a more difficult level until all 12 environments in the present level have been successfully completed. Players can, however, go back to previous environments and levels.

The game presents opportunities to build each bridge in a new environment. Success at bridge building is dependent on: 1) whether the rats are able to cross the bridge without falling, and 2) the number of nodes/links used to build the bridge. The fewer the number of nodes used, the better the performance on that environment. After completing an environment, feedback is instantly provided on bridge building performance in the form of number of stars achieved. If the
player fails a level, a dialogue box pops up and says “Defeat.” Players will not be “defeated” unless the bridge gets destroyed. If the player runs out of nodes, a “Defeat” box will not pop up, but the environment must be reattempted. The minimum criteria for success is to get the rats to the cheese, regardless of number of nodes used, as long as it is under the maximum number of nodes allowed for that environment. If a player passes a level, they are awarded one star (dialogue box states: “Not bad at all”), two stars (“Good job”), or three stars (“Excellent work”). Players can earn more stars as a function of number of nodes used to build a bridge; the fewer number of nodes used, the greater the number of stars.

Procedure

Participants were brought into the computer lab following study registration on SONA. The computer lab holds twelve individuals, but only up to eight were administered simultaneously, as study administrators needed to record behaviors during game play. Once they arrived, participants were required to provide identification. They were also asked to remove, silence, and put away any watches, cellular phones, and any other electronic devices. They were asked to sign the Informed Consent Form (See: Appendix A). Participants were told that they will play a computer game and complete several questionnaires. The study took approximately 70 minutes. After signing the Consent form, participants were asked to complete a demographics questionnaire (See: Appendix B). Participants were then provided with a short questionnaire asking two questions, one about experience playing video or computer games and a second about familiarity with Ratventure (See: Appendix C). All participants completed the experiment regardless of prior experience with the game.

Every computer was running a screen recording software (CamStudio) in the background, which recorded the game play on the computer screen. This was used to obtain performance
data. On all computers, time and date information were fully hidden. Each participant worked on a different computer. Computers were equipped with privacy screens to prevent cheating. There was a small bowl with 8 pieces of candy placed next to each computer. No mention of the candy was made until the game play instructions were provided.

Participants were first instructed to play a practice round. The practice round was the first environment in the first level. Participants received neutral and basic instructions for the practice round. They were only informed as to how to switch between building and moving modes and were told to build a bridge for the rats to cross. No further instructions or game-playing strategies were provided at this time. Just before starting the game, participants were told, “You will notice that there is some candy beside your computer. You are welcome to eat the candy if you like.” Participants had approximately 5 minutes of practice play. They were free to replay the first environment as many times as they wished during the 5 minutes, but they were instructed not to move further to play in any other environments.

Once the 5 minutes of practice play ended, participants were asked to indicate their efficacy for game play (See: Appendix D). Motivational orientation (mastery or performance-approach orientation) was then manipulated (See: Appendix E and F). To induce fit, participants then received specialized strategies to maximize performance on the game (See: Appendix G and H). Participants had a paper copy of these strategies, and the strategies were also provided verbally by the study administrator. Strategies were framed either as learning or impression-management goal pursuit strategies. Once the strategies were presented, participants completed a word fragment task, where their objective was to complete as many words as possible in 3 minutes; there were 14 words total (See: Appendix I). Participants then had an opportunity to ask any questions.
After receiving learning or IM-framed framing and completing the word fragment task, participants were ready to start game play. Game play lasted exactly 33 minutes and 17 seconds. This odd time was to counter the tendency of individuals to round time estimates to a common demarcation (e.g., 30 minutes). Participants were not provided with any information regarding time during the experiment. Over the course of game play, the study administrator played a 1-second recording of a beeping noise at 4 different times: at the 19:55 minute mark, at 24:10, at 26:30, and at 32:00. The beeping recording was played on the experimenter’s computer at the front of the room. The computer lab is a relatively small space, and the beep was loud enough to be heard throughout the room. The computer speaker always played the beeping noise at approximately 50 decibels. Since this was a quiet room, participants had no difficulty hearing the beep at this volume. After game play, participants were asked to fill out questionnaires on temporal distortion (See: Appendix J), loss of self-consciousness (See: Appendix K), and concentration (See: Appendix L). The questionnaires were administered through Virginia Tech Qualtrics on the computers. Each computer’s time was fully hidden to avoid the possibility that participants may view the time on the computer clock while they switched between screens. After completing the questionnaires, participants had to work on an anagram task (See: Appendix M), which was also administered on the computer through Qualtrics.

After completion of game play, questionnaires, and the anagram task, participants were given a Debriefing Form (See: Appendix N) and were fully debriefed on the study. Once the administrator addressed their questions, participants were thanked for their participation. After participants left, the study administrator stopped and saved the screen recordings for performance analysis.

Behavioral and Video Coding
Study administrators noted candy consumption behavior during game play during each experiment to behaviorally assess loss of self-consciousness. Administrators stood in the front of the room and watched participants during game play and recorded the number of pieces of candy were consumed by each participant. As the computer lab was a small room, there was no difficulty watching all participants at once from the front of the lab. To ensure that study administrators were comfortable with the process, I sat in on each administrator’s first two runs of the experiment. Videos of each player’s game play was assessed to determine how many levels each participant passed and how many stars they were received. I coded the videos.

Independent Variables

**Goal Orientation.** To induce a state of mastery-orientation, participants were asked: “Describe a situation in which your intellectual curiosity motivated you to acquire knowledge or gain a new skill about something meaningful to you. This is an instance in which your passion for mastering a skill/ task caused you to practice until you got better.” (Arun & Hauenstein, in preparation). To induce a state of performance-approach orientation, they were asked: “Describe a situation in which your primary motive was to compete with, and outperform others so as to create a positive impression of yourself in others.” (Arun & Hauenstein, in preparation). These prompts were provided verbally and were printed on the top of the sheet of paper that participants received to write their responses. They had approximately 5 minutes to complete their response. After completing their written responses, to ensure salience of the motivational orientation manipulation, participants were asked to pair up and verbally share their stories. If there were an odd number of participants, the administrator paired up with a participant.

**Goal Pursuit Strategies.** Regulatory fit was achieved as a result of the frame of task instructions and game strategies given to participants. All participants received the same
strategies (e.g., “use the fewest nodes possible to build the bridge”), but the framing of the instructions differed based on the condition. For learning goal pursuit, instructions were framed to emphasize learning strategies to gain information and improve game-playing skills. For example, “To learn how to play this game for effectively, make sure to use the fewest nodes possible to build the bridge. This strategy will help you to learn to play the game better.” For impression management goal pursuit, instructions were framed to emphasize relative performance and accomplishment. For example, “To play this game better than other students, make sure to use the fewest nodes possible to build the bridge. Use this strategy to help you outperform other students.”

Covariates

**Previous Experience with Computer Games.** To assess computer game experience, participants were asked “Do you play computer or video games on a regular basis?” Participants responded to this item on a five-point Likert scale, ranging from “Never” (1) to “Everyday” (5). This question was asked at the start of the experiment.

**Prior Familiarity with Ratventure.** To assess familiarity with Ratventure, participants were asked “Have you ever played the Ratventure game before?” Participants responded either “Yes” or “No.” This question was asked at the start of the experiment.

**Self-Efficacy.** To assess self-efficacy, participants were asked to complete the following statement, “I feel that I will be ___ on my bridge-building performance.” Participants responded to this item on a five-point Likert scale, ranging from “Not effective at all” (1) to “Extremely effective” (5). This question was asked at the start of the experiment and after the practice session.

**Dependent Variables: Flow**
Flow was operationalized as: intense concentration, time distortion, and loss of self-consciousness.

**Intense Concentration.** To assess intense concentration, mental focus scale items were adapted from Lee, Sheldon, & Turban (2003). “When I was playing the computer game, I: 1) was easily absorbed in the game, 2) had good concentration, 3) found my mind wandering to other things [reverse-scored], 4) felt distracted [reverse-scored], 5) found it hard to pay attention to the game [reverse-scored], and 6) had to work hard to keep my mind on-task [reverse-scored]”. Participants responded to these items on a five-point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (5). Items were summed to create an aggregate score.

**Time Distortion.** Being in a state of flow is characterized by altered perception of time. To measure temporal distortion, participants were asked: “Please estimate in minutes and seconds how long you think you were playing the game. Do not provide a ballpark figure. Please be as specific as possible in terms of minutes and seconds, as we are looking for your estimate of the exact amount of time you played the game.” Time distortion was measured as the number of seconds participants estimated for their game play.

**Loss of Self-Consciousness.** To assess loss of self-consciousness, two behavioral indicators and one self-report measure were used. For the first behavioral measure, the study administrator recorded the number of pieces of candy eaten both during game play and outside of game play. Only the pieces of candy eaten during game play were used to measure loss of self-consciousness. At the end of the experiment, the study administrator checked his/her observations against the total number of pieces at the beginning of the experiment, i.e., 8 pieces. Second, during the experiment, the study administrator played a recording of a short beep on four separate, pre-specified occasions. The timing of the four beeps (i.e., 1 second) will be the
same for all occasions. For the second behavioral measure of self-consciousness, participants’ response to the question: “How many beeps did you hear while playing the game?” was used as the operational definition.

For the loss of self-consciousness self-report measure, three questions were asked about the participants’ awareness of their self-consciousness during the study. Questions about hunger, fatigue, and other work were asked. “When I was playing the computer game, I: 1) was consciously aware of my hunger level, 2) was consciously aware of my tiredness/fatigue, and 3) was consciously thinking of other tasks I need to complete.” Participants responded to these items on a five-point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (5). Items were summed to create an aggregate score.

*Dependent Variables: Performance*

Ratventure provided information regarding the number of environments successfully passed and a score for each environment. Scores were provided in terms of number of stars earned on each environment. To successfully pass an environment, a minimum of one star was needed. To ensure that performance data was objective, the screen recording was analyzed. The videos of the screen recordings provided information about two performance measures, which were recorded: 1) the number of environments successfully completed, and 2) the number of stars received on each environment.

*Quality of Performance.* Performance quality was assessed as the number of times a participant repeated a level. This data was obtained using the recorded videos of game play.

*Quantity of Performance.* Performance quantity was assessed as the number of stars a participant received for total game play. This data was obtained using the recorded videos of game play.
Exploratory Variables

Feeling Right. This study attempted to measure feeling right by using a fill-in-the-blank task that consisted of 7 positive words and 7 negative words. The positive words chosen were: calm, happy, content, cheerful, peaceful, comfortable, and interested. The negative words chosen were: nervous, jittery, rejected, sluggish, irritable, distressed, and upset. These positive and negative words were chosen on the basis on two sources: 1) the Positive and Negative Affect Schedule (PANAS) shortened questionnaire (Watson, Clark, & Tellegan, 1988), and 2) word completion norms (Grap & Williams, 1987). To score this task, the total number of positive words and negative words completed were counted.

Resource Depletion. Resource depletion was assessed to examine whether individuals in the fit conditions would persevere on a task longer than individuals in the non-fit condition. An uninteresting anagram task was used to assess perseverance, under the prediction that as a result of fit, individuals experiencing regulatory fit would show greater perseverance on a task with little inherent enjoyment. Thirty random words were chosen for the anagram task. They ranged in level of difficulty from easy (3 letter words) to difficult (8 letter words). To score this task, the number of words unscrambled were counted.

Analysis

Descriptions and correlations were first conducted on the measured variables. To test the hypotheses, a path analysis was conducted using SPSS Amos 24. Additional univariate ANOVAs were also conducted to verify some results from the path analysis.

Four supplemental analyses were conducted to assess feeling right, self-efficacy, gaming experience, and perseverance. To assess feeling right, a t-test was conducted to examine mean differences between positive and negative words completed between fit and non-fit conditions.
To assess the impact of self-efficacy on the game, a correlational analysis was conducted with reported self-efficacy and all flow and performance dependent variables. A correlational analysis was also conducted to examine if prior gaming experience was related to performance. Perseverance was assessed using an anagram task; a t-test was conducted to examine mean differences of number of words unscrambled between fit and non-fit groups.

**Results**

*Descriptives and Correlational Statistics*

There were a total of 215 participants (126 female) in the study. The breakdown for each condition was: mastery fit (59), mastery non-fit (45), performance fit (58), and performance non-fit (53). Descriptives for dependent variables are reported in Table 1. Correlations between all dependent variables, collapsed across conditions, are displayed in Table 2. Tables 3 and 4 report correlations within condition.

*Nuisance Variables*

Two nuisance variables were examined. Self-efficacy and gaming experience were extraneous variables that could potentially influence levels of the flow and performance indicators.

*Self-Efficacy.* Participants were asked to report their level of self-efficacy on playing the Ratventure game after the practice round, as confidence in one’s ability to play the game could affect performance. A correlation analysis revealed that self-efficacy was correlated with intense concentration (r=0.19, p<.01) but not with any other flow dependent variables (time distortion, beeps, loss of self-consciousness, and candy consumed) or performance quality. However, predictably, self-efficacy did have a small significant correlation with quantity of game performance (r=0.19, p<.01), or how many stars participants earned over the course of the game.
play.

**Gaming Experience.** Prior gaming experience was also thought to have an effect on performance. First, no participant had played the Ratventure game until this experiment. Second, there was a significant correlation between gaming experience and time distortion \((r=.21, p<.01)\) and quantity of performance \((r=0.27, p<.01)\). Prior gaming experience accounts for approximately 4.4%/7.3% of the variance in time distortion/quantity of performance. Interestingly, the data revealed that there were significant group differences in terms of prior gaming experience between the fit and non-fit conditions \((t_{(1,213)}=2.93, p<.01)\), such that individuals in the non-fit condition had more prior gaming experience as compared to those in the fit condition. There was a group difference within the mastery condition \((t_{(1,102)}=-3.66, p<.01)\), such that individuals in the mastery non-fit condition had more prior gaming experience as compared to mastery fit individuals. However, there was no group difference in terms of gaming experience within the performance condition. Since participants were randomly assigned to conditions, there is no logical explanation for these gaming experience differences between the fit and non-fit conditions. Gaming experience was included as a covariate in all subsequent analyses.

**Hypotheses**

A path analysis was conducted using SPSS Amos 24 using maximum likelihood estimation. The model was created with the independent variables (goal orientation and goal pursuit), the flow variables (intense concentration questionnaire, LOSC candy consumed behavioral measure, LOSC beeps heard behavioral measure, LOSC questionnaire, and self-reported time distortion), and the performance variables (quality and quantity). Dependent variables were controlled for self-efficacy and gaming experience. The theoretical model fit the
data well. To determine model fit, the Chi-square test, RMSEA, GFI, NFI, and CFI fit indices were examined (See: Table 5). The Chi-square test provides the lack of fit of the model by assessing the discrepancy between the sample and the fitted covariance matrices (Hooper, Coughlan, & Mullen, 2008). Thus, a well-fitting model should have a non-significant Chi-square value. For this model, the Chi-square test was non-significant (Chi-square = 19.84, p>.05). The RMSEA provides information on how well the model would fit to a population covariance matrix, given the current parameter estimates (Hooper et al., 2008; Byrne, 1998). The RMSEA value for this model is .04. The GFI, NFI, and CFI statistics were .98, .92, and .98, respectively. The GFI fit statistic indicates how well the model would replicate the observed covariance matrix. In more recent literature, the recommendation for NFI is >.95 for a well-fitting model, however the NFI statistic is highly sensitive to sample-size and can underestimate fit for samples under 200 cases (Hu and Bentler, 1999). The sample size in this study (n=215) was close to this cutoff. The CFI statistic adjusts the NFI based on the sample size, meaning that the index works well even for small samples (Hooper et al., 2008). These fit statistics indicate a well-fitting theoretical model, as all aforementioned fit indices fall into the recommended ranges for each index (RMSEA < .08; GFI, NFI, and CFI > .90).

Given that the correlation between intense concentration and the loss of self-consciousness questionnaire was r=-0.59, one additional simplified model was run combining these two variables (See: Table 6; Figure 7). In this simplified model, the same independent variables (goal orientation and goal pursuit) and performance (quality and quantity) variables were retained, but there were only four flow variables (LOSC candy consumed behavioral measure, LOSC beeps heard behavioral measure, IC-LOSC combined questionnaire, and self-reported time distortion). The data fit the model reasonably well. The Chi-square, RMSEA, GFI,
NFI, and CFI are 18.87 (p>.05), 0.05, 0.98, 0.87, and 0.94, respectively. There were no significant differences between the full model and the simplified model (See: Table 7).

_Hypothesis 1._ Hypothesis 1 predicted that individuals in a state of regulatory fit (mastery-learning; performance-impression management) would experience greater levels of concentration during game play. A six-item self-report questionnaire was used to assess level of intense concentration on the task. In the path model, it appears that the alignment between motivational orientation and goal pursuit, i.e., regulatory fit, did not lead to higher levels of concentration during game play (b=.08; p>.05) as assessed by the questionnaire. Thus, hypothesis 1 was not supported.

_Hypothesis 2._ Hypothesis 2 predicted that individuals in a state of regulatory fit would report greater levels of time distortion after game play. Study participants reported in minutes and seconds the amount of time they believed they were playing the computer game. Results showed that individuals experiencing alignment between motivational orientation and goal pursuit strategies reported significantly greater levels of time distortion (b=-0.24; p<.001), such that individuals in a state of regulatory fit believed they were playing the game for a much shorter period of time as compared to individuals in a state of non-fit. A univariate ANOVA further confirmed the interaction term (MO x GPS) was significant (F(1,211)=18.61, p<.001, η2=.08). Within the mastery condition, there was a significant difference (F(1,211)=11.89; p<.01; η2=.05) in reported times between those employing learning goal pursuit (mastery-learning: M=1563.85; SD=488.47) as compared to impression management goal pursuit (mastery-IM: M=1957.76; SD=741.30) The means are reported in seconds, so individuals in the mastery non-fit condition estimated playing the computer game for approximately six minutes longer than individuals in the mastery fit condition. Similarly, within the performance condition, there was a
significant difference ($F_{(1,211)}=7.00$, $p<.01$; $\eta^2=.03$) in reported times between those employing learning goal pursuit (performance-learning: $M=1867.15$; $SD=602.20$) as compared to impression management goal pursuit (performance-IM: $M=1577.81$; $SD=485.37$). Individuals in the performance non-fit condition estimated playing the game for approximately five minutes longer than individuals in the fit condition. Thus, hypothesis 2 was supported.

**Hypothesis 3.** Hypothesis 3 predicted that individuals in a state of regulatory fit would experience greater levels of loss of self-consciousness during game play. Loss of self-consciousness was assessed using three measures, two behavioral indicators and one self-report measure. For the first behavioral measure of loss of self-consciousness, number of pieces of candy consumed was recorded. The results of the path model indicated alignment between motivational orientation and goal pursuit, i.e., fit, significantly predicted candy consumption ($b=-0.27$; $p<.001$), such that individuals in a state of regulatory fit ate significantly fewer pieces of candy as compared to individuals in a state of non-fit. A univariate ANOVA confirmed these results as the interaction term (MO x GPS) was significant ($F_{(1,211)}=19.26$, $p<.001$, $\eta^2=.08$).

Within the mastery condition, there was a significant difference ($F_{(1,211)}=11.92$; $p<.01$; $\eta^2=.05$) in number of pieces of candy consumed between those employing learning goal pursuit (mastery-learning: $M=0.75$; $SD=1.18$) as compared to impression management goal pursuit (mastery-IM: $M=1.82$; $SD=2.20$). Within the performance condition, there was a significant difference ($F_{(1,211)}=7.52$, $p<.01$; $\eta^2=.03$) in number of pieces of candy consumed between those employing learning goal pursuit (performance-learning: $M=1.32$; $SD=1.80$) as compared to impression management goal pursuit (performance-IM: $M=0.50$; $SD=1.05$). The second behavioral measure was the number of beeps heard during game play. Although the relationship between regulatory fit and beeps heard was in the expected direction, the results were not significant ($b=-0.08$, $p=.20$).
These results indicated that individuals in a state of regulatory fit heard fewer beeps than individuals in a state of non-fit, but these groups did not differ significantly. The third measure of loss of self-consciousness was a three-item self-report measure. The relationship between regulatory fit and loss of self-consciousness as measured by the self-report measure was very small and non-significant (b=-0.05; p>.05). Thus, it appears that hypothesis 3 is partially supported, and this support is dependent on the measure used to assess loss of self-consciousness.

**Hypothesis 4.** Hypothesis 4 predicted that flow will fully mediate the relationship between regulatory fit and task performance when fit aligns with the performance indicator. According to Baron and Kenny, to establish mediation, there must first be an established relationship between the criterion variable (regulatory fit: MOxGPS) and the dependent variable (performance quantity/quality). If there is no correlation between the causal and outcome variable, then there is no effect that can be mediated. There is no direct effect of performance fit between and quantity or quality of performance. There is a direct significant effect between mastery fit and quality of performance (b=0.49, p<.001). However, flow does not mediate the relationship between mastery fit and performance quality, as none of the flow indicators have a significant effect on performance quality (intense concentration: b=0.06; time distortion: b=-0.05; beeps heard: b=0.22; loss of self-consciousness: b=0.01; candy consumed: b=-0.05). Therefore, there is no support for hypothesis 4.

**Hypothesis 5.** Hypothesis 5 predicted that type of fit, mastery and performance, will be more predictive of quality and quantity of performance, respectively. Quality of performance was assessed by the number of times individuals re-attempted and repeated levels. Quantity of performance was assessed by the number of total stars an individual received over the course of
game play. As stated, the interaction between motivational orientation and goal pursuit is not predictive of performance quality or quantity. Motivational orientation appears to be predictive of quality of performance (b=.44, p<.001) but not quantity (b=.07, p>.05). Independent samples t-tests was conducted to further parse out these results. Regardless of fit, individuals in the mastery condition repeated levels significantly more number of times (M=8.34; SD=6.81) as compared to individuals in the performance condition (M=3.39, SD=2.87; t(1,213)=7.02, p<.01). There is no group difference between individuals in the mastery and performance conditions for performance quantity. There was a significant difference between mastery fit and performance fit for quality of performance (t(1,115)=5.35, p<.001), such that individuals in a state of mastery fit (M=8.92; SD=7.51) repeated levels significantly more number of times than individuals in a state of performance fit (M=3.29; SD=2.76). The independent samples t-test revealed no such group differences for quantity of performance (t(1,115)=1.04; p>.05), so individuals in the mastery fit condition (M=13.63, SD=5.71) and performance fit (M=12.64, SD=4.47) condition earned approximately the same number of stars over the course of game play. Further, contrary to the prediction, the pattern of means indicates that, although not significant, individuals in mastery fit earned more stars than those in performance fit. Thus, these results indicate that hypothesis 5a was supported, but hypothesis 5b was not supported.

*Exploratory Analyses*

*Feeling Right.* I attempted to measure feeling right by examining how many positive and negative words participants completed in a fill in the blank task after the fit manipulation. Although I expected individuals in the fit conditions would solve more positive words (than negative words) on average, the results showed no significant difference between fit and non-fit conditions. The average of positive words solved in the fit condition (M=5.16, SD=1.67) was
greater than the number of positive words solved in the non-fit condition (M=4.91, SD=1.58).

However, an independent samples t-test revealed that the difference between the groups was
non-significant (t(213)=-1.10, p>.05). Similarly, the average of negative words solved in the non-fit condition (M=3.59, SD=1.72) was slightly greater than the average of negative words solved in the fit condition (M=3.37, SD=1.69), but the groups showed no significant differences (t(213)=0.96, p>.05).

Resource Depletion. The anagram task was used to assess perseverance on a task between individuals in fit and non-fit conditions, such that those in the fit condition were expected to persevere longer on the uninteresting anagram task to solve more anagrams as compared to those in the non-fit condition. However, results revealed that there were almost no mean differences between fit (M=9.28, SD=3.56) and non-fit (M=9.35, SD=3.29) conditions in the average number of anagrams solved. Given the lack of mean differences, predictably, an independent samples t-test (t(212)=0.15, p>.05) showed that the difference between the groups was not significant.

Discussion

There are stark differences between traditional flow models and the proposed model in this study. Traditional flow models have generally worked under the assumption that flow is a function of the level of skill one possesses and the level of challenge afforded by the task. However, skill-task match has never been empirically tested as a casual antecedent to flow, and thus, it remains unclear whether it is necessary for a flow state. Further, the current flow models are more conducive to explaining a flow state after one has experienced it and do not allow for making testable a priori predictions. This issue is a result of the failure to specify the processes through which flow antecedents lead to flow components, i.e., the mediating process. Flow
models have also been based primarily on measurement techniques, such as the self-reported Flow Questionnaire (FQ) and experience sampling methods (Nakamura & Csikszentmihalyi, 2014; Moneta, 2012). The FQ is susceptible to the biases of self-report questionnaires. Further, the FQ is very subjective in that the questionnaire describes flow states and asks participants to identify if they have experienced that state and in what context. This type of qualitative measurement makes it difficult to assess the flow state across different individuals and different contexts. The experience sampling methodology used to study flow requires participants to answer a long questionnaire multiple times a day about the activity in which they are currently engaging (Csikszentmihalyi & Csikszentmihalyi, 1988).

In this study, flow was examined within a self-regulatory framework, and as such, feeling right was labeled as the mediator between the antecedents and the flow components. As mentioned, feeling right operates outside of consciousness and cannot be measured. Although feeling right is a nebulous construct, it serves a necessary mediating function between the alignment of motivational orientation and goal pursuit and any regulatory fit outcome (Higgins 2006; 2000). Thus, even though feeling right cannot be concretely measured, it does not add ambiguity into the model. Feeling right is robust; it has been shown to mediate the relationship between fit and outcome variables in multiple contexts. Further, in the proposed model, the feeling right mediator helps to explain the flow state. When an individual experiences feeling right, they assign greater subjective value to the task, which leads to strong task engagement (Higgins, 2006). This engagement influences individuals to be involved and engrossed with the task, which is similar to a flow state. The additional of feeling right as the mediating factor between regulatory fit and flow allows for making a priori predictions about flow and empirically testing these predictions. The proposed model in this study rejects traditional flow
methodology and is based in experimental design to determine the causal antecedents of flow. This model examines the determinants of a flow state, regardless of skill or task challenge level. The use of experimental methodology also allowed for greater use of objective behavioral flow indicators, which yielded better results. Thus, the proposed model allowed for measurement and study of flow in a less ambiguous and more concrete manner.

*Fit, Flow, and Performance*

The primary goal of this study was to examine the relationship between regulatory fit and flow, and therefore, the experimental task was specifically chosen to maximize the fit to flow effect. There was initial support for motivational orientation and goal pursuit, i.e., regulatory fit, as causal precursors to the flow state in the context of a computer game. Examining the relationship between flow and performance was a secondary goal, and based on these results, there was little evidence to suggest that flow positively influenced task performance. Only one flow indicator, time distortion, had a significant link to performance quantity but not quality. It is possible that the present study did not show expected results for performance due to the fact that the performance criteria chosen for the computer game was not suitable to detect the relationship between flow and performance. Further, although the relationship between regulatory fit and performance has been well-established, this study revealed no relationship between fit and performance quality nor quantity. Previous fit research shows a clear link between regulatory fit and both quality and quantity of performance (Spiegel et al., 2004; Frietas & Higgins 2002;)

Flow researchers also imply that a flow state positively affects performance (Nakamura & Csikszentmihalyi, 2005; Csikszentmihalyi, 1988), but much of the research examining flow and performance is correlational (Jackson, Thomas, Marsh, & Smethurst, 2001; Puca & Schmalt, 1999). The flow-performance relationship is often examined in the sports context, where athletes
complete self-report measures of flow prior to and after their sporting event and complete a self-report measure of their performance after the event (e.g., Jackson et al., 2001). The self-report measures are analyzed using correlations and regressions; therefore, causality cannot be rigorously tested.

*Fit to Flow*

I predicted that alignment between motivational orientation and goal pursuit, i.e., regulatory fit, influences the experience of flow. Two self-report measures and three behavioral measures were used to assess the flow state. There was a moderate relationship between a regulatory fit state, and the time distortion and amount of candy consumed flow behavioral indicators. There was no relationship between the alignment of motivational orientation and goal pursuit and the intense concentration or loss of self-consciousness questionnaires. Two interesting conclusions can be drawn from these results. First, the relative independence of the flow indicators used in this study suggest flow is a formative construct. Second, the relationship between fit and flow appears to differ based on the use of self-report versus behavioral indicators of flow.

*Flow as a Formative Construct.* Researchers have long questioned the dimensionality of flow (Hone, Jarden, & Schofield, 2013; Diener, Wirtz, Tov, Kim-Prieto, Choi, Oishi, & Biswas-Diener, 2009). In the flow literature, it remains unclear whether flow is a unidimensional construct that reflects specific sub-facets or components (i.e., flow as a reflective construct), or whether flow is a multidimensional construct wherein different components or indicators come together to form the flow construct (i.e., flow as a formative construct). I examined whether the flow state and its indicators exist at the same level or whether flow is a higher order construct, and I argue that flow is a formative construct. Formative indicators do not necessarily correlate
strongly with each other, and the intercorrelations between flow indicators used in this study were small. As such, based on the assumption that the chosen indicators are content valid, it is impossible to consider flow to be a reflective construct. The intercorrelations between the five flow indicators used in this study range from -0.01 to -0.59. The loss of self-consciousness and intense concentration scores have the strongest correlation ($r = -0.59$), but these scores likely suffer from construct overlap and self-report bias. When these questionnaires are combined to form one intense concentration–loss of self-consciousness indicator, the correlations between the four flow indicators remain low.

This suggests that estimates of standing on flow state is a function of the chosen indicators of flow and that acceptable indicators of flow can differ across contexts. There is evidence of this in the larger flow literature. Even though some flow studies indicate flow as a reflective construct (e.g., Siepke, 2005), flow researchers have intuitively been embracing the formative nature of flow in that different flow indicators have been used in different achievement contexts. Flow has been examined in a variety of contexts, such as sports (Jackson et al., 2001; Jackson, 1995), work (Csikszentmihalyi & LeFevre, 1989), leisure states (Csikszentmihalyi & Csikszentmihalyi, 1988), games (Mannel-Roger, Zuzanek, & Larson, 1988), human-computer interaction (Ghani & Deshpande, 1994; Trevino & Webster, 1992), and internet use (Skadberg & Kimmel, 2004; Novak, Hoffman, & Yung, 2000; Chen, Wigand, & Nilan, 1999), and different sets of indicators have been used in these different contexts. As a result, a plethora of flow models, antecedents, and indicators presently exist (Skadberg & Kimmel, 2004). Flow appears to be uniquely defined by the operational definition that fits with a given context; as such, flow researchers must focus their efforts on the validation of formative constructs in different contexts.
Behavioral versus Self-Report Flow Indicators. The aforementioned conceptual issues and the sensitivity of the flow construct to context makes it challenging to operationalize flow. The present study used a combination of behavioral and self-report flow indicators. Given the fit hypotheses for the behavioral indicators were supported more strongly than the self-report indicators are suggestive that behavioral indicators are a superior choice for empirical research on flow.

A concern with the above conclusion is my use of circular logic; observed fit effects are being used to argue that regulatory fit is a necessary precursor to flow, and support for fit prediction is then being used to argue that behavioral indicators are better measures of flow than self-report measures. However, it is well-recognized that responses to self-report scales are influenced by comprehension, information processing, social desirability, and other extraneous factors (Chan, 2008). Much of flow research utilizes a single source—self-report methodology raising further concerns about common methods bias. According to Doty and Glick, “common methods variance biases empirical estimates of the true relationship between two constructs when systematic variance associated with the method(s) confounds the systematic variance associated with traits” (1998). Behavioral indicators are generally considered superior to self-reports due to greater objectivity and accuracy (Donaldson & Grant-Vallone, 2002).

Limitations and Recommendations for Study Replication

Although the primary aim of this study was accomplished, it is important to address some methodological limitations of this study. First, although the Ratventure computer game used in the study was enjoyable and conducive to attaining a flow state, it was not ideal to assess performance. In essence, performance quality deals with the amount of effort exerted to master a level. Using this computer game, the only way to assess if participants were exerting more effort
was to count the number of times a level was repeated. However, repetition of a level may not have been identified by participants as a metric for effort, i.e., participants may not have associated repeating levels with effort to master the game. Performance quantity was operationalized as total stars earned over the course of the game. This computer game did not display a running total of: 1) the number of levels participants successfully completed, or 2) the number of stars participants earned overall. This was not conducive to keep track of one’s performance over the course of the game. These shortcomings for assessing performance quality and quantity indicate that the performance metrics chosen were limited by the computer game and possibly confounded (the strongest correlation between quality and quantity was in the Mastery-Learning Goal condition, \( r = 0.49 \)). The most straightforward strategy for a participant to earn the most stars would have been to continually replay an easy level and earn three stars with each repetition. This participant would have also been rated high in quality based on the quality metric because of the number of level repetitions over the course of game play. However, this would have been an inaccurate measure of quality as the participant would not have repeated levels to improve skills, but rather to earn more stars.

Second, motivational orientation was manipulated by asking participants to write a response to the mastery or performance prompt. After writing, participants were asked to pair up and verbally share their stories, i.e., every participant heard a different story. This verbal sharing was intended to increase the salience of the motivational orientation prime. It was not possible to measure whether some participants’ manipulations were stronger or weaker than others as a result of the story they heard. However, it is possible that this protocol added variability to the efficacy of the motivational orientation manipulation thereby increasing error variance in the dependent variable scores. In retrospect, a better strategy for manipulating motivational
orientation is to retain the written response to the mastery or performance prompt and omit verbally sharing stories. This would eliminate randomness and differences in motivational orientation salience between participants. Behavioral indicators are better suited to measure flow as compared to self-report measures.

Third, flow is a challenging variable to measure given that it cannot be concretely defined. This study used three behavioral measures and two self-report measures to assess flow. The time distortion and candy consumed behavioral indicators worked as measures of flow in the sense that the hypotheses were supported for these measures. However, the beeps heard indicator did not yield results. Time distortion is a non-reactive indicator of flow sustainment because it is measured without interrupting flow. In contrast, both candy eaten and beeps heard are both reactive indicators of flow disruption. Of the two, the presence of candy was more salient in that the candy was proximal to the participant, and participants were aware of the availability of the candy prior to starting game play. In contrast, the beeps are not physically present in the environment, and participants were not made aware of the beeps prior to game play. If participants had been instructed to monitor the number of beeps prior to game play, the measure of beeps may have yielded the expected fit/flow effects.

I recommend a few key changes to the methodology to address the aforementioned limitations. Since it was difficult to assess performance with this game, I first recommend identifying a task or game that is suitable to assessing both performance quality and quantity. If no single task is conducive for examining both types of performance, researchers must utilize a two-study approach to quality and quantity with the use of two tasks or games. A task/game that allows participants to gauge the amount of effort they are exerting will be fitting to measure performance quality. A task/game that clearly shows participants their point total (e.g., Tetris) is
ideal to assess performance quantity. Further, I would make the performance metrics explicit when providing game instructions (e.g., “Repeating levels to improve your skills will indicate that you are trying to master this task.”). This will more directly allow for the examination of fit effects on performance.

My second recommendation is to seek behavioral indicators of flow that work in the given research context. Of the three behavioral measures used in this study, time distortion was a passive measure, and candy consumed and beeps heard were reactive measures. I suggest the use of passive measures of flow, as they sustain the flow state. However, if the behavioral indicator used is a reactive measure, which disrupts the flow state, then the results from this study informs researchers that reactive indicators must be made salient prior to task engagement.

My third recommendation is the omission of the fill-in-the-blank feeling right task. This task did not yield any promising results to assess feeling right. Feeling right is experienced outside of conscious awareness making it difficult to empirically assess. If the cognitive processes of feeling right operate outside of consciousness, individuals will be unable to self-report their feeling right experience.

Future Directions

Researchers should look to advance flow research in three directions. First, this study successfully showed the utility of examining flow in a self-regulatory framework. Flow is limited by the ambiguity that plagues humanistic concepts, which focus on structure of the model and largely ignore the process. This lack of understanding of the process limits humanistic researchers in their ability to make falsifiable predictions about positive psychology constructs. Thus, humanistic researchers should pursue this avenue of research to integrate self-regulation
models with positive psychology theories that lack process explanations to provide further clarity to humanistic concepts. Second, this study used the concept of regulatory fit to examine flow theory. To expand upon the integration of self-regulation with humanistic concepts, researchers should look to other self-regulation models to understand flow effects. For instance, the goal setting theory of motivation can be applied to examine flow and performance. According to goal setting theorists, setting goals is linked to task performance (Locke and Latham, 2002). Goals are a key component of self-regulation models, and in the goal setting literature, researchers describe the link between types of goals, affect, and performance, which are all related to the flow state. This study examined flow using a self-regulatory framework within the gaming context. Gaming is an intuitive context in which to study flow, because gaming is an inherently enjoyable task in which it is easy to get absorbed. Thus, third, flow researchers should look to validating the use of self-regulatory models of flow in other contexts, such as in the sports or organizational settings.

Conclusion

The present study sought to apply the flow construct to a self-regulation framework. Regulatory fit effects were seen for most of the behavioral indicators of flow. This lent initial support for the following assertions: 1) regulatory fit is a causal precursor to the flow state, and 2) behavioral indicators are more objective and valid as compared self-report flow indicators. Current flow methodologies are lacking and the flow construct is plagued with issues of ambiguity. Applying flow to a self-regulatory framework paves the path for future empirical flow research using experimental designs. This can help to improve methodology and reduce ambiguity of the construct. Further research is needed to: 1) validate new types of flow indicators in different contexts, and 2) test the relationship between flow and performance using empirical methods.
References


Computers in Human Behavior, 15, 585-608.


the quality of subjective experience. Journal of Personality, 64, 274–310.


APPENDICES
APPENDIX A

INFORMED CONSENT FORM

VIRGINIA POLYTECHNIC INSTITUTE AND STATE

UNIVERSITY Informed Consent Form for Participants of

Investigative Projects

Title of Project: An Examination of Flow in a Gaming Context: Individual Computer Game Experiences

Investigators: Dr. Neil M. Hauenstein, Nikita Arun

I. Purpose of this Research/Project
The purpose of this study is to assess individual attentional experience in the computer game context. The results of this study will have practical importance for understanding cognitive processes during leisure activities and will be made available to those interested in this topic upon request.

II. Procedures
You will be introduced to a computer game, which you will be asked to play. Prior to game play, you will be asked to fill out a demographics questionnaire and write a short, 1-paragraph response. After game play, you will be asked to fill out four short questionnaires and complete two spatial awareness tasks. Total participation time will be 100 minutes.

III. Risks
There are no more than minimal risks involved in participation in this study.

IV. Benefits of this Project
The information obtained by this research may be used for scientific and/or educational purposes. The information relating to responses of all participants may be presented at scientific meetings and/or published in professional journals or books. This information may be used for any other purpose, which Virginia Tech’s Department of Psychology considers proper in the interest of education, knowledge, or research. If you are interested in obtaining results of this study they will be made available to you upon request. No guarantee of benefits has been made to induce you participate.

V. Extent of Anonymity and Confidentiality
The results of this study will remain strictly anonymous. At no time will the researcher release identifiable results of this study to anyone, other than those individuals involved with the research project. You will not be required to identify yourself in any manner on the survey instrument, nor will you be required to divulge any of your answers to anyone.

VI. Compensation
Undergraduate students will be compensated for participating in the present study by receiving 2.5 points of extra credit towards their Introduction to Psychology or other psychology class final grade. If you choose not to participate in this study, you have the option of writing essays for extra credit. If you are enrolled in Introduction to Psychology, please see the Introductory Psychology Office (Williams 307) for details. All others should see their instructor for other extra credit options.

VII. Freedom to Withdraw
You may withdraw from participation in this study at any time without penalty. If you choose to withdraw from this experiment you will not be penalized in extra credit points or grade in a course. You are free not to answer any questions without penalty.
VIII. Approval of Research
This research has been approved, as required, by the Human Subjects Committee of the Psychology Department and by the Institutional Review Board for Research Involving Human Subjects at Virginia Tech.

IX. Subject’s Responsibility
I voluntarily agree to participate in this study.

X. Subject’s Permission
I have read and understand the Informed Consent and the conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent.

If I participate, I may withdraw at any time without penalty.

NAME (PLEASE PRINT): ___________________________ DATE: ______________

SIGNATURE: ______________________________________

Should I have any pertinent questions about this research or its conduct I may contact:

Investigator: Nikita Arun, 847-924-8959/ narun528@vt.edu
Investigator: Dr. Neil M. Hauenstein, 540-231-5716/ nhauen@vt.edu

Chair, IHC: Dr. David W. Harrison, 540-231-4422/ dwh@vt.edu

Should I have any questions regarding my rights as a human research participant, I may contact:

Chair, IRB: Dr. David M. Moore, 231-4991/ moored@vt.edu
APPENDIX B

DEMOGRAPHICS QUESTIONNAIRE

Demographics Questionnaire

Age:

Sex:

- Male
- Female

Ethnicity:

- Caucasian
- African American
- Hispanic
- Asian
- Native American
- Other

Academic Standing:

- Freshman
- Sophomore
- Junior
Senior

Major:

- Arts
- Business
- Communications and Journalism
- Computers and Mathematics
- Education
- Engineering
- Humanities
- Law/ Public Policy
- Psychology and Social Work
- Recreation
- Sciences (Life/ Physical)
- Social Sciences
APPENDIX C

ASSESSMENT OF PRIOR GAMING EXPERIENCE

Assessment of Prior Experience With Computer Games

Do you play computer or video games on a regular basis?

- Never
- Rarely (~1-2 times/month)
- Sometimes (~1 time/week)
- Often (~3-4 times/week)
- Everyday

Have you ever played the Ratventure game before?

- Yes
- No
APPENDIX D

SELF-EFFICACY

You have now completed the practice session.

Knowing that the bridges will become increasingly difficult to build, think about how efficacious you feel about your bridge building skills.

I feel that I will be ____ on my bridge-building performance.

a) Not effective at all
b) Slightly effective
c) Moderately effective
d) Very effective
e) Extremely effective

Please circle one.
Describe a situation in which your intellectual curiosity motivated you to acquire knowledge or gain a new skill about something meaningful to you. This is an instance in which your passion for mastering a skill/task caused you to practice until you got better.
APPENDIX F

PERFORMANCE PRIME

Describe a situation in which your primary motive was to compete with, and outperform others so as to create a positive impression of yourself in others.
APPENDIX G

BRIDGE BUILDING STRATEGIES: LEARNING

Bridge Building Strategies

There are several aspects of bridge building that you will have to take into account to learn how to build bridges and improve your bridge-building skills.

Pattern of bridges:

- To learn how to build a good bridge, make sure to take into account the pattern of the bridges.
- Make sure to build a foundation for your bridge; this will help to improve your bridge building skills. For instance, some bridge building environments will require you to build a vertical bridge. In this cases, building a foundation for your bridge so that it won’t topple over will help to improve your bridge-building skills.
- For bridges where you have to build horizontally, you will have to make sure the bridge is balanced. In these environments, building the bridge on an upward trajectory will help you to improve your bridge-building skills.
- To learn how to build a good bridge, think of building columns, how they are structured, and how they have connections within the columns. You will want to build similar columns when building your bridge.
- To learn how to build a good bridge, make sure to pay attention to the length of the nodes. To improve your bridge-building skills, understand that in some cases, you’ll want to make the nodes as wide and long as possible; however, in other cases, you’ll want to make the nodes as narrow as possible.
- In most of the environments, there will be multiple blocks of cheese. Another tactic you can use to improve your skills is to build one part of the bridge, move the rats to the first block of cheese, and then build the next part of the bridge.
- Another tactic you can use to learn how to build a good bridge is to create a wheel pattern with the nodes. This will help to move the rats to the cheese.

Timing:

- To improve your bridge-building skills, make sure to take into account timing during bridge-building.
- During certain bridge building sessions, if you see the bridge falling over, know that you may be able to prevent this.
- To learn how to build a good bridge, make sure to quickly stabilize a failing bridge by adding another node to it to stabilize it on a platform.

Game play environment:

- To learn how to build good bridges, you will have to make sure to pay attention to the environment you’re building in.
- For instance, you will notice that some environments have green rocks that look a bit like toads. These rocks will jump onto your bridge and weight it down. To improve your bridge-building skills, make sure to understand that sometimes these rocks can be really helpful to stabilize your bridge but other times, they can weigh down your bridge when you don’t want them to.
- To learn how to build a good bridge, make sure to use the help of these rocks when you want to stabilize your bridge.
- Further, to improve your bridge-building skills, you can use the weight of the rats to stabilize the bridge.
APPENDIX H

BRIDGE BUILDING STRATEGIES: IMPRESSION-MANAGEMENT

Bridge Building Strategies

There are several aspects of bridge building that you will have to take into account to make sure that you do better than other participants taking this study.

Pattern of bridges:
• To be able to outperform other participants taking this study, make sure to take into account the pattern of the bridges.
• Make sure to build a foundation for your bridge; this will help you to build a better bridge than other participants. For instance, some bridge building environments will require you to build a vertical bridge. In this cases, building a foundation for your bridge so that it won’t topple over will help you to maximize your performance.
• For bridges where you have to build horizontally, you will have to make sure the bridge is balanced. Building the bridge on an upward trajectory will help you to maximize your performance.
• To outperform other participants on the game, think of building columns, how they are structured, and how they have connections within the columns. Build similar columns when constructing your bridge.
• To ensure that you are able to adequately display your bridge building skills, make sure to pay attention to the length of the nodes. To outperform other participants, understand that in some cases, you’ll want to make the nodes as wide and long as possible; however, in other cases, you’ll want to make the nodes as narrow as possible.
• In most of the environments, there will be multiple blocks of cheese. Another tactic you can use to outperform others is to build one part of the bridge, move the rats to the first block of cheese, and then build the next part of the bridge.
• Another tactic you can use to learn how to maximize your performance is to create a wheel pattern with the nodes. This will help to move the rats to the cheese.

Timing:
• Another tactic you can use to outperform other participants is to make sure to take into account timing during bridge building.
• During some sessions, if you see the bridge falling over, know that you may be able to prevent this.
• To maximize your performance, make sure to quickly stabilize a falling bridge by adding another node to it to stabilize it on a platform.

Game play environment:
• To properly display your bridge-building skills and do better than other participants, you will have to make sure to pay attention to the environment you’re building in.
• For instance, you will notice that some environments have green rocks that look a bit like toads. These rocks will jump onto your bridge and weight it down. To maximize your performance, make sure to understand that sometimes these rocks can be really helpful to stabilize your bridge but other times, they can weigh down your bridge when you don’t want them to.
• To outperform others, make sure to use the help of these rocks when you want to stabilize your bridge.
• Another tactic you can use to outperform others is to use the weight of the rats to stabilize the bridge.
APPENDIX I

FEELING RIGHT WORD FRAGMENT TASK AND SOLUTIONS

This page contains a list of word fragments. Please complete as many words as you can to form a full English word.

1) C__M
2) __AP__Y
3) N__V_O__S
4) C__NT__T
5) J__TE__Y
6) R__JE__D
7) S__G__S_H
8) __HERF__L
9) P__CE__L
10) __R_I_T__LE
11) CMF__TA__E
12) D__S_T__S_D
13) __ERE__D
14) __PET
This page contains a list of word fragments. Please complete as many words as you can to form a full English word.

1) CALM  8) CHEERFUL
2) HAPPY  9) PEACEFUL
3) NERVOUS  10) IRRITABLE
4) CONTENT  11) COMFORTABLE
5) JITTERY  12) DISTRESSED
6) REJECTED  13) INTERESTED
7) SLUGGISH  14) UPSET
APPENDIX J

TIME DISTORTION QUESTION

Assessment of Temporal Distortion

Please estimate in minutes and seconds how long you think you were playing the game.

Do not provide a ballpark figure.

Please be as specific as possible in terms of minutes and seconds, as we are looking for your estimate of the exact amount of time you played the game.

>
APPENDIX K

BEEPS AND LOSS OF SELF-CONSCIOUSNESS QUESTIONNAIRE

Assessment of Loss of Self-Consciousness

How many beeps did you hear while playing the game?

When I was playing the computer game, I:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>was consciously aware of my hunger</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>was consciously aware of my</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>tiredness/fatigue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>was consciously thinking of other</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>tasks I need to complete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX L

INTENSE CONCENTRATION QUESTIONNAIRE

Assessment of Intense Concentration

When I was playing the computer game, I:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>was easily absorbed in the game</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>had good concentration</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>found my mind wandering to other things</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>felt distracted</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>found it hard to pay attention to the game</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>had to work hard to keep my mind on-task</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

>>

Powered by Qualtrics
APPENDIX M

RESOURCE DEPLETION ANAGRAM TASK – SAMPLE

TASK #2: ANAGRAMS

---

Below you will see a number of anagrams.

- Eg., If you see: "ELESP", you will write: SLEEP

Please solve as many as you can in the allotted time.

URN


YAW


WED


AIDE
APPENDIX N

DEBRIEFING FORM

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Debriefing Form

Title of Project: An Examination of Flow in a Gaming Context: Individual Computer Game Experiences
Investigators: Dr. Neil M. Hauenstein, Nikita Arun

This study is meant to examine the self-regulatory processes behind flow experiences. Additionally, it is examined whether differences in self-regulation will affect flow and resource depletion. Studying self-regulation and flow provides insight into how individuals can motivate themselves during prolonged task engagement.

The data from this study do not contain any individuating information and your right to privacy is guaranteed if the results of this study become public. If you have questions about any aspect of this study, or would like to see the results of this study once completed, please feel free to contact either of the investigators listed below.

Thank you for your participation.

WE ASK THAT YOU DO NOT SHARE THE DETAILS OF THIS STUDY WITH ANYONE, AS THIS MIGHT AFFECT OUR DATA.

Contact Information:
Investigator: Nikita Arun, 847-924-8959/ narun528@vt.edu
Investigator: Dr. Neil M. Hauenstein, 540-231-5716/ nhauen@vt.edu

Chair, HSC: Dr. David W. Harrison, 540-231-4422/ dwh@vt.edu

Questions about being a human research participant may be directed to the IRB office:
Chair, IRB: Dr. David M. Moore, 540-231-4991/ moored@vt.edu
### Table 1. Descriptive Statistics for Dependent Variables Within Condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mastery Condition</th>
<th>Performance Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Learning-Frame</td>
<td>Competitive-Frame</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Intense Concentration</td>
<td>3.89</td>
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</tr>
<tr>
<td>Time Distortion</td>
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</tr>
<tr>
<td>Candy Consumed</td>
<td>0.75</td>
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</tr>
<tr>
<td>Beeps Heard</td>
<td>1.58</td>
<td>1.73</td>
</tr>
<tr>
<td>LOSC Questionnaire</td>
<td>3.22</td>
<td>1.21</td>
</tr>
<tr>
<td>Performance Quality</td>
<td>8.92</td>
<td>7.51</td>
</tr>
<tr>
<td>Performance Quantity</td>
<td>13.63</td>
<td>5.71</td>
</tr>
</tbody>
</table>

*Note.* Mastery-Learning: n=59; Mastery-Competitive: n=45; Performance-Learning: n=53; Performance Competitive: n=58; LOSC: Loss of Self-Consciousness
Table 2. Means, Standard Deviations, and Intercorrelations for all Covariate and Dependent Variables Collapsed over all Conditions

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intense Concentration</td>
<td>3.92</td>
<td>0.94</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Time Distortion</td>
<td>1742.83</td>
<td>598.29</td>
<td>-0.03</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Candy Consumed</td>
<td>1.05</td>
<td>1.64</td>
<td>-0.18**</td>
<td>0.03</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Beeps Heard</td>
<td>1.71</td>
<td>2.90</td>
<td>-0.01</td>
<td>-0.12</td>
<td>0.05</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>LOSC Questionnaire</td>
<td>3.15</td>
<td>1.23</td>
<td>-0.59**</td>
<td>0.06</td>
<td>0.15*</td>
<td>0.09</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Performance Quality</td>
<td>5.78</td>
<td>5.72</td>
<td>0.02</td>
<td>-0.10</td>
<td>-0.03</td>
<td>0.01</td>
<td>-0.04</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Performance Quantity</td>
<td>13.21</td>
<td>5.62</td>
<td>0.18**</td>
<td>-0.11</td>
<td>-0.05</td>
<td>-0.01</td>
<td>-0.10</td>
<td>0.35**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>3.22</td>
<td>0.78</td>
<td>0.19**</td>
<td>-0.05</td>
<td>-0.10</td>
<td>0.10</td>
<td>0.02</td>
<td>0.06</td>
<td>0.19**</td>
<td>-</td>
</tr>
<tr>
<td>Gaming Experience</td>
<td>2.09</td>
<td>1.16</td>
<td>0.10</td>
<td>0.21**</td>
<td>0.05</td>
<td>0.11^</td>
<td>-0.02</td>
<td>-0.05</td>
<td>0.27**</td>
<td>0.19**</td>
</tr>
</tbody>
</table>

*Note. n = 215; ^p < .10; *p < .05; **p < .01; LOSC: Loss of Self-Consciousness*
Table 3. Intercorrelations between Covariate and Dependent Variables within the Mastery Condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intense Concentration</td>
<td>-</td>
<td>0.21</td>
<td>-0.01</td>
<td>0.06</td>
<td>-0.70**</td>
<td>-0.28^</td>
<td>-0.10</td>
<td>0.11</td>
<td>0.24</td>
</tr>
<tr>
<td>Time Distortion</td>
<td>-0.01</td>
<td>-</td>
<td>-0.22</td>
<td>-0.27^</td>
<td>-0.09</td>
<td>-0.15</td>
<td>-0.27^</td>
<td>-0.05</td>
<td>0.19</td>
</tr>
<tr>
<td>Candy Consumed</td>
<td>-0.34**</td>
<td>0.10</td>
<td>-</td>
<td>0.16</td>
<td>0.14</td>
<td>0.02</td>
<td>0.03</td>
<td>0.07</td>
<td>-0.02</td>
</tr>
<tr>
<td>Beeps Heard</td>
<td>-0.23^</td>
<td>-0.15</td>
<td>0.02</td>
<td>-</td>
<td>0.06</td>
<td>-0.15</td>
<td>0.02</td>
<td>0.16</td>
<td>0.15</td>
</tr>
<tr>
<td>LOSC Questionnaire</td>
<td>-0.45**</td>
<td>0.10</td>
<td>0.07</td>
<td>0.31*</td>
<td>-</td>
<td>-0.04</td>
<td>0.02</td>
<td>0.18</td>
<td>-0.07</td>
</tr>
<tr>
<td>Performance Quality</td>
<td>0.23</td>
<td>-0.05</td>
<td>-0.14</td>
<td>0.16</td>
<td>-0.11</td>
<td>-</td>
<td>0.21</td>
<td>-0.23</td>
<td>-0.38**</td>
</tr>
<tr>
<td>Performance Quantity</td>
<td>0.40**</td>
<td>-0.13</td>
<td>-0.21</td>
<td>0.01</td>
<td>-0.10</td>
<td>0.49**</td>
<td>-</td>
<td>0.12</td>
<td>0.23</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>0.24^</td>
<td>-0.14</td>
<td>-0.30*</td>
<td>0.02</td>
<td>-0.08</td>
<td>0.23^</td>
<td>0.18</td>
<td>-</td>
<td>0.47**</td>
</tr>
<tr>
<td>Gaming Experience</td>
<td>0.05</td>
<td>0.04</td>
<td>0.04</td>
<td>-0.04</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.10</td>
<td>0.17</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. Mastery-Learning: n=59, Mastery-Impression Management: n=45; ^p<.10; *p < .05; **p <.01; LOSC: Loss of Self-Consciousness
Correlations below the diagonal are the Mastery-Learning (fit condition) correlations.
Correlations above the diagonal are the Mastery-Impression Management (non-fit condition) correlations.
### Table 4. Intercorrelations between Covariate and Dependent Variables within the Performance Condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intense Concentration</td>
<td>-</td>
<td>-0.11</td>
<td>-0.26^</td>
<td>0.07</td>
<td>-0.66**</td>
<td>0.10</td>
<td>0.26^</td>
<td>0.13</td>
<td>0.09</td>
</tr>
<tr>
<td>Time Distortion</td>
<td>-0.19</td>
<td>-</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.11</td>
<td>-0.15</td>
<td>0.05</td>
<td>0.04</td>
<td>0.21</td>
</tr>
<tr>
<td>Candy Consumed</td>
<td>-0.13</td>
<td>0.04</td>
<td>-</td>
<td>-0.14</td>
<td>0.16</td>
<td>-0.10</td>
<td>-0.06</td>
<td>-0.14</td>
<td>0.05</td>
</tr>
<tr>
<td>Beeps Heard</td>
<td>0.03</td>
<td>-0.08</td>
<td>-0.15</td>
<td>-</td>
<td>0.05</td>
<td>0.03</td>
<td>-0.06</td>
<td>0.02</td>
<td>0.12</td>
</tr>
<tr>
<td>LOSC Questionnaire</td>
<td>-0.58**</td>
<td>0.09</td>
<td>0.24^</td>
<td>0.03</td>
<td>-</td>
<td>-0.11</td>
<td>0.28*</td>
<td>0.12</td>
<td>-0.10</td>
</tr>
<tr>
<td>Performance Quality</td>
<td>0.01</td>
<td>-0.15</td>
<td>-0.12</td>
<td>0.21</td>
<td>0.03</td>
<td>-</td>
<td>0.40**</td>
<td>0.15</td>
<td>0.31*</td>
</tr>
<tr>
<td>Performance Quantity</td>
<td>0.08</td>
<td>-0.12</td>
<td>-0.09</td>
<td>-0.08</td>
<td>-0.04</td>
<td>0.35**</td>
<td>-</td>
<td>0.35**</td>
<td>0.51**</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>0.21</td>
<td>-0.02</td>
<td>-0.13</td>
<td>0.17</td>
<td>-0.10</td>
<td>-0.05</td>
<td>0.05</td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td>Gaming Experience</td>
<td>0.03</td>
<td>0.18</td>
<td>-0.21</td>
<td>0.15</td>
<td>0.14</td>
<td>0.05</td>
<td>0.28*</td>
<td>-0.10</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note.* Performance-Learning: n=53, Performance-Impression Management: n=58; ^p<.10; *p < .05; **p <.01; LOSC: Loss of Self-Consciousness

Correlations below the diagonal are the Performance-Impression Management (fit condition) correlations.

Correlations above the diagonal are the Performance-Learning (non-fit condition) correlations.
<table>
<thead>
<tr>
<th>Hypothesized Path</th>
<th>b</th>
<th>SE</th>
<th>Critical Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Distortion  ( \leftarrow ) Fit</td>
<td>-0.24**</td>
<td>0.07</td>
<td>-3.60</td>
</tr>
<tr>
<td>Beeps Heard  ( \leftarrow ) Fit</td>
<td>-0.08</td>
<td>0.07</td>
<td>-1.18</td>
</tr>
<tr>
<td>LOSC  ( \leftarrow ) Fit</td>
<td>-0.05</td>
<td>0.07</td>
<td>-0.69</td>
</tr>
<tr>
<td>Intense Concentration  ( \leftarrow ) Fit</td>
<td>0.08</td>
<td>0.07</td>
<td>1.12</td>
</tr>
<tr>
<td>Candy Consumed  ( \leftarrow ) Fit</td>
<td>-0.27**</td>
<td>0.07</td>
<td>-4.07</td>
</tr>
<tr>
<td>Perf. Quantity  ( \leftarrow ) Fit</td>
<td>-0.05</td>
<td>0.07</td>
<td>-0.63</td>
</tr>
<tr>
<td>Perf. Quality  ( \leftarrow ) Fit</td>
<td>-0.01</td>
<td>0.07</td>
<td>-0.11</td>
</tr>
<tr>
<td>Perf. Quantity  ( \leftarrow ) Motivational Orientation</td>
<td>0.07</td>
<td>0.07</td>
<td>0.98</td>
</tr>
<tr>
<td>Perf. Quality  ( \leftarrow ) Motivational Orientation</td>
<td>0.44**</td>
<td>0.06</td>
<td>7.23</td>
</tr>
<tr>
<td>Perf. Quantity  ( \leftarrow ) Time Distortion</td>
<td>-0.19**</td>
<td>0.07</td>
<td>-2.70</td>
</tr>
<tr>
<td>Perf. Quality  ( \leftarrow ) Time Distortion</td>
<td>-0.09</td>
<td>0.06</td>
<td>-1.44</td>
</tr>
<tr>
<td>Perf. Quantity  ( \leftarrow ) Beeps Heard</td>
<td>-0.08</td>
<td>0.07</td>
<td>-1.23</td>
</tr>
<tr>
<td>Perf. Quality  ( \leftarrow ) Beeps Heard</td>
<td>0.00</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>Perf. Quantity  ( \leftarrow ) LOSC</td>
<td>-0.02</td>
<td>0.08</td>
<td>-0.18</td>
</tr>
<tr>
<td>Perf. Quality  ( \leftarrow ) LOSC</td>
<td>-0.06</td>
<td>0.08</td>
<td>-0.83</td>
</tr>
<tr>
<td>Perf. Quantity  ( \leftarrow ) Intense Concentration</td>
<td>0.11</td>
<td>0.08</td>
<td>1.32</td>
</tr>
<tr>
<td>Perf. Quality  ( \leftarrow ) Intense Concentration</td>
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<td>0.08</td>
<td>-0.56</td>
</tr>
<tr>
<td>Perf. Quantity  ( \leftarrow ) Candy Consumed</td>
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<td>0.07</td>
<td>-0.62</td>
</tr>
<tr>
<td>Perf. Quality  ( \leftarrow ) Candy Consumed</td>
<td>-0.06</td>
<td>0.06</td>
<td>-1.00</td>
</tr>
</tbody>
</table>

*Note.* n = 215; ^p<.10; *p < .05; **p <.01; LOSC: Loss of Self-Consciousness

Fit Indices for Model: \( \chi^2 = 19.84; \) df = 15; RMSEA = 0.04; GFI = 0.98; NFI = 0.92; CFI = 0.98
Table 6. Simplified Model Path Estimates

<table>
<thead>
<tr>
<th>Hypothesized Path</th>
<th>b</th>
<th>SE</th>
<th>b/SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Distortion ← Fit</td>
<td>-0.24**</td>
<td>0.07</td>
<td>-3.60</td>
</tr>
<tr>
<td>Beeps Heard ← Fit</td>
<td>-0.08</td>
<td>0.07</td>
<td>-1.18</td>
</tr>
<tr>
<td>Candy Consumed ← Fit</td>
<td>-0.27**</td>
<td>0.07</td>
<td>-4.07</td>
</tr>
<tr>
<td>IC-LOSC ← Fit</td>
<td>0.00</td>
<td>0.07</td>
<td>0.00</td>
</tr>
<tr>
<td>Perf. Quantity ← Fit</td>
<td>-0.04</td>
<td>0.07</td>
<td>-0.49</td>
</tr>
<tr>
<td>Perf. Quality ← Fit</td>
<td>-0.01</td>
<td>0.07</td>
<td>-0.12</td>
</tr>
<tr>
<td>Perf. Quality ← Motivational Orientation</td>
<td>0.07</td>
<td>0.07</td>
<td>1.01</td>
</tr>
<tr>
<td>Perf. Quality ← Motivational Orientation</td>
<td>0.44**</td>
<td>0.06</td>
<td>7.19</td>
</tr>
<tr>
<td>Perf. Quantity ← Time Distortion</td>
<td>-0.18**</td>
<td>0.07</td>
<td>-2.65</td>
</tr>
<tr>
<td>Perf. Quality ← Time Distortion</td>
<td>-0.09</td>
<td>0.06</td>
<td>-1.47</td>
</tr>
<tr>
<td>Perf. Quantity ← Beeps Heard</td>
<td>-0.08</td>
<td>0.07</td>
<td>-1.17</td>
</tr>
<tr>
<td>Perf. Quality ← Beeps Heard</td>
<td>0.00</td>
<td>0.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Perf. Quantity ← Candy Consumed</td>
<td>-0.04</td>
<td>0.07</td>
<td>-0.63</td>
</tr>
<tr>
<td>Perf. Quality ← Candy Consumed</td>
<td>-0.06</td>
<td>0.06</td>
<td>-0.97</td>
</tr>
<tr>
<td>Perf. Quantity ← IC-LOSC</td>
<td>-0.12^</td>
<td>0.07</td>
<td>-1.73</td>
</tr>
<tr>
<td>Perf. Quality ← IC-LOSC</td>
<td>-0.03</td>
<td>0.06</td>
<td>-0.40</td>
</tr>
</tbody>
</table>

Note. n = 215; ^p<.10; *p < .05; **p <.01; IC: Intense Concentration; LOSC: Loss of Self-Consciousness
Fit Indices for Model: $\chi^2 = 17.86$; df = 11; RMSEA = 0.05; GFI = 0.98; NFI = 0.87; CFI = 0.94
Table 7. Fit Indices of Theoretical and Simplified Model

<table>
<thead>
<tr>
<th></th>
<th>$\chi^2$</th>
<th>df</th>
<th>RMSEA</th>
<th>GFI</th>
<th>NFI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Model</td>
<td>19.04</td>
<td>15</td>
<td>0.04</td>
<td>0.98</td>
<td>0.92</td>
<td>0.98</td>
</tr>
<tr>
<td>Simplified Model</td>
<td>17.86</td>
<td>11</td>
<td>0.05</td>
<td>0.98</td>
<td>0.87</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Note. n=215; RMSEA: Root Mean Square Error of Approximation; GFI: Goodness of Fit Index; NFI: Normed Fit Index; CFI: Comparative Fit Index
Figure 1. Original Flow Model
Figure 2. Revised Flow Model
Figure 3. Mastery Fit Influences Performance Quality
Figure 4. Performance Fit Influences Performance Quantity
Figure 5. Regulatory Fit and Flow Experience on Task Performance
Figure 6. Regulatory Fit, Flow, and Performance Path Model with Path Estimates
Figure 7. Regulatory Fit, Flow, and Performance Simplified Path Model with Path Estimates