AN EMPIRICAL EXAMINATION OF TIMELESSNESS AND CREATIVITY

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ABSTRACT

The research reported in this paper examined the dimensions, antecedents, and effects of the experience of timelessness in the workplace. Three studies were conducted to measure and validate the construct of timelessness as a task-related experience. Two measures were developed to assess timelessness as a state and as the frequency by which one experiences this state in an organizational setting. Exploratory and confirmatory factor analyses supported the multidimensional representation of timelessness as a second-order construct manifested in four first-order dimensions, namely immersion, time distortion, sense of mastery, and sense of transcendence. A study in an R&D setting supported the nomological validity of the construct of timelessness, its hypothesized relationships with intrinsic motivation and autonomy, and its predicted effects on creativity.

Timelessness is an experience well known to most of us: those moments in which we are fully engaged in doing something that we love, in which our attention is fully invested in our work, to the point that we forget, if temporarily, our problems, our selves, and time itself. More accurately, the term timelessness refers to how individuals experience a focused state of consciousness in which total cognitive, affective, and physical involvement in the task at hand results in loss of self-consciousness and loss of the sense of time. Recently, Mainemelis (2001, 2002) has drawn on flow theory (Csikszentmihalyi, 1975, 1990) and on theories of time experience (Bergson, 1960; Hartocollis, 1983; Pöppel, 1988) to conceptualize timelessness as a complex construct that entails four dimensions: immersion in the task at hand, time distortion, a sense of mastery over the task, and a sense of transcendence. According to this model, intrinsic motivation and other contextual variables, such as autonomy and distractions, influence the likelihood of experiencing timelessness in the workplace, and the frequency by which one experiences timelessness while working on core work tasks increases the likelihood of his or her creativity.

In this paper we present three studies designed to conduct the first empirico-deductive test of the construct of timelessness. The research involved three specific objectives. The first was the development of two measures for assessing timelessness as an immediate state and as the frequency by which one experiences this state while working on a core task of his or her work. The second objective was to test the internal validity of the construct, that is, the multidimensional representation of timelessness. The third objective was to begin validating the nomological network of timelessness, specifically its pattern of associations with intrinsic motivation, autonomy, distractions, and creativity.

THEORETICAL BACKGROUND

The construct of timelessness is based on two postulates. The first is derived from information-processing theory and suggests that consciousness, as a field of mental energy, is

a zero-sum space of limited attention resources. The "default" state of consciousness is filled by numerous stimuli that compete for the limited attention resources; an "optimal" state of consciousness emerges when attention resources are withdrawn from all other stimuli and become fully invested in the stimulus provided by the task at hand (Csikszentmihalyi, 1990). This optimal state is generally designated as "flow," a highly enjoyable state that comprises one or more of the following dimensions: A clear goal about the task at hand; a balance between challenges and skills; immediate feedback from the task; a merging of action and awareness; intense concentration; a sense of heighten control over the activity; forgetting one's self; forgetting time; and an activity that becomes autotelic, that is, an end in and of itself (Csikszentmihalyi, 1975, 1997). The flow construct is very broad and it can be operationalized in different ways because it encompasses states whose intensity ranges from simple daily enjoyments, such as enjoying the drive home from work, to personally epiphanies that occur once in a lifetime (Csikszentmihalyi, 1990). Timelessness is an experience that emerges in the more complex and intense levels of flow, which are characterized by the interdependent loss of self-consciousness and loss of the sense of time (Csikszentmihalyi, 1997; Mainemelis, 2001).

The second postulate is derived from time experience theory and suggests that the notion of time and the concept of the self are interrelated and inseparable as subjective experiences. The "default" psychological experience involves, at any moment in daily life, the interrelated and interdependent experience of time and of the self; "timelessness" is a finite state in which both the self and time, as subjective experiences, temporarily cease to exist (Hartocollis, 1983). Because the self consists of experienced states that presuppose the existence of time (e.g., fears, desires), and because the subjective experience of time's passage presupposes the presence of the self, any experience of the self involves a subjective experience of time, and vice-versa (Bergson, 1960; Hartocollis, 1983). The self is

experienced as memories of the "past," feelings of boredom in the "present," and dreams about the "future;" time is experienced as photographs from high school that make one "nostalgic," deadlines that make one "anxious," and next month's award ceremony that fills one with the "desire" to win an award. If the activity that one is performing at any given moment in time is perceived as meaningless, one's attention is directed toward the self, boredom arises, and time seems to slow down. If the activity is perceived as threatening, one's attention is directed toward the self again, anxiety arises, and time seems to slow down or to pass rapidly. But when the activity is captivating and fully rewarding in and of itself, attention moves from the self to the activity, and from time to the timeless depth of immediate experience (Csikszentmihalyi, 1990; Kolb, 1984; Ornstein, 1986; Pöppel, 1998).

In simpler terms, there are moments in life in which immediate experience is so complete, fulfilling, and rewarding in and of itself, that one's attention is withdrawn from the self, and time as an experience ceases to exist. This state is experienced as timelessness—a transcendence of both time and one's self (Mainemelis, 2001).

Dimensions of Timelessness

Individuals are not fully aware of such focused states of consciousness while they are still immersed in them (Csikszentmihalyi, 1975, 1990; Ornstein, 1986). Gardner notes that, in one sense, people engrossed in such states "are not conscious of the experience at the moment; on reflection, however, such people feel they have been fully alive, totally realized, and involved" (1993, p. 25). The focus of the present study is on the manifest experience of the state, that is, how individuals describe it as soon as they emerge from it. As noted before, timelessness has been conceptualised as a complex state manifested in four retrospectively reported experiences: immersion in the task at hand; time distortion; a sense of mastery over the task; and a sense of transcendence (Mainemelis, 2001).

Immersion refers to the experience of being totally engaged and deeply engrossed in the task a hand. As soon as people emerge from the state, they recognize that they were deeply immersed, fully absorbed, surrendered to, or consumed in the activity to the point of forgetting one's self and surroundings (Dewey, 1934; May, 1994; Pöppel, 1988). Time distortion refers to the recognition that during the state one has been operating according to the internal rhythms of the activity without being aware of time (Csikszentmihalyi, 1990, 1997; Pöppel, 1988; Ornstein, 1986). One recognizes time distortion in retrospect by realizing that one has been unconscious of time, out of time, forgot time, lost track of time, or that time flew away, and so forth (Mainemelis, 2001).

Sense of mastery refers to the subjective experience of peak performance, heightened competence, and total control over the task; it may be experienced as optimal performance accomplished with effortless action (Hartocollis, 1983; May, 1994). Both immersion and sense of mastery reflect the fact that states of timelessness are not induced when the task is unattractive or threatening because, in either case, attention is withdrawn from the task and becomes invested in the self, inducing feelings of boredom or anxiety which lead, in turn, to a heighten awareness of time. Timelessness is induced when the activity is captivating and attractive, allowing one to simultaneously take control over it and to "lose" one's self in it. Sense of transcendence refers to the feeling of crossing the limits of consciousness and stepping temporarily outside of normal life, of life as usual. This is an accurate reflection of the fact that during states of timelessness one operates beyond the normal psychological context delineated by the awareness of time and the consciousness of the self (Hartocollis, 1993; May, 1994). In the world of work, sense of transcendence refers to the experience that one's work contributes to something larger than one's self, career, or organization, and becomes a vehicle to a higher cause or to a larger sense of purpose (Mainemelis, 2001).

Timelessness, therefore, is a constellation of these four retrospectively reported experiences--a complex, higher-order construct, manifested in these four dimensions.

> **Hypothesis 1**: Timelessness has four dimensions: Immersion, time distortion, sense of mastery, and sense of transcendence.

Partial Nomological Network of Timelessness

To test the nomological validity of timelessness, we created the partial nomological network shown in Figure 1. Drawing on the extant literature, we modeled intrinsic motivation, autonomy, and distractions as antecedents of timelessness, and creativity as its consequence. Intrinsic motivation refers to engaging in an activity for the inherent satisfaction one finds in it rather than to attain outcomes separate from it (Amabile, 1996; Deci & Ryan, 1985). With no or little intrinsic motivation it is unlikely that one will invest the affect and effort required to become fully engrossed in the task at hand. One's attention will more likely be diverted to another activity, other thoughts, or the future rewards associated with doing the task. People who are intrinsically motivated, on the other hand, are more likely to become fully immersed in the activity and forget temporarily time and other problems. In a recent study in an educational setting, Conti (2001) has found that higher intrinsic motivation is associated with checking and thinking about time less often and with a higher tendency to lose track of time. Low intrinsic motivation, on the other hand, was associated with heightened time awareness, a tendency to overestimate the passage of time, and a more negative affective experience. In organizational settings, intrinsic motivation toward one's core work tasks should increase the likelihood of experiencing timelessness while one is performing them.

> **Hypothesis 2**: The more intrinsically motivated an individual is in doing the core tasks of his or her work, the more likely he or she will experience timelessness while performing them.

Autonomy refers to the relative degree of freedom an employee has to select what work to do and how to perform it (Amabile et al., 1996). Autonomy facilitates timelessness

indirectly by supporting intrinsic motivation. The more autonomy an employee has to select what work to do, the more likely he or she will choose tasks that he or she finds intrinsically rewarding, and therefore, the higher the likelihood that he or she will experience timelessness while performing them. But autonomy also has direct effects on timelessness. Previous studies have shown that nearly any type of task, from fixing machines to writing reports, can be structured to provide optimal experiences (Csikszentmihalyi & LeFevre, 1988). Timelessness requires the creation of a psychological, and sometimes physical, space in which one can become engrossed in the task at hand away from distractions (Mainemelis, 2001). Autonomy to select how and when to perform one's work increases the likelihood that he or she will create such a space of uninterrupted engrossment in the task. Professors, for example, have the relative autonomy to select not only what to write, but also when and how to write it and to shut the office door so that they can become engrossed in the activity.

> **Hypothesis 3**: The more autonomy an individual has to select what work to do and how to perform it, the more likely he or is will experience timelessness while working.

As noted earlier, timelessness requires a space of uninterrupted engrossment in the activity. Timelessness is hindered by workplace distractions that prevent employees from concentrating on their work, or interrupt the flow of the work activity and distract employees' attention away from the task while they are engaged in it. Such distractions include physical events and noise (Amabile et al., 1996), interruptions by coworkers (Perlow, 1999), and boundary control activities by managers, such as imposed work times and deadlines, physical monitoring, or influence to work according to managers' rhythms and styles (Perlow, 1998).

> **Hypothesis 4**: The more distractions there are in the work environment, the less likely an individual will experience timelessness while working in it.

Creativity refers to the generation of ideas that are both original and useful (Amabile, 1988; Russ, 1993). Timelessness facilitates creativity through both affective and cognitive mechanisms. Creativity requires divergent thinking, the ability to generate numerous and

diverse ideas to a problem or situation. Divergent thinking involves free associations, broad scanning, and fluidity of thought (Runco, 1999), and it has been portrayed metaphorically as a walk in a maze (Amabile, 1996). Heighten time awareness usually stifles divergent thinking: it leads people to walk in the maze so as to find as soon as possible the way out, that is, it triggers the most common, routine, or otherwise tried response to the problem or situation at hand (Amabile, 1996). When people's attention is directed away from time, on the other hand, they are more likely to stay longer in the maze and to walk around so as to explore what the maze looks like and what alternative paths lead out of it (Eco, 1994). In other words, the loss of the sense of time in timelessness increases the likelihood of divergent thinking—of generating numerous and diverse responses to the task at hand.

This implies, of course, that one is not afraid to explore the maze and that he or she finds affective pleasure in doing so. As noted earlier, timelessness involves loss of self-consciousness; as soon as one forgets the fears and other demands of the self, one also suspends two factors that have detrimental effects on the generation of creative ideas, namely fear of failure and negative judgment (Deci & Ryan, 1985; Nicherson, 1999). What usually kills or blocks creativity is lack of courage to explore new ideas, paralyzing fear about one's performance, or premature rejection of one's insights as inadequate or not worthy of further elaboration. The loss of self-consciousness in timelessness prevents the arousal of such fears and judgments, and facilitates the playful engagement with the task. Moreover, several studies have shown that positive affect states facilitate cognitive flexibility, associative fluency, idea categorization, and affective pleasure in challenge, all of which facilitate creativity (for integrative reviews see Isen, 1999, and Russ, 1993, 1999a, 1999b). Timelessness fosters creativity because it is a highly positive affect state, in fact, one of the most enjoyable and exciting experiences of work life (Csikszentmihalyi, 1990; Massimini & Delle Fave, 2000). Being an "out of the ordinary," highly positive affect state, timelessness

increases the likelihood of generating more variance, exploration, and experimentation with variables, ideas, opportunities, or possibilities in one's work (Mainemelis, 2001).

In addition, nearly all forms of creative accomplishment entail, at some stage in the process, periods of total involvement in the task at hand (Csikszentmihalyi, 1997; May, 1994). Although creative insights can emerge from the subconscious at any time and out-of-the-blue, they usually have their own developmental history, that is, they are preceded and thereafter followed by periods of total immersion in one's work (Csikszentmihalyi, 1990; Gruber & Davis, 1995; Gruber & Wallace, 1999). Recent studies have shown that creativity is severely hindered by extreme time pressures and distractions that prevent employees from becoming deeply engrossed in their work (Amabile, Mueller, Simpson, Hadley, Kramer, & Fleming, 2002; Amabile et al., 1996; Perlow, 1998, 1999). Timelessness fosters creativity because it is the space within one's workday that accounts for a significant proportion of quality work--a context of highly focused, uninterrupted performance. Finally, because timelessness is an experience that tends to recreate itself, it also tends to reinforce over time the benefits of working in a context of focused attention and positive affect (Gardner, 1993). Timelessness is highly and intrinsically rewarding, which implies that individuals will try to protect a space within the workday so that they can experience it again--even if that requires them to voluntarily stay at work long after 5 so that they can become deeply immersed in their work and play with ideas away from the normal pressures of the workplace (Amabile et al., 2002; Mainemelis, 2001; Pinchot, 1985).

> **Hypothesis 5**: The more frequently an individual experiences timelessness while performing core work tasks, the more likely he or she will be creative in relation to those tasks.

RESEARCH DESIGN AND METHOD

Scale development

Two measures were developed to assess timelessness. The first measures timelessness as an immediate state--the degree to which one experiences timelessness while working on a controlled task. The second measures the frequency of the state--how frequently one experiences timelessness while working on a core task of his or her work. Frequency measures by themselves are subject to memory and other biases, while state measures by themselves do not capture the frequency by which people experience timelessness in their work environments, and consequently, the additive long-term effects of timelessness on such outcomes as creativity. However, when both types of measures are used together they offset these limitations and offer two complementary ways for testing the validity of the construct.

To measure the four hypothesized dimensions of timelessness, four scales were developed following the processes suggested by Clark and Watson (1995), DeVellis (1991), and Churchill (1979). A large item pool was generated, reviewed, and refined over a period of three months with the help of two other behavioral scientists each with more than thirty years of experience in scale development and validation. Items were written based on the conceptual definitions of the constructs. Another source of input were published interviews and biographical accounts of experiences of timelessness (Barron, Montuori, & Barron, 1997; Csikszentmihalyi, 1997; Ghiselin, 1982). A pilot questionnaire consisting of 28 items (7 per scale) was administered to a group of 20 behavioral scientists, who filled it out and commented on the items. Based on their qualitative feedback and an examination of the properties of the items and scales, ambiguous and overly complex items were eliminated or rewritten, and new items were developed to form a final pool of 28 items. Anderson and Gerbing (1998) and DeVellis (1991) recommend that in the early stages of scale development several redundant items should be written so as to allow the flexibility to select a smaller pool of the best items in the stage of analysis. Here, 28 items (seven per scale) were developed with the objective of reducing the scale to a smaller number of items at the stage of analysis.

The 28-item instrument was a measure of the frequency by which one experiences timelessness. The instructions to the frequency measure state that one should answer the questions in relation to how one feels while working on a core work task. The response format is a 5-point frequency scale, where 1 = Never or Almost Never True of Me, 2 = Seldom True of Me, 3 = Occasionally True of Me, 4 = Often True of Me, and 5 = Always or Almost Always True of Me. A five-point rating scale was selected to limit potential response bias sets often associated with the seven-point scale (Clark & Watson, 1995; DeVellis, 1991).

The 28-item frequency measure was used to conduct EFA in study I and CFA in study II. The results of these two studies were then examined together to reduce the frequency measure to 16 items (four per scale) and to conduct a second CFA with the 16-item measure in study II. A third sample (study III) was then used to replicate these findings and to modify the 16-item frequency measure so as to produce a 16-item state measure. The state measure was administered immediately after the participants had completed a task in a controlled setting. The items of the state measure are identical to those of the frequency measure, but in the state measure the items are phrased in the past tense (see Appendixes 1-4). The instructions indicate that one should answer the questions in relation to how one felt while performing the task one has just completed. The response format is a 5-point scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Samples and Procedures

To strengthen the generalizability of the results, and to control for potential biases due to contextual variability, the three samples were intentionally selected to be highly diverse in terms of demographics, geographical location, and institutional environments.

Study I. The first study was conducted in a sample of 120 art students at a Midwestern Institute of Art. Data were collected with the 28-item frequency measure during a workshop. The introduction to the instrument read, “Please answer the following questions

in relation to how you feel while you are working on your artistic work." Participation in the survey was voluntary and 110 students gave their written consent to participate (response rate 92%). After checking the responses for unusually large proportions of missing data, two cases were dropped from the analysis. The remaining 108 cases were used in the analysis. 53% of the participants were female and 47% male. 89% were Caucasian, 5% African American, 2% Hispanic, 2% Asian, and 2% had various other ethnic backgrounds. The average age was 19 (minimum = 18, maximum = 39, median = 18).

Study II. The second study was conducted in a sample of 143 employees of the R&D division of a Midwestern corporation in the health industry. Data were collected with the 28-item frequency measure through a web survey. The introduction stated, "Please think of one regular work activity (e.g., conducting experiments, designing, or testing) and answer the following questions in relation to how you feel during that activity." Participation was voluntary; 115 individuals gave their consent to participate (response rate 80%). Two surveys had an unusually large number of missing item responses and were removed from the analysis. 75% were male and 25% female. The average age was 39 (minimum = 21, maximum = 62, median 38.5). 85% were Caucasian, 4.5% African American, 4.5% Asian, and the remaining 6% had various other ethnic backgrounds. 5% held a Ph.D., 1% a M.D., 23% a graduate degree, 46% a college degree, and 22% had some college education.

Study III. The third study was conducted in a sample of 320 employees, in approximately as many organizations and jobs, who later enrolled in an MBA program in the United Kingdom. The average age was 28 (minimum= 23, maximum = 35, median = 28). 77% were male and 23% female. The participants represented 50 nationalities from five continents. They completed a web survey one month before they enrolled to the MBA program, when most of them were still working in their organizations. The introduction to the web survey stated, "Please think of one regular work activity in your current job (or your last

job if you have already left it), and answer the following questions in relation to how you feel while performing that activity". The participants answered the frequency scale. 282 participants gave their consent to participate in the study (response rate 94%).

Three months later, when a subset of this sample (N=248) was enrolled in a course of the MBA program, the state measure was administered during a scheduled class exercise. Students worked in groups of six in break out rooms to create a poster for London's bid to host the 2012 Olympic Games. The students were provided with a brief by London's bid committee which explained the desired messages the poster should convey, the intended audiences, what is unique about the city of London, and the technical requirements for designing the poster. Students were also provided with sample posters from all summer Olympic Games between 1896 and 2008, a brief history of the Olympic Games, and paper and color markers to design the posters. At the end of the exercise, research assistants walked into the rooms and administered the paper-and-pencil state measure of timelessness. The introduction read, "Please answer the following questions in relation to how you felt during the activity you have just completed (i.e., designing an Olympic poster)".

Other Measures

Intrinsic motivation. The nomological validity was tested in the second study (R&D sample). Participants completed measures of intrinsic motivation, autonomy, and distractions through the web survey described earlier. Intrinsic motivation was measured with three items adopted from the Job Diagnostic Survey (JDS, Hackman & Oldham, 1980). The scale consisted of three items ("I feel bad when I do not perform well," "I feel a great sense of personal satisfaction when I do my job well", "My opinion of myself goes up when I do my job well") rated on a five-point disagree/agree scale. Cronbach's alpha for this scale was .61.

Autonomy. Autonomy was measured with items adopted from the JDS (Hackman & Oldham, 1980). The autonomy scale consisted of four items ("My job gives me considerable

opportunity for independence and freedom in how I do the work", "My job gives me responsibility for deciding how and when the work is done", "My job gives me the chance to use my personal initiative or judgment in carrying out the work", and the reversely scored item "My job gives me almost no personal "say" about when and how the work is done") which were rated on a five-point frequency scale. The alpha reliability for this scale was .80.

Distractions. To measure distractions, two items were written and two were adopted from Amabile et al. (1996). The response format was a five-point frequency scale. The items were, "My colleagues make it difficult for me to focus on my work", "I have to deal with many distractions in my workplace", "People interrupt me when I am trying to do my work", and "My workplace has too much noise." This scale had a Cronbach's alpha of .73.

Creativity. To measure creativity, six items were adopted from Scott & Bruce (1994), Quinn (1988), and Shalley, Gilson, and Blum (2000). These items formed a creativity scale that was administered in two different ways to collect two different data sets on creativity. First, a self-report, concurrent measure of creativity was collected from the participants at the same time they completed the timelessness measure via the web survey. Because this self-report and concurrent creativity measure had obvious limitations it was not used to test Hypothesis 5. It was, rather, used to test whether the frequency by which the participants' experience timelessness correlates with their perceptions of their own creativity at work. Second, a predictive, rated measure of creativity was collected through supervisor ratings. Two months after the participants in the R&D sample completed the timelessness measures, their supervisors provided ratings of the creativity of their direct reports. The supervisors did not participate in the early phase when data on timelessness was collected from their direct reports. On a five-point frequency scale, the supervisors rated the degree to which each of their direct reports "Generates creative ideas", "Experiments with original, innovative ways to do his/her work", "Solves problems in creative ways", "Discovers new

procedures, applications, or ways of doing things", "Uses his/her imagination to come up with novel and useful ideas and concepts", and "Invents new things or processes". Supervisor ratings were collected via email. This creativity measure was used to test the nomological validity of timelessness and Hypothesis 5. The self-report creativity measure, on the other hand, was used only as an additional piece of validation. The six items and the rating scale of the self-report creativity measure were identical to those in the supervisor-ratings creativity measure, but the items in the self-report measure were phrased in first-person (e.g., "I generate creative ideas). The self-report creativity scale had an alpha reliability of .87, and the supervisor-ratings creativity scale had an alpha reliability of .89. The correlation between the self-report creativity measure and the supervisor-ratings creativity measure collected two months later was significant ($r = .21$, $p < .05$).

Analysis

The internal validity of the model (Hypothesis 1) was tested through both exploratory (EFA) and confirmatory factor analyses (CFA). In study I, common EFA with an oblique rotation was conducted because the theory behind the model does not assume that the factors are orthogonal but that they covary due to a higher-order factor (Floyd & Widaman, 1995; Pedhazur & Schmelkin, 1991). Furthermore, because an oblique rotation does not assume that the factors are correlated it will simply produce correlations close to zero if the factors are not correlated (Fabrigar et al., 1999). In studies II and III, CFA was conducted following step-by-step the process suggested by Marsh and Hocevar (1985, 1988), Jackson and Marsh (1996), and Byrne (2001). Three competing factorial models were specified and tested in AMOS (Arbuckle, 1999; Arbuckle & Wothke, 1999). The first model (M1) was a 1 First-Order Factor model, in which the items were modeled to 'load' on a latent unobserved factor. If that model were supported, that would suggest that one single factor is sufficient to explain the common variance of the items. That would support that timelessness is not a complex,

but rather, a unitary construct. If that were true, Hypothesis 1 would be rejected. The second model (M2) specified was a 4 First-Order Factors model. Here the items of each scale were constrained to load on their hypothesized constructs. Given the predictions of the study, the four unobserved factors—immersion, time distortion, sense of mastery, and sense of transcendence—were modeled to correlate with each other. The expectations regarding this model were that, first, it would fit the data better than M1; the test in that case is that the X^2 of M2 is smaller than the X^2 of M1 and the difference is statistically significant for the given difference in the degrees of freedom (Pedhazur & Schmelkin, 1991). Second, it was expected that M2 would show an acceptable fit to the data, specifically a X^2/df ratio between 1 and 2 (Arbuckle, 1999; Marsh & Hocevar, 1985, 1988), NNFI (Tucker & Lewis, 1973) and CFI values larger than .90 (Arbuckle & Wothke, 1999; Byrne, 2001; Hair, Anderson, Tatham, & Black, 1998), and a RMSEA value smaller than .08 (Browne & Cudeck, 1993; Byrne, 2001).

If M2 were supported that would show that timelessness has four distinct yet related dimensions. But in order to support Hypothesis 1 it is necessary to also show that the common variance between the four first factors is due to a common second-order factor of timelessness. A third, 1 Second-Order Factor model (M3) was specified to test that hypothesis. This model is similar to M2 with the only difference that the 6 correlation paths between the four first order factors are now replaced by a common second-order factor. In fact, that was the purpose of the investigation: To test whether a single, higher-order factor (timelessness) accounts for and sufficiently explains the shared variance of the four first-order factors. If that were true, it would suggest that timelessness has four distinct dimensions and would support Hypothesis 1. Recall that the purpose of a second-order model is to explain the variance of its first-order dimensions in a parsimonious way. That being the case, the second-order model (M3) can never fit the data better than the first-order model (M2), that is, the former is always nested within the latter. To accept a second-order

model, therefore, support should emerge that the second-order model fits the data almost as well as the first-order model. This condition is met when (1) the X^2 of the second-order model is not significantly different than the X^2 of the first-order model; (2) the ratio of the X^2 of the first-order model over the X^2 of the second-order model is larger than .90 (coefficient 'T'); and (3) the two models have almost identical measures of fit (Marsh & Hocevar, 1985). If the above conditions are satisfied, additional support for the second-order model should be provided by large (> .6) and statistically significant standardized factor loadings.

Finally, the convergent and discriminant validity of a second-order model is supported when (1) the first-order factors have composite reliabilities larger than .70 (Hair et al., 1996), (2) the variance extracted by each first-order factor is larger than .50 (Bagozzi & Yi, 1988), and (3) the variance extracted by each first-order factor is larger than its shared variance with any other first-order factor (Fornell & Larker, 1981; Singh, 1991).

Nomological validity. The nomological validity of the model was tested with the model shown in Figure 1. Intrinsic motivation, autonomy, and distractions were modeled as antecedent latent variables that correlate with the latent variable of timelessness, which, in turn, was modeled to correlate with the latent variable of creativity (supervisor ratings). Because previous research has shown that intrinsic motivation and autonomy are correlated (Amabile, 1996; Oldham & Cummings, 1996), these two latent variables were allowed to covary. Finally, to test that timelessness also correlates with employees' perceptions of their own creativity, a simple structural model was specified where timelessness, as a second-order factor, was allowed to correlate with the latent variable of creativity (self-report measure).

RESULTS

Internal consistency

The univariate statistics and correlations of the timelessness scales are shown in Table 2. Both the state and the frequency measure showed good internal consistency across all

studies. In the initial 28-item frequency measure, the alpha reliabilities in study I and study II were, respectively, immersion .80 and .74, time distortion .86 and .82, sense of mastery .86 and .86, and sense of transcendence .88 and .89. The alpha reliabilities for the reduced 16-item frequency scale in study II and study III were, respectively, immersion .82 and .81, time distortion .83 and .80, sense of mastery .83 and .78, and sense of transcendence .89 and .87. The alpha reliabilities for the state measure in study III were immersion .89, time distortion .87, sense of mastery .83, and sense of transcendence .86. All alpha reliabilities were therefore larger than the minimum criterion of .70, and most were larger than .80.

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Internal validity

Study I. In the unrotated EFA matrix there were 6 factors with initial eigen values larger than 1 (7.70, 4.91, 2.46, 1.54, 1.07, and 1.03) that extracted 67% of the variance. However, the problems of EFA in over-extracting factors based on the eigen-larger-than-one criterion are well documented in the literature (Fabrigar et al., 1999; Floyd & Widaman, 1995; Pedhazur & Schmelkin, 1991). This was particularly relevant in this case because the initial eigen values for Factors 5 and 6 were only marginally larger than 1, respectively 1.07 and 1.03. The first four factors, on the other hand, had eigen values equal to 7.70, 4.91, 2.46, and 1.54, and extracted respectively 27.50, 17.54, 8.79, and 5.48% of the variance, for a total cumulative variance of 59%. Support for the four-factor structure was also provided by the scree plot, which showed a clear leveling after the fourth factor.

Given the above results and the fact that a final decision as to the factorial structure of timelessness would be made after conducting a more conservative CFA in a second sample, a decision was made to extract four factors. After the oblique rotation, the four factors extracted a cumulative 53% of the variance. The results from the rotated pattern matrix, shown in Appendix 1, showed substantial support to the four-factor structure. In the

Immersion scale, six items loaded on a common factor and ranged from -.49 to -.70 with no cross-loadings larger than .30 on other factors; one item in that scale loaded on another factor. Six items in the Time Distortion scale loaded on a common factor ranging from .61 to .86, with no cross-loadings larger than .30 on other factors; one item loaded on that scale but not in the expected direction. All seven items in the Sense of Mastery scale loaded on a common factor, ranging from .43 to .76, with no cross-loadings larger than .30 on other factors. Finally, five items in the Sense of Transcendence scale loaded on a common factor, ranging from .69 to .86, with no cross-loadings on other factors. Two items in that scale showed cross-loadings larger than .30 on two distinct factors, as shown in Appendix 1.

Overall, (a) 24 of the 28 items loaded on their hypothesized factors, (b) showed no cross-loadings larger than .30, and (c) their loadings were larger than .43, thereby exceeding the conventionally recommended cut-off value of .40 (Floyd & Widaman, 1995; Pedhazur & Schmelkin, 1991). Additional support for the four-factor structure was provided by the factor intercorrelations, which were as follows: Immersion – Time Distortion .36, Immersion – Sense of Mastery .39, Immersion – Sense of Transcendence .17, Time Distortion – Sense of Mastery .02, Time Distortion – Sense of Transcendence .06, and Sense of Mastery – Sense of Transcendence .38. As was expected, the four factors covary but they are also distinct from each other as none of their intercorrelations is larger than .50. These results offered initial support to the four-factor structure of timelessness, but they also indicated that there is space for improving the scales. The conclusions from the EFA in Study I were used as input to Study II. The 28-item frequency questionnaire was administered to the R&D sample, and items that were identified as offending or weak in the EFA of the art sample data became candidates for elimination upon confirmation from the CFA results in the R&D sample.

Study II. Table 2 presents the model-fit results of the CFA in the R&D sample. In the original 28-item frequency measure, the 1 first-order factor model showed a very poor fit (X^2

= 1,149, df = 350, $p < .001$; $X^2/df = 3.28$; RMSEA = .143; CFI = .45; NNFI = .75). The 4 first-order factors model showed a large and statistically significant improvement over the 1 first-order factor model ($X^2 = 680$, df = 344, $p < .001$; difference in $X^2 = 469.14$, df = 6, $p < .001$). As was also expected, the second-order factor model ($X^2 = 683$, df = 346, $p < .001$) was not significantly different from the 4 first-order factors model. Specifically, (a) the difference in chi-square between the two models was not significant (3.35, df = 2, $p > .10$), (b) the T coefficient was larger than .90 (.99), and (c) the two models had identical indexes of fit ($X^2/df = 1.98$, RMSEA = .093, CFI = .77, NNFI = .75).

-----insert Table 2 about here-----

The pattern of these results shows that the four-factor representation of timelessness fits the data better than a single factor model, and that the shared variance of the first-order factors can be explained by a common higher-order factor. At the same time, the fit indexes are not within acceptable limits. This outcome is not surprising given that the analysis so far involved a new measure without any modifications. Recall that the 28-item frequency measure was made purposefully redundant, and the CFA measures of fit, shown in Table 2, contain severe penalties for lack of parsimony. In order to improve the scales and the model fit, the steps recommended by Anderson and Gerbing (1988) and Jackson & Marsh (1996) were followed so as to reduce the scales. First, the CFA standardized loadings (i.e., regression weights) and residuals were examined for the four offending items identified in the EFA of Study I. These items were found to be problematic also in the CFA of the R&D sample data, and therefore, they were eliminated. Second, items identified as weak in both studies and samples were eliminated. Such items showed small loadings or/and large cross loadings (EFA) and large error estimates (CFA). Finally, from the remaining pool of items the four best items per scale were retained, using a combination of criteria from the EFA (i.e., large factor loading, no cross-loadings), the CFA (i.e., large standardized loading, small

standardized residuals) and internal consistency analysis (i.e., large square multiple correlations). This analysis resulted in a final, 16-item frequency measure (four per scale) which was then used to conduct CFA on the data of the same sample.

The CFA model fit measures for the 16-item frequency measure are shown in Table 2. The pattern of fit among the models is identical to the one in the 28-item measure: The 1 first-order factor model showed a very poor fit ($X^2 = 518$, df = 104, $p < .001$; $X^2/df = 4.98$, RMSEA = .189, CFI = .52, NNFI = .44), and the 4 first-order factors model showed a large and statistically significant improvement over the 1 first-order factor model ($X^2 = 167$, df = 98, $p < .001$; difference in $X^2 = 350.98$, df = 6, $p < .001$). The second-order model had a $X^2 = 169$ (df = 100, $p < .001$) and the three conditions required to support it were met. The goodness of fit of the second-order model was not significantly different from the 4 first-order factors model (difference in $X^2 = 2.03$, df = 2, $p > .30$); the T coefficient was larger than .90 (.99); and the two models had almost identical indexes of fit, as shown in Table 2.

The 16-item measure showed reasonably good levels of fit. For the second-order model, X^2/df was 1.69, RMSEA = .078, CFI = .92, and NNFI = .90. An inspection of the 16x16 standardized residual covariance matrix showed that none of the 120 values exceeds the critical value of ± 2.58 (Byrne, 2001; Jöreskog & Sörbom, 1988), a 0% well below the recommended maximum acceptable limit of 5% (Arbuckle, 1995; Hair et al, 1998). These CFA results show that the higher-order representation of timelessness, as measured by the 16-item measure, meets the standards of acceptable goodness-of-fit set by previous studies with second-order models (i.e., Anderson & Gerbing, 1988; Bennett & Robinson, 2000; Jackson & Marsh, 1996; Spreitzer, 1995). Appendix 2 shows the factor loadings, error estimates, and uniqueness values for the 16 items (the values are from the second-order CFA and are almost identical to the respective first-order CFA values). Observe that (a) all 16 regression standardized factor loadings are statistically significant at $p < .001$, (b) all 16 are large (> .59)

and 14 are larger than .70, and (c) all standard errors are relatively small (especially when considering the magnitude of the factor loadings) and range from .08 to .16. Furthermore, the factor loadings on the second-order factor of Timelessness were all significant at $p < .001$ (Immersion .67, Time Distortion .44, Sense of Mastery .60, and Sense of Transcendence .76).

Additional support for the four-factor structure is shown in Table 3. First, the composite reliabilities of the four first-order factors are much larger than .70. The composite reliability for Immersion is .82, Time Distortion .84, Sense of Mastery .84, and Sense of Transcendence .89. Second, each first-order factor extracts a larger than .50 proportion of the variance of its indicators (Bagozzi & Yi, 1988). Immersion extracts .54, Time Distortion .58, Sense of Mastery .56, and Sense of Transcendence .67. Finally, the variance extracted by any given individual factor is larger than the variance that this factor shares with any other factor, as shown in Table 3. This satisfies the condition that although the four factors are correlated they are distinct from each other (Fornell & Larker, 1981; Singh, 1991). In summary, these results satisfy the criteria required for accepting the second-order model (Hypothesis 1). To strengthen the confidence in this hypothesis, the results of Study II were replicated in Study III in which data was collected by administering the 16-item frequency measure.

-----insert Table 3 about here-----

Study III. Table 2 presents the model-fit indexes for the 16-item frequency measure in study III. The pattern of these results is identical to those in Study II. The 1 first-order factor model showed a very poor fit ($X^2 = 1119$, $df = 104$, $p < .001$; $X^2/df = 10.76$, RMSEA = .186, CFI = .45, NNFI = .36), and the 4 first-order factors model showed a large and statistically significant improvement over the 1 first-order factor model ($X^2 = 193.93$, $df = 98$, $p < .001$; difference in $X^2 = 925.07$, $df = 6$, $p < .001$). The second-order model had a $X^2 = 195.25$ ($df = 100$, $p < .001$), and the three conditions required to support it were met. The goodness of fit of the second-order model was not significantly different from the 4 first-

order factors model (difference in $X^2 = 1.32$, df = 2, $p > .51$); the T coefficient was larger than .90 (.99); and the two models had almost identical and good indexes of fit, as shown in Table 2: CFI = .95, NNFI=.94, RMSEA= .058, and $X^2/df = 1.95$ (M3). Appendix 3 shows the factor loadings, standard error estimates, and uniqueness values for the 16 items. Overall, (a) all 16 factor loadings are statistically significant at $p < .001$, (b) all 16 are larger than .50 and 14 are larger than .60, and (c) all standard errors are relatively small (especially when considering the magnitude of the factor loadings) and range from .06 to .17. Furthermore, the factor loadings on the second-order factor of Timelessness are all significant at $p < .001$ (Immersion .96, Time Distortion .34, Sense of Mastery .53, and Sense of Transcendence .45).

Additional support for the four-factor structure is shown in Table 3. The composite reliabilities of the four first-order factors are larger than .70. The composite reliability for Immersion is .81, Time Distortion .81, Sense of Mastery .79, and Sense of Transcendence .88. Second, each first-order factor extracts a larger than .50 proportion of the variance of its indicators: Immersion extracts .52, Time Distortion .52, Sense of Mastery .50, and Sense of Transcendence .64. Finally, the variance extracted by any given individual factor is larger than the variance that this factor shares with any other factor, as shown in Table 3.

The results of study III satisfy the criteria required for accepting the second-order model and replicate the results of study II. However, because both tests were conducted with the frequency measure, which has some limitations as individuals assess in retrospect the state, prior to accepting Hypothesis 1 an additional test was performed using this time the data collected with the state measure in study III. These results are shown at the bottom of Table 2 and their pattern is identical to the results obtained using the frequency measure in both studies II and III. The 1 first-order factor model showed a very poor fit ($X^2 = 983.85$, df = 104, $p < .001$; $X^2/df = 9.46$, RMSEA = .185, CFI = .59, NNFI = .52), and the 4 first-order factors model showed a large and statistically significant improvement over the 1 first-order

factor model (X^2 = 155.71, df = 98, $p < .001$; difference in X^2 = 828.14, df = 6, $p < .001$). The second-order model had a X^2 = 158.52 (df = 100, $p < .001$), and the three conditions required to support it were met. The goodness of fit of the second-order model was not significantly different from the 4 first-order factors model (difference in X^2 = 2.81, df = 2, $p > .24$); the T coefficient was larger than .90 (.98); and the two models had almost identical and good indexes of fit (CFI = .97, NNFI =.97, RMSEA = .049, and X^2/df = 1.58).

Appendix 4 shows the factor loadings, standard error estimates, and uniqueness values for the 16 items (the values are from the second-order CFA and are almost identical to the respective first-order CFA values). Observe that (a) all 16 standardized factor loadings are statistically significant at $p < .001$, (b) all 16 are larger than .60, and (c) all standard errors are relatively small (especially when considering the magnitude of the factor loadings) and range from .06 to .13. Furthermore, the factor loadings on the second-order factor of Timelessness were all significant at $p < .001$ (Immersion .87, Time Distortion .35, Sense of Mastery .69, and Sense of Transcendence .78).

The convergent and discriminant validity of the four-factor structure was supported by the state measure data as well, as shown in Table 3. The composite reliabilities of the four first-order factors are much larger than .70. The composite reliability for Immersion is .89, Time Distortion .88, Sense of Mastery .83, and Sense of Transcendence .88. Second, each first-order factor extracts a larger than .50 proportion of the variance of its indicators--Immersion extracts .66, Time Distortion .64, Sense of Mastery .55, and Sense of Transcendence .60. Finally, the variance extracted by any given individual factor is larger than the variance that this factor shares with any other factor, as shown in Table 3. These results offer additional support to the representation of timelessness as a second-order construct manifested in the first-order dimensions of Immersion, Time Distortion, Sense of Mastery, and Sense of Transcendence. On the basis of the results obtained in Studies I, II,

and III, through both EFA and CFA, and with data collected with both the frequency and the state measures of timelessness, Hypothesis 1 was supported.

Nomological validity

Table 4 presents the univariate statistics and correlations of the variables used to test the nomological validity of timelessness in study II. The specified model, shown in Figure 1, showed a reasonably good fit to the data. Specifically, the model fit statistics were X^2 = 344.65 (df = 266, $p < .001$), $X^2/df = 1.30$, RMSEA = .055, CFI = .92, and NNFI = .91. Prior to accepting this model, the modification indexes were consulted to determine whether a better structural model could result by "freeing" some structural paths (e.g., between autonomy and creativity or between distractions and time distortion). The modification indexes showed that modifying the structural model would not result to an improvement, and therefore, the model was accepted exactly as it was originally specified.

-----insert Table 4 about here-----

Given that these results offered support to the nomological model *as a whole*, Hypotheses 2 to 5 were next tested. As shown in Figure 1, intrinsic motivation was significantly and positively correlated with timelessness (regression weight = .33, $p < .05$). Hypothesis 2 was therefore supported. Autonomy was significantly and positively correlated with timelessness (regression weight = .38, $p < .05$). Hypothesis 3 was therefore supported. The correlation between distractions and timelessness was in the expected direction (negative) but not significant (regression weight = -.17, $p > .18$). Hypotheses 4, therefore, was not supported, however, recall that in nomological validation the interest is less on the statistical significance of discrete relationships and more on the overall goodness-of-fit of the model, that is, the entire pattern of relationships. After checking the modification indexes, it was concluded that eliminating the latent variable of distractions would not significantly improve the fit of the model. This suggests that even if in this study the relationship was not

significant, it did contribute to the overall model, and therefore it would be useful to continue investigating it in the future. Last but not least, timelessness was significantly and positively correlated with rated creativity (regression weight = .37, $p < .01$). The timelessness measure was predictive of the supervisors' creativity ratings collected two months later. Hypothesis 5 was therefore supported. Moreover, recall that that we also tested whether employees' perceptions of their creativity are associated with the frequency by which they experience timelessness. The simple structural model that included only timelessness and the self-report creativity measure showed a good fit ($X^2 = 98.80$, df = 72, $p < .05$, $X^2/df = 1.37$, RMSEA = .026, CFI = .96, and NNFI = .95), and the structural coefficient between timelessness and creativity (self-report) was positive and significant (regression weight= .53, $p < .001$).

DISCUSSION

Summary of findings. The first objective of this research was the development of a measure of timelessness. A measure was developed, refined, and modified to yield two variants, one of which assesses timelessness as a state (the degree to which one experiences timelessness in a controlled task) and the other as frequency (how often one experiences timelessness while working on a core work task over time). Both measures showed good internal consistency and consistent patterns of internal validity across three studies. The second objective was to test the internal validity of the construct, that timelessness is a higher-order construct manifested in the four first-order dimensions of immersion, time distortion, sense of mastery, and sense of transcendence. This hypothesis was supported by exploratory and confirmatory factor analyses, in three diverse samples, and with data collected with both the state and the frequency measures of timelessness.

The third objective of this research was to begin validating the nomological network of timelessness. The results of the study in the R&D sample supported the nomological validity of the underlying theoretical model as a whole. Hypothesized relationships between

intrinsic motivation (Hypothesis 2) and autonomy (Hypothesis 3), on the one hand, and timelessness, on the other hand, were supported, while the relationship between distractions and timelessness was in the expected direction but not significant. Although Hypothesis 4 was not supported, the latent variable of distractions made a contribution to the overall model, and therefore, it would be useful to continue investigating this relationship in the future. The R&D environment of study II did not involve a high level of distractions (the mean of the scale was 11.42 out of 20 and standard deviation was 2.86). Also considering the relatively high degree of autonomy in this sample (the mean of the Autonomy scale was 14.67 out of 20 and standard deviation was 2.83), it is possible that the R&D employees had the relative freedom to structure their core work tasks in such a way so that they can perform them away from external distractions. Future research should shed more light on this issue.

Finally, the prediction (Hypothesis 5) that the frequency by which one experiences timelessness while working on core work tasks increases the likelihood of his or her creativity was supported. The data on timelessness collected from the R&D employees was predictive of their supervisors' creativity ratings collected two months later. Furthermore, the frequency by which employees experience timelessness was also significantly and positively correlated with their own concurrent perceptions of their personal creativity. In conjunction, these findings support both the long-held proposition of psychological theory that individuals experience heightened personal creativity in states of optimal experience (Csikszentmihalyi, 1997; Csikszentmihalyi & LeFevre, 1989; Maslow, 1968; May, 1994) and that the benefits of timelessness to creativity go beyond individuals' own perceptions of their personal creativity.

Limitations. First, timelessness is a state that is not directly observable to researchers, and in one sense, not even those engaged in it are fully aware of it until they emerge from the state (Gardner, 1997; Mainemelis, 2001). As a result, any measure of timelessness is inadequate to some degree. The state measure developed in this research

comes as closely as possible to assessing this state immediately after individuals emerge from it (Jackson & Marsh, 1996). Knowing, of course, whether one has experienced timelessness in a controlled task cannot answer how frequently one experiences timelessness while working on core tasks of his or her work over time, a fact which can ultimately answer whether timelessness influences such workplace outcomes as creativity. The frequency measure addresses this problem, but it may also involve memory biases as individual recollect in retrospect their experiences—a problem that is addressed by the state measure. Therefore, while both levels of measurement present limitations, when used together they strengthen our confidence in the results. This was important in this research because *the pattern of the results* obtained with the state measure (study III) was identical to the pattern of results obtained with the frequency measure in the same sample (study III) and in an independent second sample (study II). Equally important is the fact that the pattern of results was identical in three samples that were highly diverse.

A second possible limitation is the relatively small sample size in the first two studies (N=108 and N=113 respectively). However, it is unlikely that sample size has biased the results. MacCallum, Widaman, Zhang, and Hong (1999) have shown that sample size becomes an important determinant of recovery of population factors only when all communalities are low and the factors are not strongly determined. The results presented earlier show that the communalities in these studies ranged from moderate to high. As for the degree of determination of the factors, Hair et al. (1998) and MacCallum et al. (1999) suggest that factors are considered strongly determined when the variables-to-factors ratio is larger than 3.33 with 7 being the usual maximum ratio. In the original 28-item measure the ratio was 7, and in the final 16-item measure the ratio was 4. Furthermore, the NNFI index, which is relatively insensitive to sample size (Hair et al, 1998), had values larger than .90 in all second-order CFA tests (M3 in Table 2) as well as in the nomological test. Recall also that

the results of studies I and II were replicated in study III with a more-that-twice-as-large sample size (N=282). In fact, Hypothesis 1 was supported not on the basis of the results of any single sample but on the basis of the consistent pattern of results across all three samples.

A third limitation is that the internal consistency of one of the variables, intrinsic motivation, was less that satisfactory (alpha = .61). However, given that intrinsic motivation was significantly correlated with timelessness, a better, more internally consistent measure of intrinsic motivation would likely result in a larger correlation.

Research implications. The results of this research create many opportunities for further investigations. First, the internal validity of the construct can be further tested using both the frequency and the state measures. Second, future research can add support to the nomological validity of the model, not merely by replicating the results of study II, but most importantly, by exploring other variables in the nomological network of timelessness. The structural model shown in Figure 1 explains 38% of the variance of timelessness and 14% of the variance of creativity. Clearly, creativity is influenced by many factors other than timelessness, and timelessness is shaped by more factors other than intrinsic motivation, autonomy, and distractions. Mainemelis (2001) hypothesized 10 factors that influence timelessness; in the present study we tested only three of them. Testing in the future for more relationships can lead to models that explain a higher proportion of the variance of timelessness. At minimum, the results of this study offer initial support to the nomological validity of timelessness, explain more than one-third of its variance, and create opportunities for further exploring other relationships in the nomological network of the construct.

Future studies should explore the relative importance of task characteristics and other contextual variables on timelessness. For example, in an academic context one could explore how frequently people experience timelessness while conducting field research, writing papers, teaching, and so forth, and whether and how this experience varies across different

situational configurations and contextual conditions. If timelessness is indeed one of the most enjoyable workplace experiences (Csikszentmihalyi, 1990; Mainemelis, 2001; Massimini & Delle Fave, 2000), and if organizations can benefit from its potential effects on such outcomes as creativity, exploring the situational determinants of timelessness can have important practical implications for the workplace.

Contributions and conclusion. While the concept of optimal, or aesthetic, experience and its importance for the world work have been discussed in recent decades (e.g., Deci & Ryan, 1985; Massimini & Delle Fave, 2000; Quinn, 2000; Sandelands & Buckner, 1989; Seligman & Csikszentmihalyi, 2000), few studies have sought, to date, to measure optimal experience in organizations. This research offers a rare empirical investigation of optimal experience. It also offers the first deductive test of the construct of timelessness as a task-related experience and two measures for assessing timelessness in the workplace as a state and as frequency of experience of that state. Several opportunities for future empirical studies and for theory development emanate from these contributions, as discussed above.

Moreover, previous research has focused on the personal and work-environment factors that affect creativity (e.g., Amabile et al., 1996; Oldham & Cummings, 1996; Scott & Bruce, 1994; Shalley et al., 2000; Shalley, Zhou, & Oldham, 2004) but has paid little attention to how the quality of one's immediate engagement with work affects creativity. This paper contributes to the creativity literature an empirical investigation of a state—of a form of engagement with organizational work—that increases the likelihood of creativity. In a simple sense, this research supports the long-standing and yet rarely tested hypothesis that creativity requires one to become deeply immersed in the task at hand. The results of the study in the R&D setting suggest that timelessness makes, in its own merit, a positive contribution to creativity. This finding is important for another reason. In recent years, studies have shown that time pressures, unrealistic expectations for productivity, distractions,

and highly stressful working conditions literally kill creativity (Amabile, 1996; Amabile et al., 2002; Amabile et al., 1996; Perlow, 1998, 1999). Less attention has been paid, however, to testing the polar side of this dynamic: that immersing fully in one's work away from such pressures stimulates creativity. The results of this study suggest that this is case.

Ever since Roy's (1959) study of the informal social play of a group of machine operators, research has suggested that employees often find enjoyable experiences by taking a break from their work or by escaping their work altogether (Boland & Hoffman, 1983; D'Abate, 2004; Elsbach & Hargadon, 2002; Jett & George, 2003). Considering that individuals invest the largest part of their lives in the world of work, it is surprising how little attention has been given, to date, to exploring what makes work itself exciting and enjoyable *while one is performing it*. Our research suggests that there is a form of optimal experience which is not only enjoyable to the individual immersed in it, but also beneficial to his or her work and organization. Clearly, creativity is just one process that is useful to organizations; as we continue to explore timelessness, we will likely uncover whether and how it contributes to other workplace processes.

Yet, the fact that timelessness is an experience of work that is aesthetically rewarding and life-giving to the individual immersed in it provides all the justifications we need for studying it. In her 1996 Nobel Prize acceptance lecture, Wistawa Szymborska said that "Loveless work, boring work, work valued only because others haven't got even that much—this is one of the hardest human miseries" (1998: xvi). She may have a good point. While work must satisfy instrumental ends that are necessary to support life, the aesthetic pleasure of work is what ultimately makes the life at work worth living.

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APPENDIX 1

Exploratory Factor Analysis: Factor Loadings

(Study I, Art Sample, USA, 28-item Frequency Measure, N=108).

	Scale Items	Factors			
		1	2	3	4
Immersion Scale					
1.	All my attention is invested in my work.	.12	-.09	-.04	-.*60*
2.	I concentrate intensely in my work.	.16	-.02	.03	-.*62*
3.	I am completely absorbed in my work.	-.13	.19	.08	-.*70*
4.	I am deeply immersed in my work.	.04	.26	.10	-.*64*
5.	I am fully engaged in my work.	.10	.02	.00	-.*66*
6.	I forget about problems not related to the task I am doing	-.08	.15	.08	-.*49*
7.	I am oblivious to my surroundings.	.16	.*48*	-.06	-.10
Time Distortion Scale					
8.	I lose track of time.	-.02	.*62*	-.19	-.13
9.	I feel that time stops.	-.03	.*61*	.19	.11
10.	I lose all sense of time.	-.01	.*86*	-.14	-.02
11.	I am not aware of the passage of time.	-.08	.*67*	.03	-.20
12.	The way time passes seems to be different from normal.	-.13	.*72*	-.08	-.10
13.	I feel that time alters (either slows down or speeds up).	-.02	.*72*	-.01	-.07
14.	I am aware of what time it is.	.00	.*45*	-.17	-.13
Sense of Mastery Scale					
15.	I feel in command of my work.	.*43*	-.09	.17	-.26
16.	I feel in complete control of my work.	.*60*	-.12	.09	-.24
17.	I get a great sense of control over what I am doing.	.*60*	-.11	.08	-.23
18.	I have a feeling of mastery.	.*63*	.15	.25	.03
19.	I have a sense of mastery over my work.	.*70*	.07	.06	.04
20.	I am confident about my performance.	.*66*	-.12	-.04	.01
21.	I am sure about my ability to do my work well.	.*76*	.08	-.12	.02
Transcendence Scale					
22.	I feel that I am contributing to something larger than my self.	.00	-.08	.*84*	-.11
23.	I feel that my work is a vehicle for a greater cause.	-.08	-.19	.*77*	-.09
24.	I feel part of a larger purpose.	.08	-.09	.*78*	-.09
25.	I feel that I am contributing to something larger than my organization.	.08	.11	.*86*	.06
26.	My work feels larger than myself.	.18	.14	.*69*	.01
27.	I experience a sense of transcendence.	.07	.*57*	.34	.10
28.	I go beyond myself.	.26	.32	.33	-.11

Method used is Principal Axis Factoring with an Oblique (Oblimin) rotation.
Values in italics indicate a factor loading > .40.

APPENDIX 2

Confirmatory Factor Analysis: First-Order Standardized Factor Loadings, Standard Errors, and Uniqueness (Study II, R&D Sample, USA, 28-item Frequency Measure, N=113).

TLSS Items	IM	TD	SM	ST	se	u
1. All my attention is invested in my work.	*.59*	.00	.00	.00	.13	.35
2. I concentrate intensely in my work.	*.71*	.00	.00	.00	.14	.50
3. I am completely absorbed in my work.	*.85*	.00	.00	.00	.13	.72
4. I am deeply immersed in my work.	*.78*	.00	.00	.00	.10	.60
5. I lose track of time.	.00	*.64*	.00	.00	.08	.40
6. I feel that time stops.	.00	*.73*	.00	.00	.12	.54
7. I lose all sense of time.	.00	*.90*	.00	.00	.14	.80
8. I am not aware of the passage of time.	.00	*.76*	.00	.00	.11	.57
9. I feel in command of my work.	.00	.00	*.76*	.00	.14	.58
10. I feel in complete control of my work.	.00	.00	*.77*	.00	.16	.60
11. I get a great sense of control over what I am doing.	.00	.00	*.75*	.00	.14	.56
12. I have a feeling of mastery.	.00	.00	*.70*	.00	.18	.49
13. I feel that I am contributing to something larger than my self.	.00	.00	.00	*.84*	.08	.71
14. I feel that my work is a vehicle for a greater cause.	.00	.00	.00	*.86*	.10	.74
15. I feel part of a larger purpose.	.00	.00	.00	*.78*	.10	.61
16. I feel that I am contributing to something larger than my organization.	.00	.00	.00	*.78*	.11	.61

All 16 standardized regression weights are statistically significant at $p < .001$.

Abbreviations: IM = Immersion, TD = Time Distortion, SM = Sense of Mastery, ST = Sense of Transcendence, se = Standard Error, u = Uniqueness.

APPENDIX 3

Confirmatory Factor Analysis: First-Order Standardized Factor Loadings, Standard Errors, and Uniqueness (Study III, MBA Sample, UK, 16-item Frequency Measure, N=282).

Items	IM	TD	SM	ST	se	u
1. All my attention is invested in my work.	*.66*	.00	.00	.00	.12	.44
2. I concentrate intensely in my work.	*.62*	.00	.00	.00	.11	.38
3. I am completely absorbed in my work.	*.82*	.00	.00	.00	.13	.67
4. I am deeply immersed in my work.	*.77*	.00	.00	.00	.12	.59
5. I lose track of time.	.00	*.70*	.00	.00	.17	.49
6. I feel that time stops.	.00	*.52*	.00	.00	.10	.27
7. I lose all sense of time.	.00	*.86*	.00	.00	.12	.74
8. I am not aware of the passage of time.	.00	*.76*	.00	.00	.10	.58
9. I feel in command of my work.	.00	.00	*.73*	.00	.08	.53
10. I feel in complete control of my work.	.00	.00	*.80*	.00	.10	.64
11. I get a great sense of control over what I am doing.	.00	.00	*.76*	.00	.10	.58
12. I have a feeling of mastery.	.00	.00	*.51*	.00	.11	.26
13. I feel that I am contributing to something larger than my self.	.00	.00	.00	*.70*	.06	.49
14. I feel that my work is a vehicle for a greater cause.	.00	.00	.00	*.82*	.11	.67
15. I feel part of a larger purpose.	.00	.00	.00	*.87*	.10	.76
16. I feel that I am contributing to something larger than my organization.	.00	.00	.00	*.80*	.10	.64

All 16 standardized regression weights are statistically significant at $p < .001$.

Abbreviations: IM = Immersion, TD = Time Distortion, SM = Sense of Mastery, ST = Sense of Transcendence, se = Standard Error, u = Uniqueness.

APPENDIX 4

Confirmatory Factor Analysis: First-Order Standardized Factor Loadings, Standard Errors, and Uniqueness (Study III, MBA Sample, UK, 16-item State Measure, N=248).

Items	IM	TD	SM	ST	Se	U
1. All my attention was invested in the activity.	*.68*	.00	.00	.00	.06	.46
2. I was intensely concentrated in the activity.	*.83*	.00	.00	.00	.12	.69
3. I was completely absorbed in the activity.	*.86*	.00	.00	.00	.13	.74
4. I was deeply immersed in the activity.	*.87*	.00	.00	.00	.13	.76
5. I lost track of time.	.00	*.78*	.00	.00	.13	.61
6. I felt that time stopped.	.00	*.66*	.00	.00	.07	.44
7. I lost all sense of time.	.00	*.85*	.00	.00	.07	.72
8. I was not aware of the passage of time.	.00	*.89*	.00	.00	.07	.79
9. I felt in command of the activity.	.00	.00	*.79*	.00	.08	.62
10. I felt in complete control of the activity.	.00	.00	*.77*	.00	.09	.59
11. I got a great sense of control over what I was doing.	.00	.00	*.71*	.00	.09	.50
12. I had a feeling of mastery.	.00	.00	*.71*	.00	.10	.50
13. I felt that I was contributing to something larger than my self.	.00	.00	.00	*.71*	.08	.50
14. I felt that my work was a vehicle for a greater cause.	.00	.00	.00	*.80*	.10	.64
15. I felt part of a larger purpose.	.00	.00	.00	*.80*	.10	.64
16. I felt that I was contributing to something larger than my organization.	.00	.00	.00	*.80*	.11	.64

All 16 standardized regression weights are statistically significant at $p < .001$.

Abbreviations: IM = Immersion, TD = Time Distortion, SM = Sense of Mastery, ST = Sense of Transcendence, se = Standard Error, u = Uniqueness.

TABLE 1
Univariate Statistics and Pearson Correlations

Timelessness Scales	α	Mean	s.d.	1	2	3
Study I (N=108).						
28-item Frequency measure.						
1. Immersion	.80	26.51	4.00	--		
2. Time Distortion	.86	23.12	6.00	.52***	--	
3. Sense of Mastery	.86	24.42	4.21	.43***	.00	--
4. Sense of Transcendence	.88	21.73	5.53	.34***	.13	.51***
Study II (N=113).						
28-item Frequency measure.						
1. Immersion	.74	26.05	3.25	--		
2. Time Distortion	.82	19.91	4.79	.50***	--	
3. Sense of Mastery	.86	27.24	4.24	.41***	.15	--
4. Sense of Transcendence	.84	23.33	4.64	.54***	.43***	.48***
Study II (N=113).						
16-item Frequency measure.						
1. Immersion	.82	15.58	2.11	--		
2. Time Distortion	.83	11.29	3.27	.28***	--	
3. Sense of Mastery	.83	14.76	2.88	.34***	. 17^{+}	--
4. Sense of Transcendence	.89	14.33	3.04	.44***	.35***	.43***
Study III (N=282).						
16-item Frequency measure.						
1. Immersion	.81	15.23	2.39	--		
2. Time Distortion	.80	10.38	3.04	.26***	--	
3. Sense of Mastery	.78	15.15	2.48	.44***	.17**	--
4. Sense of Transcendence	.87	13.80	3.38	.38***	.11^{+}	.24***
Study III (N=248).						
16-item State measure.						
1. Immersion	.89	15.51	2.79	--		
2. Time Distortion	.87	10.66	3.73	.30***	--	
3. Sense of Mastery	.83	12.49	2.81	.51***	.20**	--
4. Sense of Transcendence	.86	13.80	3.03	.60***	.20**	.49***

Significance (two-tailed): $^{+}$p < .10, * p < .05, ** p < .01, *** p < .001.

TABLE 2
Confirmatory Factor Analysis: Model Fit Indexes.

Models	X^2	df	X^2 /df	CFI	NNFI	RMSEA	T
Study II.							
28-item Frequency measure.							
M1: 1 First-order factor	1149.03	350	3.28	.45	.41	.143	--
M2: 4 First-order factors	679.86	344	1.98	.77	.75	.093	--
M3: 1 Second-order factor	683.21	346	1.98	.77	.75	.093	.99
Study II.							
16-item Frequency measure.							
M1: 1 First-order factor	517.92	104	4.98	.52	.44	.189	--
M2: 4 First-order factors	166.93	98	1.70	.92	.90	.079	--
M3: 1 Second-order factor	168.96	100	1.69	.92	.90	.078	.99
Study III.							
16-item Frequency measure.							
M1: 1 First-order factor	1119.10	104	10.76	.45	.36	.186	--
M2: 4 First-order factors	193.93	98	1.98	.95	.94	.059	--
M3: 1 Second-order factor	195.15	100	1.95	.95	.94	.058	.99
Study III.							
16-item State measure.							
M1: 1 First-order factor	983.85	104	9.46	.59	.52	.185	--
M2: 4 First-order factors	155.71	98	1.59	.97	.97	.049	--
M3: 1 Second-order factor	158.52	100	1.58	.97	.97	.049	.98

TABLE 3
Confirmatory Factor Analysis: Convergent and Discriminant Validity.

	Composite Reliability	Variance Extracted	Variance Shared 1	2	3
Study II.					
16-item Frequency measure.					
1. Immersion	.82	.54	--		
2. Time Distortion	.84	.58	.11	--	
3. Sense of Mastery	.83	.56	.18	.03	--
4. Sense of Transcendence	.89	.67	.24	.12	.22
Study III.					
16-item Frequency measure.					
1. Immersion	.81	.52	--		
2. Time Distortion	.81	.52	.11	--	
3. Sense of Mastery	.79	.50	.25	.02	--
4. Sense of Transcendence	.88	.64	.18	.02	.08
Study III.					
16-item State measure.					
1. Immersion	.89	.66	--		
2. Time Distortion	.88	.64	.12	--	
3. Sense of Mastery	.83	.55	.35	.06	--
4. Sense of Transcendence	.86	.60	.46	.05	.31

TABLE 4

Univariate Statistics and Pearson Correlations (Study II, R&D Sample, US, Frequency Measure, N=100).

Variables	α	Mean	s.d.	1	2	3	4	5	6	7	8
1. Immersion scale	.82	15.55	2.06	--							
2. Time Distortion scale	.84	11.29	3.27	.33***	--						
3. Sense of Mastery scale	.82	14.78	2.82	.38***	.19^{+}	--					
4. Sense of Transcendence scale	.89	14.34	3.03	.46***	.35***	.38***	--				
5. Intrinsic Motivation	.61	13.25	1.51	.36***	.11	.15	.27**	--			
6. Autonomy	.80	14.67	2.83	.19^{+}	.00	.34***	.39***	.24*	--		
7. Distractions	.73	11.42	2.86	-.06	-.07	-.16	-.11	-.02	-.06	--	
8. Creativity (self-report)	.87	21.65	3.52	.32**	.26*	.41***	.30**	.14	.23*	-.07	--
9. Creativity (supervisor ratings)	.89	19.46	4.40	.26**	.20*	.17^{+}	.24*	.03	.16	-.13	.21*

Significance (two-tailed): $^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, ** $p < .001$.

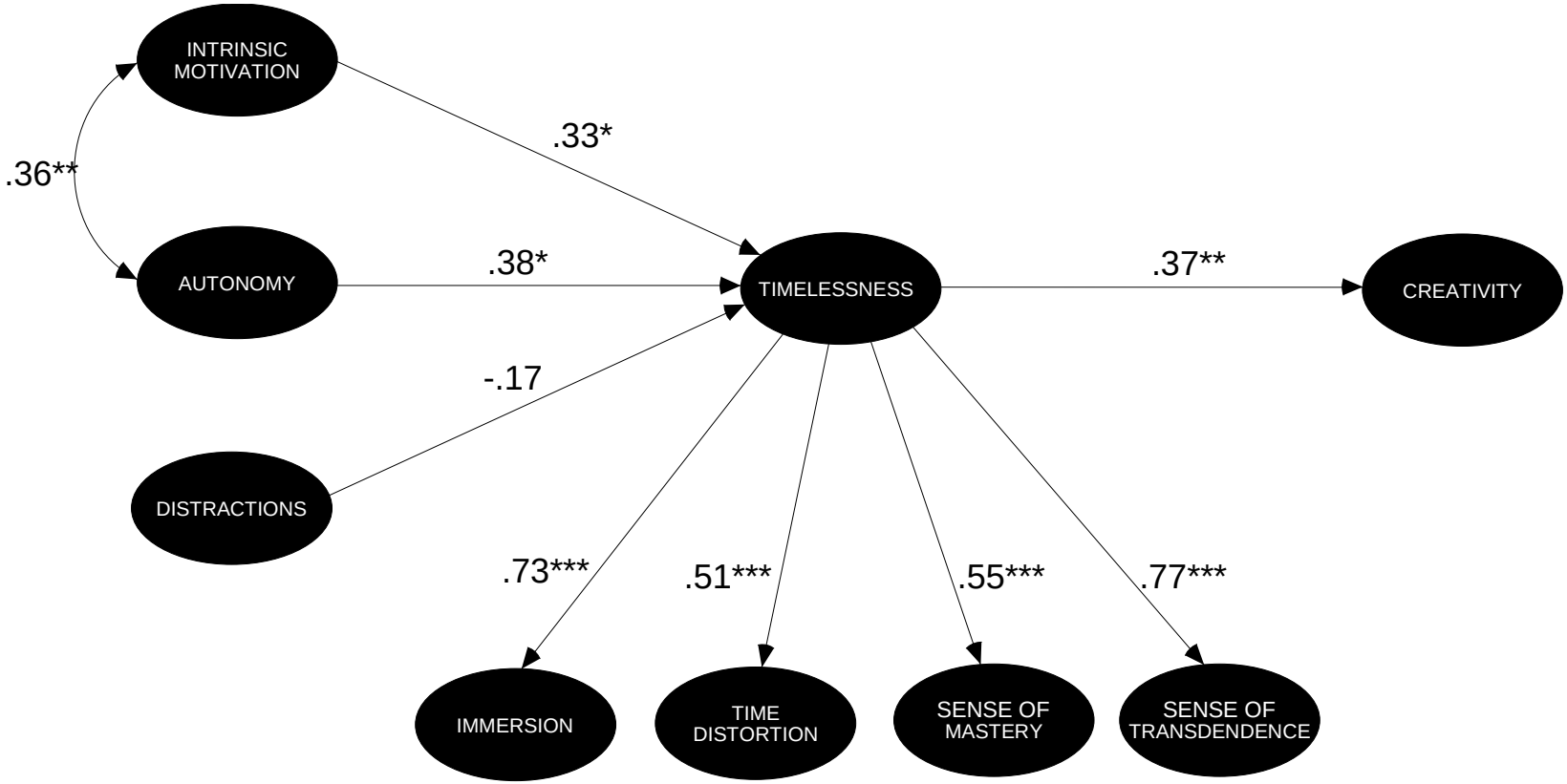

Figure 1. Partial Nomological Model of Timelessness. The structural coefficients shown are from Study II (R&D sample). Model fit indexes: CFI = .92, NNFI = .91, RMSEA = .055, $X^2/df = 1.30$. Significance: *p < .05, **p < .01, ***p < .001.