



# Changing interests: A longitudinal study of intrinsic motivation for personally salient activities

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## Abstract

The present longitudinal study extends the findings of earlier cross-sectional studies (Waterman, Schwartz, Green, Miller, & Philip, 2003) on the subjective experience of intrinsic motivation. University students generated lists of personally salient (identity-related) activities at the beginning of an academic semester and were asked to evaluate these activities at three points during the semester. Drawing on theories of intrinsic motivation, three subjective indices of intrinsic motivation (interest, flow experiences, and feelings of personal expressiveness) and three theoretically derived predictor variables (self-determination, the balance of challenges and skills, and self-realization values) were used in the present study. Cross-sectional relationships between the predictors and subjective experience indices at each timepoint replicated those observed in previous research. Hierarchical linear modeling was used to demonstrate that, as hypothesized, increases or decreases in the predictor variables between timepoints were associated with corresponding increases or decreases in the subjective experience indices. Implications for the study of intrinsic motivation are discussed.

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## 1. Introduction

Intrinsically motivated activities have been described as those in which a person engages without the need for external rewards (Amabile, Hill, Hennessey, & Tighe, 1994). They are

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said to be “self reinforcing” (Day, Berlyne, & Hunt, 1971) or “autotelic” (Csikszentmihalyi, 1990). However, such designations do not specify what it is about such activities that serves as the reinforcement.

It is well-established that engaging in intrinsically motivated activities is accompanied by a set of positive subjective experiences. These subjective experiences are variously referred to as interest (Deci & Ryan, 1985), flow (Csikszentmihalyi, 1988), and feelings of personal expressiveness (Waterman, 1990). These terms have different operational definitions in the research literature but have been shown to be strongly interrelated (Waterman et al., 2003). Although such positive subjective states can serve to reinforce the activities with which they are associated, the question remains as to why the same activity that is experienced positively by some individuals will be experienced neutrally by others, while still others may find it aversive. Waterman (1990) has labeled this “the problem of selectivity.” Just as different people may experience the same activity in different ways, so too a given person’s feelings about an activity may change over time, that is, a person may experience the same activity in different ways at different times. In some instances this will entail an increase in interest and enjoyment for an activity. In other instances, intrinsic motivation may decrease as evidenced by a loss of interest in continuing to engage in the activity. The question regarding why such changes in motivation occur when they do will be referred to here as “the problem of changing interests.”

Three theoretical approaches regarding intrinsic motivation guided the development of the present study. Each perspective both provides a description of the subjective experiences associated with intrinsic motivation and specifies predictor variables that are hypothesized to contribute to the positive subjective experiences engendered when engaged in an activity. These predictor variables offer the promise for better understanding why particular activities are experienced as intrinsically motivated and to explain why changes in intrinsic motivation occur over time. That is, they have the potential to resolve the problem of changing interests.

*Cognitive-evaluation/self-determination theory* (Deci & Ryan, 1985, 1987, 2002) emerged out of laboratory-based studies designed to identify variables predicting the time spent continuing to engage in activities (e.g., puzzle solving or game playing) after participation in those activities is no longer required by the experimental conditions. The *teleonomic theory of the self* (Csikszentmihalyi, 1975, 1988, 1990) developed out of efforts to understand the circumstances associated with activities in which a person felt fully engaged. Research in this tradition has most often employed the Experience Sampling Method (ESM; Csikszentmihalyi & Larson, 1987), in which individuals are paged at random intervals and asked to describe what they are doing and to record the subjective experiences present. Research using the ESM has emphasized ecological validity across the full spectrum of activities in which a research participant engages. The third theoretical approach, *eudaimonistic identity theory* (Waterman, 1990, 1992, 1993a), has its roots in Erikson’s (1968) theory of psychosocial identity development. Research studies developed from this perspective focus on activities selected by the research participants, with personal importance or salience constituting one of the criteria for selection. This stands in contrast to lab-based studies involving experimenter-selected activities that provide the opportunity for a high level of control but that are unlikely to be personally salient. Similarly, while ESM studies have the advantage of ecological validity, a substantial proportion of the activities rated are likely to involve daily routines or other activities that may be of low personal salience or for which intrinsic motivation may be absent (e.g., work). The explicit focus on personally salient

activities in research using a eudaimonistic identity perspective maximizes the likelihood that the relationships among the variables under investigation pertain to the actual experiences of intrinsic motivation in the lives of research participants.

Despite the quite different foci of the three theories, the linkages postulated between the predictor variables and experiential outcomes are largely compatible. According to cognitive-evaluation/self-determination theory, two important predictors of intrinsic motivation are the self-selection of activities and the competence that individuals feel while engaging in them. According to the proponents of the theory, when activities are perceived as chosen (i.e., self-determined) rather than required, and when people believe they will be successful in carrying out the activities, the likelihood is high that intrinsic motivation will be experienced in the form of “interest.”

Within the teleonomic theory of the self, self-selection of activities (i.e., self-determination) is recognized as important in the generation of intrinsic motivation (Graef, Csikszentmihalyi, & Giannino, 1983). However, the balance of the challenges posed by an activity with the skills brought to it is hypothesized to serve as the primary determinant of the subjective experiences of intrinsic motivation in the form of “flow.” Initially, this balance was seen as applying across the full range of levels of challenges and skills (Csikszentmihalyi, 1975). In a later formulation (Csikszentmihalyi, 1988), flow was viewed as initiated only when both the levels of challenges and skills are balanced and relatively high. Csikszentmihalyi (1988) observed that when the level of skills for an activity is high but the level of challenges is low, the resulting cognitive-affective condition is boredom, rather than flow, despite the success one experiences when engaging in the activity.

Waterman (1990) explicitly noted that eudaimonistic identity theory built on and incorporated elements from cognitive-evaluation/self-determination theory and from the teleonomic theory of the self. The theory was developed to better understand individual differences in the quality of identity commitments formed during the transition from adolescence to adulthood. It integrates concepts pertaining to intrinsic motivation with the identity development literature. Beyond self-determination and the balance of challenges and skills, the theory posits that self-realization values serve as an additional important predictor of intrinsic motivation.

The decision to include self-realization values as a hypothesized predictor of intrinsic motivation derives from the philosophical theory of eudaimonism, from which eudaimonistic identity theory is drawn. Eudaimonism is an ethical theory originating in the Hellenistic period, primarily in the work of Aristotle (1985). As an ethical theory, it calls upon individuals to recognize and to strive to realize their “daimon” or “true self,” that is, their best potentials. Happiness (eudaimonia) is seen as derived from self-realization in the pursuit of excellence through fulfillment of personal potentials, in contrast to the hedonic enjoyment resulting from consumption or indulgence in impulses (Norton, 1976; Ryan & Deci, 2001; Waterman, 1990).<sup>1</sup> Accordingly, eudaimonistic identity

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<sup>1</sup> Eudaimonia and hedonic enjoyment should not be viewed as independent subjective states, however. From a philosophical perspective, eudaimonia is considered a sufficient but not a necessary condition for hedonic enjoyment (Telfer, 1980). Activities that serve to advance personal potentials will promote eudaimonia and hedonic enjoyment simultaneously. However, there are many activities unrelated to self-realization that can promote hedonic enjoyment without contributing to eudaimonia. Studies by Waterman (1993b) and Waterman et al. (in press) have demonstrated strong positive correlations between measures of these two conceptions of happiness.

theory puts forth the proposition that the successful attainment of life goals and consequent psychological well-being are a function of making identity choices reflecting a person's best potentials—choices which are then incorporated into the person's purposes-in-living. In the process of identity development, activities giving rise to the subjective experiences of intrinsic motivation, particularly “feelings of personal expressiveness,” are viewed as a means for identifying a person's best potentials and as a basis for the selection of personal goals and purposes (Waterman, 1993b, 2004; Waterman et al., 2003). In empirical studies, a measure of personal expressiveness, as an index of eudaimonia, was found to be significantly more strongly associated with variables such as the balance of challenges and skills, self-realization values, and effort than was a measure of hedonic enjoyment (Waterman, 1993b; Waterman, Schwartz, & Conti, in press). Similarly, Sheldon et al. (2004) demonstrated that the pursuit of personally salient goals perceived as consistent with the “authentic” self was associated with higher levels of subjective well being.

Like cognitive-evaluation/self-determination theory and the teleonomic theory of the self, eudaimonistic identity theory provides a basis for resolving the problem of changing interests by developing a better understanding as to why and when activities will be experienced as intrinsically motivating and why increases and decreases in intrinsic motivation may occur over time. Table 1 contains a detailed description of both the subjective experience and predictor variables under investigation here. Within each set of variables, distinctions are drawn with respect both to their conceptual definitions and to the manner in which they are assessed. The table also contains a summary of findings pertaining to the interrelationships among variables within each grouping.

Of particular relevance to the current study, Waterman et al. (2003) demonstrated significant positive relationships of each of the three predictor variables (i.e., self-determination, the balance of challenges and skills, and self-realization values) with each of the three subjective indices of intrinsic motivation (i.e., interest, flow, and feelings of personal expressiveness). Self-determination was found to be the strongest predictor of each of the three subjective experience outcome variables, while self-realization values made substantially larger contributions to flow experiences and feelings of personal expressiveness than to interest. The balance of challenges and skills made the smallest unique contributions to the subjective experience variables. It was also found that, although the three measures of the subjective experience were strongly intercorrelated, interest appeared to be less intense and was applied to a broader array of activities than were flow experiences or feelings of personal expressiveness.

Although it is clear that there are strong correlational linkages between the predictor and subjective experience variables, earlier studies assessing this relationship have involved data collected at only one point in time. The understanding of the relationship of the predictor and subjective experience variables for intrinsic motivation can be further advanced by addressing the question of changing interests through examining the relationships among these variables longitudinally. Each of the three theories considered above incorporates the hypothesis that, for any given activity, *changes* in the levels of the predictor variables over time should be associated with corresponding *changes* in the subjective experiences occurring when engaged in the activity. Increases in the strength of the predictor variables should be accompanied by increases in the strength of intrinsic motivation as indicated by the subjective experience variables. A similar correspondence should hold for decreases in the predictor variables.

Table 1

Contrasts among the subjective experience and the predictor variables for intrinsic motivation

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Subjective experiences of intrinsic motivation

*Interest:* (Deci & Ryan, 1985) Pertains to the level of attraction a person feels in anticipation of, and while engaged in, a particular activity. It is an expression of “feeling like doing” an activity (Sansone & Harackiewicz, 1996). An item referring to the level of interest present may be endorsed whether the intensity of involvement reflects relatively mild and passing engagement or passionate involvement. Previous research has demonstrated that the patterns for variables predicting interest, differ from those predicting flow experiences and feelings of personal expressiveness (Waterman et al., 2003).

*Flow experiences:* (Csikszentmihalyi, 1975, 1988) Pertains to the subjective experiences immediately present when a person is fully engaged in an activity. The subjective experiences assessed include (a) having clear goals, (b) not feeling self-conscious, (c) feeling in control, (d) losing track of time, (e) knowing how well one is doing, (f) maintaining a high level of concentration, (g) forgetting personal problems, and (h) feeling fully involved with the activity. Csikszentmihalyi (1975) has demonstrated that the same subjective experience elements are present whether the person is fully engaged in sports competition (e.g., basketball), artistic expression (e.g., ballet), or intellectual competition (e.g., chess).

*Feelings of personal expressiveness:* (Waterman, 1990, 1993b) Pertains to the subjective experiences associated with intrinsically motivated, personally salient, and identity-related activities. In contrast to flow experiences in which the focus is on the experiences immediately present when engaged in an activity, feelings of personal expressiveness involve reflections on the role of the activity in a person’s life, including contrasting an activity with other types of activities in which the person engages. Feelings of personal expressiveness include endorsing items indicating that a given activity is associated with (a) having the greatest feeling of really being alive, (b) feeling more intensely involved than when engaged in most other activities, (c) having the strongest feeling that this is who one really is, (d) feeling that this is what one was meant to do, (e) feeling more complete or fulfilled than when engaged in other activities, and (f) feeling a special fit or meshing when engaged in the activity.

*Relationships among variables:* Correlations among the three subjective experience indicators of intrinsic motivation are consistently in the moderate to strong range: .41 to .74 (Waterman et al., 2003). As predicted, there is a notable asymmetry between interest and the other types of subjective experiences. Whereas between 78% and 88% of activities high on a measure of flow experiences were rated comparably high on interest, only between 26% and 53% of activities rated high on interest were also rated high on flow. An even stronger asymmetry exists for feelings of personal expressiveness, with between 92% and 95% of activities rated high on personal expressiveness rated as high on interest, while only 26–37% of activities rated high on interest were rated comparably high on personal expressiveness (Waterman et al., 2003). These asymmetries indicate that the term interest is experienced with respect to a far broader range of activities than are either flow experiences or feelings of personal expressiveness.

Predictor variables for intrinsic motivation

*Self-determination:* (Deci & Ryan, 1985, 2002) Pertains to the belief that one has personally chosen to engage in an activity rather than being required to perform it in order to satisfy the expectations or demands of others. There is an implication that the person would rather be doing this activity rather than other activities the person could be doing at the time.

*The balance of challenges and skills:* (Csikszentmihalyi, 1975, 1988) Pertains to the competence an individual feels when engaged in an activity. Csikszentmihalyi (1975, 1988) reported that flow experiences regularly occurred when the level of challenges encountered in an activity was high and the level of skills the person brought to it was correspondingly high. Instances when the level of skills is high but the level of challenges is low; are characterized by boredom rather than flow because a task is too easy. Anxiety is the concomitant of activities where the level of challenges is high while the level of skills is low; and apathy is experienced when both the levels of challenges and skills are low. Whereas Csikszentmihalyi (1988) has generally used a fourfold classification system for the study of the balance of challenges and skills, in the present study separate items for the levels of challenges and skills were combined into a single index. The creation of a continuous variable for the balance of challenges and skills allows for entering all predictors into the same statistical analyses. The continuous measure for the balance of challenges and skills used here has yielded findings consistent with theory in a variety of studies (Waterman et al., 2003, in press).

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Table 1 (continued)

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*Self-realization values:* (Waterman, 1990, 1993a, 1993b) Pertains to the role that particular activities play in an individual's life. Activities reflecting self-realization values are perceived to involve the development of a person's best potentials and to further the person's goals and purposes in living. The pursuit of personal goals and purposes under circumstances when the level of potentials is low is likely to produce frustration. To act on the basis of strong potentials which, for whatever reasons, have not been incorporated into personal goals and purposes is likely to leave the person disengaged from the activities performed. High scores on the measure of self-realization values reflect the simultaneous association of both values with an activity.

*Relationships among variables:* Whereas there is a moderate correlation between the balance of challenges and skills and self-realization values (between .49 and .58), the association of self-determination to the other predictors is weak to nonsignificant (ranging between .26 and  $-.05$ ) (Waterman et al., 2003).

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A finding reflecting correlated changes over time would represent a significant advance over cross-sectional correlations at a single point in time. In correlations estimated at a single point in time, any number of unassessed variables may be at least partially responsible for the correlation. In cases of correlated changes, however, the likelihood that unassessed variables are responsible for the correlation is greatly decreased because any unmeasured variables would have to be changing in concert with the predictor and subjective experience variables over the same time period between measurement occasions. With correlated changes assessed over multiple time periods, the possibility that unassessed variables are responsible for the correlation is further reduced. Thus, longitudinal research assessing correlated changes in predictor and subjective experience measures of intrinsic motivation can provide greater confidence in the direct association between the two sets of variables.

### 1.1. *The present study*

The design of the present study involved the use of the standard version of the Personally Expressive Activities Questionnaire (PEAQ-S; Waterman, 1998) at three points in time over the course of a college semester. The three assessments were conducted at approximately six-week intervals. On the PEAQ-S, research participants are first asked to identify five activities that are considered personally salient. Each activity is then rated on a variety of measures including the three predictor variables: (a) self-determination, (b) balance of challenges and skills, and (c) self-realization values; and three measures of the subjective experiences of motivation: (a) interest, (b) flow experiences, and (c) feelings of personal expressiveness. The use of a longitudinal research design allowed the following research questions to be addressed:

- (1) Are there systematic, directional changes in the predictor and subjective experience variables over time? No hypothesis was advanced with respect to this research question. Although it was expected that for that for any individual, some activities might become more intrinsically motivating over time, while other activities become less so, the theories used here do not provide a basis for anticipating that more changes would occur in one direction than in the other direction over the course of a college semester. Intrinsic motivation is not a developmental variable in the sense that there is an expected directional sequence involving an ordered set of changes over time.

Rather, according to each of the theories under study, situational factors presumably play a role in creating changes in the predictor variables for intrinsic motivation, either increases or decreases, which in turn should lead to corresponding changes in the subjective experiences associated with the activities.

- (2) Are the predictor variables significantly associated with each of the subjective experience variables cross-sectionally? This study provides the opportunity to replicate the findings reported by Waterman et al. (2003). The cross-sectional relationships among predictors and subjective experience variables can be tested at each of the three assessment points. It is hypothesized that, at each timepoint, self-determination, the balance of challenges and skills, and self-realization values will each be positively correlated with the measures of interest, flow experiences, and feelings of personal expressiveness.
- (3) The central hypothesis under investigation here involved determining the presence of correlated changes between the predictor and subjective experience variables. It was predicted that increases in the predictor variables (i.e., self-determination, the balance of challenges and skills, and self-realization values) over time would be accompanied by corresponding increases in the subjective experience variables (i.e., interest, flow experiences, and feelings of personal expressiveness). Similarly, decreases in the predictor variables between successive timepoints should be accompanied by corresponding decreases in the subjective experience variables over the same time interval. Because there are three points of assessment, it is possible to test these associations from Time 1 to Time 2 and from Time 2 to Time 3. Support for this hypothesis would provide added empirical validation for the understanding of the contributions made by the predictor variables to experiences of intrinsic motivation. Such contributions are an important aspect of all three of the theories under study.

## 2. Method

### 2.1. Participants

The present sample consisted of undergraduate students enrolled in an Introductory Psychology course at Florida International University during the fall semester. Students were awarded points toward their course grade for participation. At the beginning of the semester, 109 students (40 males, 69 females) participated during the first wave of data collection. Seventy-three percent ( $n = 79$ ) of the students were first semester freshmen, with the remainder being sophomores ( $n = 19$ ), juniors ( $n = 10$ ), or seniors ( $n = 1$ ). In terms of ethnicity, the majority (57%;  $n = 62$ ) of the participants were Hispanic, with the remainder being non-Hispanic White (25%;  $n = 27$ ), African American (9%;  $n = 10$ ), or Other (9%;  $n = 10$ ). The mean age of the sample was 18.9 years, with 98 percent of the sample between 17 and 22.

Of the initial 109 participants, 87 (80% of the sample) provided data at all three timepoints. Eleven students (10%) provided data at two of the three time timepoints. Eleven of the initial participants (10%) dropped the course and therefore provided data only at the first timepoint. Because of the longitudinal nature of the present analyses, participants providing data only at the first timepoint were dropped from analysis. All of these individ-

uals were freshmen and dropped the course before the second timepoint. Linear contrasts indicated that, compared to participants who provided data at two or three timepoints, those who dropped the course rated their listed activities as significantly lower on self-realization values,  $t = 3.44$ ,  $p < .05$ ,  $d = 0.67$ ; interest,  $t = 2.14$ ,  $p < .05$ ,  $d = 0.41$ ; flow experiences,  $t = 4.19$ ,  $p < .05$ ,  $d = 0.81$ ; and feelings of personal expressiveness,  $t = 2.43$ ,  $p < .05$ ,  $d = 0.47$ . At the initial timepoint, none of the predictor or subjective experience variables differed significantly between participants providing data at two versus three timepoints.

## 2.2. Instrument

The Standard form of the Personally Expressive Activities Questionnaire (PEAQ-S; Waterman, 1998) was used throughout the study. On the PEAQ-S, a free-choice format is used wherein respondents identify five activities to be evaluated. The instructions on the PEAQ-S read as follows: “If you wanted another person to know about who you are and what you are like as a person, what five (5) activities of importance to you would you describe?”

## 2.3. Measures of the subjective experience of intrinsic motivation

### 2.3.1. Interest

Interest was assessed with one item pertaining to the usual level of interest experienced when engaged in the activity. The 7-point response scale ranged from “very low” to “very high.” In previous research (Waterman et al., 2003), as much as 64% of variability in this measure of interest was explained by the predictor variables.

### 2.3.2. Flow experiences

Flow experiences were measured using an eight-item scale, with items corresponding to elements identified by Csikszentmihalyi (1990). The items were phrased as completions of a common stem: “When I engage in this activity \_\_\_\_\_.” The item completions for this scale were the following: (a) I feel I have clear goals, (b) I feel self-conscious (reverse-scored), (c) I feel in control, (d) I lose track of time, (e) I feel I know how well I am doing, (f) I have a high level of concentration, (g) I forget personal problems, and (h) I feel fully involved. These items were embedded among a series of other sentence completions not specific to flow experiences. Each item was responded to on a 7-point scale ranging from “not at all characteristic of me” to “very characteristic of me.” Cronbach’s  $\alpha$  for scores on the flow experiences scale in the present study was .70.

### 2.3.3. Personal expressiveness

Feelings of personal expressiveness were assessed with six items for which respondents were asked the extent to which they agreed or disagreed with a series of statements. The items tapping feelings of personal expressiveness were the following: (a) “This activity gives me my greatest feeling of really being alive”; (b) “When I engage in this activity I feel more intensely involved than I do when engaged in most other activities”; (c) “This activity gives me my strongest feeling that this is who I really am”; (d) “When engaged in this activity I feel this is what I was meant to do”; (e) “I feel more complete or fulfilled when engaging in this activity than I do when engaged in most other activities”; and (f)

“I feel a special fit or meshing when engaged in this activity.” The 7-point scale for these items ranged from “strongly disagree” to “strongly agree.” Cronbach’s  $\alpha$  for personal expressiveness scores in the present study was .91.

#### 2.4. *Predictor measures of intrinsic motivation*

##### 2.4.1. *Self-determination*

Self-determination was assessed by two items adapted from Graef et al. (1983). The first item read “To what extent do you usually feel that engaging in this activity is something you are required to do or is your choice to do?” The endpoints of the 7-point scale were “required to do” and “my choice to do.” The second read “When engaging in this activity, to what extent do you wish you were doing something else?,” with the endpoints of the scale labeled “not at all” and “very much” (reverse scored). These two items were correlated at  $r = .39$  ( $p < .05$ ). Despite this lower than expected inter-item correlation, it is worthy of note that the self-determination scale has behaved as expected in a previous series of studies (Waterman et al., 2003, in press).

##### 2.4.2. *Balance of challenges and skills*

Perceived competence, in the form of the balance of challenges and skills, was measured by the sum of two items. The first referred to the usual level of challenges encountered when engaged in the activity, the second to the level of skills the respondent usually brings to the activity. For both items, the endpoints of the 7-point scale were “very low” and “very high.” Scores for the balance of challenges and skills can range from 2 to 14. High scores on this measure can only be obtained when the level of challenges and skills are both balanced and high, corresponding to the condition Csikszentmihalyi (1988) termed “flow.” Low scores are obtained when the levels of both elements are low, corresponding to the condition associated with apathy. Intermediate scores are obtained when both variables are intermediate or when one is high and the other low, corresponding to either the conditions for boredom or for anxiety.

The inter-item correlation between the indices of challenges and skills was .34 ( $p < .05$ ). Given that Csikszentmihalyi (1990) conceptualized challenge and skill by independent dimensions of perceived competence, a strong correlation between these dimensions should not be expected. The positive correlation observed here is likely a result of having respondents generate a panel of activities to be evaluated that is high on personal salience. For such activities, the two aspects of perceived competence are related. Whereas Csikszentmihalyi (1990) typically has studied the various combinations of challenges and skills as a typology, thereby restricting the type of statistical analyses that can be employed, the creation of a continuous variable with high challenge-high skill activities placed in opposition to low challenge-low skill activities allows for the use of a wider array of statistical analyses. The index for the balance of challenges and skills employed here has been demonstrated to have substantial construct validity (Waterman et al., 2003).

##### 2.4.3. *Self-realization values*

Self-realization values were assessed by two items, embedded within a series of items with the stem: “To what extent does this activity provide you with each of the following types of opportunities?” The relevant completions were “the opportunity for me to develop my best potentials” and “the opportunity for me to make progress toward my goals.”

Each item was associated with a 7-point scale with the endpoints identified as “not at all” and “very extensively.” These two items were correlated at  $r = .67$  ( $p < .05$ ).

### 2.5. Procedure

During the first week of the fall semester (about September 1), participants were asked to complete the PEAQ-S for the first time. Responses for each of the five activities were filled in on separate answer sheets, one answer sheet per activity. At the two subsequent assessment points (approximately October 15 and December 1), each participant received a copy of the PEAQ-S with his/her originally listed activities filled in on the face page. A blank set of answer sheets, one per activity, was provided along with the PEAQ-S at each assessment point. During the second and third assessments, participants were asked to rate the same activities that they had written on the face page during the first assessment.

## 3. Results

### 3.1. Changes in the predictor and subjective experience variables over time

Means and standard deviations for the predictor and subjective experience indices for the three assessment points are presented in Table 2. Separate repeated-measures MANOVAs were conducted for the predictor variables and the subjective experience variables. Although no hypothesis was advanced with respect to systematic, directional changes over time for the predictor and subjective experience variables, significant effects were found in both analyses. The multivariate test for the predictor variables was significant, Wilks'  $\lambda = .89$ ,  $F(6, 398) = 7.88$ ,  $p < .05$ ,  $\eta^2 = .11$ . Follow-up univariate analyses indicated a significant effect for self-determination,  $F(2, 806) = 21.69$ ,  $p < .05$ ,  $\eta^2 = .05$ , with scores decreasing over time. Nonsignificant effects were found for the balance of challenges and skills and for self-realization values. With respect to the subjective experience variables, the multivariate test yielded a significant overall effect, Wilks'  $\lambda = .85$ ,  $F(6, 306) = 8.95$ ,  $p < .05$ ,  $\eta^2 = .15$ . The follow-up univariate analyses indicated significant decreases over time for interest,  $F(2, 622) = 10.64$ ,  $p < .05$ ,  $\eta^2 = .03$ , and for flow experiences,  $F(2, 622) = 3.30$ ,  $p < .05$ ,  $\eta^2 = .01$ . Although statistically significant, the effect sizes

Table 2

Means and standard deviations for intrinsic motivation predictors and subjective experience variables by time of assessment

| Variable                             | Time 1       | Time 2       | Time 3       | F ratio | $\eta^2$ |
|--------------------------------------|--------------|--------------|--------------|---------|----------|
| <i>Predictor variables</i>           |              |              |              |         |          |
| Self-determination                   | 11.34 (2.87) | 10.47 (3.06) | 10.36 (2.98) | 21.69*  | .05      |
| Balance of challenges and skills     | 9.69 (2.92)  | 9.77 (2.56)  | 9.74 (2.65)  | 0.14    | .00      |
| Self-realization values              | 9.40 (3.49)  | 9.67 (3.02)  | 9.60 (2.96)  | 1.41    | .00      |
| <i>Subjective experience indices</i> |              |              |              |         |          |
| Interest                             | 5.94 (1.31)  | 5.68 (1.34)  | 5.53 (1.38)  | 10.64*  | .03      |
| Flow experiences                     | 41.16 (7.86) | 40.79 (7.48) | 40.51 (8.04) | 3.30*   | .01      |
| Personal expressiveness              | 28.49 (8.51) | 29.21 (7.87) | 29.73 (7.59) | 0.91    | .00      |

\*  $p < .05$ .

obtained were quite modest. The univariate analysis for feelings of personal expressiveness was not statistically significant.

### 3.2. Evaluating the need for multilevel regression analyses to test the study hypotheses

Because activities are nested within persons, a first step of analysis was to conduct intraclass correlation analyses to examine whether the person-level variance was significantly different from zero (Raudenbush & Bryk, 2002). More specifically, if there is significant variability at the level of the person as well as at the level of the activity, then multilevel modeling would be necessary. If the variability at the level of the person were to not be significantly different from zero, then the tests of hypotheses could proceed as standard regression or path analyses.

Intraclass correlations conducted for this purpose are estimated as hierarchical linear models with no level-1 or level-2 predictors. The intraclass correlation is computed as the ratio of the level-2 variance to the total variance across both levels (i.e., activity and person). The significance of this intraclass correlation coefficient is obtained by dividing the coefficient by its standard error, squaring the resulting quotient, and evaluating it against the chi-square distribution with degrees of freedom equal to the number of level-2 units.

The level-1 equation for each subjective experience index (interest, flow experiences, and personal expressiveness) therefore takes the form of  $Y_{ij} = \beta_{0j} + r_{ij}$ , where  $\beta_{0j}$  represents the intercept for a given individual and  $r_{ij}$  represents the activity-specific error term (i.e., a random deviation from the intercept). The level-2 equation for each subjective experience index takes the form of  $\beta_{0j} = \gamma_{00} + u_{0j}$ , where  $\gamma_{00}$  represents the grand mean of all activity ratings and  $u_{0j}$  represents a random person-specific error term. The variance of  $r_{ij}$  is written as  $\sigma^2$ , and the variance of  $u_{0j}$  is written as  $\tau_{00}$ . The intraclass correlation is therefore computed as

$$\rho = \frac{\tau_{00}}{\tau_{00} + \sigma^2}.$$

All three intraclass correlations were statistically significant: interest,  $\rho = .14$ ;  $\chi^2(101) = 183.98, p < .05$ ; flow experiences,  $\rho = .29$ ;  $\chi^2(101) = 307.62, p < .05$ ; and personal expressiveness,  $\rho = .13$ ;  $\chi^2(101) = 178.67, p < .05$ . Although the vast majority (between 71% and 86%) of variability was at the level of the activity, there was enough variability at the level of the person to require multilevel modeling. As a result, all subsequent analyses were conducted as hierarchical linear models. We nested activities within persons by serial position (e.g., first, second, and third) depending on where each activity was listed in the participant's list of personally salient activities.

### 3.3. Bivariate associations between the predictor with the subjective experience variables

Table 3 contains the zero-order correlations among all study variables for each of the three points of assessment. These correlations were computed using hierarchical linear modeling (HLM). The predictor and subjective experience indices were converted to standard scores so that the HLM coefficients could be interpreted as correlation coefficients. The zero-order correlations were estimated using the level-1 equation  $Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - X_{..}) + r_{ij}$ , where  $X$  and  $Y$  represent the variables being correlated and  $\beta_{1j}$  represents

Table 3  
Zero-order correlations among study variables<sup>a,b</sup>

| Variable                         | Balance challenges–skills | Self-realization values | Interest | Flow experiences | Personal expressiveness |
|----------------------------------|---------------------------|-------------------------|----------|------------------|-------------------------|
| <i>Self-determination</i>        |                           |                         |          |                  |                         |
| Time 1                           | –.07                      | –.15*                   | .50*     | .31*             | .42*                    |
| Time 2                           | –.06                      | –.03                    | .54*     | .32*             | .42*                    |
| Time 3                           | –.02                      | .06                     | .52*     | .28*             | .47*                    |
| <i>Balance challenges–skills</i> |                           |                         |          |                  |                         |
| Time 1                           |                           | .51*                    | .16*     | .38*             | .30*                    |
| Time 2                           |                           | .44*                    | .27*     | .34*             | .30*                    |
| Time 3                           |                           | .51*                    | .19*     | .30*             | .40*                    |
| <i>Self-realization values</i>   |                           |                         |          |                  |                         |
| Time 1                           |                           |                         | .10*     | .40*             | .47*                    |
| Time 2                           |                           |                         | .22*     | .41*             | .57*                    |
| Time 3                           |                           |                         | .32*     | .36*             | .59*                    |
| <i>Interest</i>                  |                           |                         |          |                  |                         |
| Time 1                           |                           |                         |          | .49*             | .49*                    |
| Time 2                           |                           |                         |          | .47*             | .53*                    |
| Time 3                           |                           |                         |          | .57*             | .56*                    |
| <i>Flow experiences</i>          |                           |                         |          |                  |                         |
| Time 1                           |                           |                         |          |                  | .56*                    |
| Time 2                           |                           |                         |          |                  | .49*                    |
| Time 3                           |                           |                         |          |                  | .48*                    |

<sup>a</sup> All correlations presented are within the timepoint specified.

<sup>b</sup> Correlation coefficients are HLM slopes where the predictor and criterion variables have both been converted to standard scores.

\*  $p < .05$ .

the correlation coefficient. No level-2 predictors were introduced, so the level-1 intercept ( $\beta_{0j}$ ) is defined by the level-2 formula  $\gamma_{00} + u_{0j}$ , and the level-1 slope (correlation coefficient,  $\beta_{1j}$ ) is defined by the level-2 formula  $\gamma_{10} + u_{1j}$ .

Consistent with the hypothesis and findings from Waterman et al. (2003), significant positive correlations were found for all of the predictors with all of the subjective experience variables at each of the three points in time. These correlations ranged in magnitude from .16 to .59. Moreover, also as reported in Waterman et al. (2003), the three subjective experience indices were highly interrelated, with correlations ranging from .47 to .57. Among the predictor variables, only self-realization values and the balance of challenges and skills were significantly interrelated at all three timepoints. Self-determination was not consistently related to either of the other predictor variables.

### 3.4. The relationships between changes in the predictor variables and changes in the subjective experience variables

HLM was used to test the extent to which changes in the predictor variables would be associated with corresponding changes in the subjective experience variables. First, change scores were computed for each predictor and subjective experience variable between each pair of successive timepoints (i.e., Times 1–2 and Times 2–3). These change scores were

computed by subtracting the score at the prior timepoint from the score at the later timepoint. These scores were then standardized within each time lag so that the HLM coefficients could be interpreted as standardized  $\beta$  coefficients.

Because there were only two time lags available for analysis (i.e., Times 1–2 and Times 2–3), we conducted separate analyses for each time lag and compared the results across time lags. Although it may be possible to create a three-level HLM model where time lags are nested within activities and activities are nested within persons, the inclusion of only two level-1 units within each level-2 unit may undermine the stability of the model and the coefficients that it produces (Raudenbush & Bryk, 2002). A pair of two-level HLM models, with activities nested within persons and one model estimated for each time lag, was adopted as the analytic strategy. No level-2 predictors were introduced. Each of these models took the following form:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(\text{SD}_{ij} - \text{SD}_{\bullet\bullet}) + \beta_{2j}(\text{BCS}_{ij} - \text{BCS}_{\bullet\bullet}) + \beta_{3j}(\text{SR}_{ij} - \text{SR}_{\bullet\bullet}) + r_{ij},$$

(Level 1)

$$\beta_{0j} = \gamma_{00} + u_{0j},$$

$$\beta_{1j} = \gamma_{10} + u_{1j},$$

$$\beta_{2j} = \gamma_{20} + u_{2j},$$

$$\beta_{3j} = \gamma_{30} + u_{3j}.$$

(Level 2)

In these equations,  $Y_{ij}$  represents the score for a given subjective experience variable for activity  $i$  rated by person  $j$ . All of the predictors (self-determination, balance of challenges and skills, and self-realization values) are centered around their respective grand means. At level 2, each level-1 parameter is modeled as its grand mean plus a person-specific random variance component. In each of these models, degrees of freedom reflect the number of participants providing valid data at both timepoints that comprise the time lag. Table 4 presents bivariate correlations between change scores between the predictor and subjective

Table 4  
Zero-order correlations for change scores between predictor and subjective experience variables<sup>a,b</sup>

| Variable                         | Interest | Flow experiences | Personal expressiveness |
|----------------------------------|----------|------------------|-------------------------|
| <i>Self-determination</i>        |          |                  |                         |
| Times 1–2                        | .28*     | .28*             | .34*                    |
| Times 2–3                        | .34*     | .21*             | .26*                    |
| <i>Balance challenges–skills</i> |          |                  |                         |
| Times 1–2                        | .21*     | .13*             | .22*                    |
| Times 2–3                        | .15*     | .23*             | .24*                    |
| <i>Self-realization values</i>   |          |                  |                         |
| Times 1–2                        | .09      | .32*             | .45*                    |
| Times 2–3                        | .21*     | .26*             | .38*                    |

<sup>a</sup> All correlations presented are within the time lag specified.

<sup>b</sup> Correlation coefficients are HLM slopes where the predictor and criterion variables have both been converted to standard scores.

\*  $p < .05$ .

experience variables. These bivariate correlations were computed in a similar fashion to the within-timepoint correlations presented in Table 2. Results of HLM regression analyses are presented immediately below.

### 3.4.1. Interest

For the lag between Time 1 and Time 2, changes in self-determination ( $\beta = .31$ ,  $t[83] = 5.74$ ,  $p < .05$ ) and in the balance of challenges and skills ( $\beta = .22$ ,  $t[83] = 3.91$ ,  $p < .05$ ) emerged as significant predictors of changes in interest. Changes in self-realization values ( $\beta = .06$ ,  $t[83] = 1.39$ ,  $p = .17$ ) were not a significant predictor. For the lag between Time 2 and Time 3, changes in self-determination ( $\beta = .34$ ,  $t[84] = 7.38$ ,  $p < .05$ ) and in self-realization values ( $\beta = .15$ ,  $t[84] = 2.91$ ,  $p < .05$ ) emerged as significant predictors. Changes in the balance of challenges and skills ( $\beta = .13$ ,  $t[84] = 1.89$ ,  $p = .061$ ) approached significance as a predictor.

### 3.4.2. Flow experiences

For the lag between Time 1 and Time 2, changes in self-determination ( $\beta = .29$ ,  $t[83] = 4.77$ ,  $p < .05$ ) and in self-realization values ( $\beta = .31$ ,  $t[83] = 6.55$ ,  $p < .05$ ) emerged as significant predictors of changes in flow experiences. Changes in the balance of challenges and skills ( $\beta = .04$ ,  $t[83] = 0.93$ ,  $p = .35$ ) were not a significant predictor. For the lag between Time 2 and Time 3, changes in self-determination ( $\beta = .24$ ,  $t[84] = 4.95$ ,  $p < .05$ ), in the balance of challenges and skills ( $\beta = .21$ ,  $t[84] = 4.21$ ,  $p < .05$ ), and in self-realization values ( $\beta = .20$ ,  $t[84] = 3.41$ ,  $p < .05$ ) emerged as significant predictors.

### 3.4.3. Personal expressiveness

For the lag between Time 1 and Time 2, changes in self-determination ( $\beta = .35$ ,  $t[83] = 5.97$ ,  $p < .05$ ), in the balance of challenges and skills ( $\beta = .16$ ,  $t[83] = 3.64$ ,  $p < .05$ ), and in self-realization values ( $\beta = .37$ ,  $t[83] = 6.93$ ,  $p < .05$ ) emerged as significant predictors of changes in personal expressiveness. For the lag between Time 2 and Time 3, changes in self-determination ( $\beta = .25$ ,  $t[84] = 5.26$ ,  $p < .05$ ), in the balance of challenges and skills ( $\beta = .16$ ,  $t[84] = 3.69$ ,  $p < .05$ ), and in self-realization values ( $\beta = .33$ ,  $t[84] = 6.21$ ,  $p < .05$ ) again emerged as significant predictors.

## 4. Discussion

Building on previous cross-sectional studies on the relationship of hypothesized predictors of intrinsic motivation with subjective-experience indices of such motivation, the present study was designed to investigate changing interests, that is, to identify variables associated with increases or decreases in the subjective experience of intrinsic motivation over time. Over the course of an academic semester, research participants evaluated personally salient activities at six-week intervals with respect to theoretically derived predictor and subjective experience variables.

The first research question addressed concerned possible systematic, directional changes in the predictor and subjective experience variables for intrinsic motivation over the course of the study. No hypotheses were advanced with respect to this question, given that it is plausible that over time activities could become either more or less associated with intrinsic motivation. For any given person, movement in both directions for different activities could occur within the span between assessments. Significant progressive decreases over

the course of the semester were found for self-determination, interest, and flow experiences. It is plausible that, as the semester drew toward a close, these student respondents may have felt that they had decreasing discretion over their use of time and the activities in which they engaged. As they experienced less self-determination with respect to their choice of activities, they may also have reported less intrinsic motivation as indicated by lower interest and flow experience scores. It is also plausible that regression toward the mean may have played a role in the lowered scores observed at Time 2 and Time 3, given that activities of high personal salience at Time 1 were rated at all three timepoints.

The second research question pertained to the extent of cross-sectional association between the predictor variables of self-determination, the balance of challenges and skills, and self-realization values and the subjective experience variables of interest, flow experiences, and feelings of personal expressiveness. The zero-order correlations obtained here fully replicated those obtained in previous research on this question (Waterman et al., 2003), and did so at each of the three points of data collection. This consistency across studies is especially noteworthy given that, in past studies, we have not controlled for the nesting of activities within participants. Although there is evidence that failure to control for multilevel nesting can lead to erroneous results (Bliese & Hanges, 2004), the consistency of results across single-level and multilevel analyses speaks to the robustness of the findings.

The third and principal research question addressed in this study concerns the extent of association between changes over time in the strength of the predictor variables with corresponding changes in the subjective experience variables. If the predictor variables play a role in determining the strength of the subjective experiences of intrinsic motivation, then it should be possible to demonstrate that the two sets of variables change in tandem. In the HLM model that we estimated, between each pair of subsequent timepoints, changes in self-determination were consistently associated with changes in all three subjective experience indices. Changes in self-realization values were most strongly and reliably associated with changes in flow experiences and in personal expressiveness. Changes in the balance of challenges and skills made the smallest contributions to changes in the subjective experience variables, and in two cases (interest between Times 2–3 and flow experiences between Times 1–2) its contribution did not reach significance. As we have found in previous cross-sectional work (Waterman et al., 2003), self-determination significantly predicts all three subjective experience indices, self-realization values make the strongest contribution to more intense forms of intrinsic motivation, and the balance of challenges and skills makes a modest or nonsignificant contribution.

The demonstration of correlated changes between the predictor variables for intrinsic motivation and the subjective experience variables contributes to the potential resolution of the problem of changing interests. Proceeding on the assumption that the subjective experiences of interest, flow experiences, and feelings of personal expressiveness serve as the reinforcement for engaging in intrinsically motivating activities, the observation of changing interests over time serves to underscore the fact that such motivation is not a function of any particular activity, per se. The same activity that gives rise to interest, flow experiences, and feelings of personal expressiveness at one point in time may no longer do so at a later time, whereas an activity that was not intrinsically motivating initially may become so at a subsequent time. If the nature of the activity itself does not account for the motivation, then an explanation needs to be sought through some combination of activity and person variables. The three theories that framed this investigation identify

three predictor variables that represent such a combination: (a) one perceives oneself as having chosen to engage in the activity (i.e., self-determination), (b) one feels competent to handle the challenges posed by the activity (i.e., the balance of challenges and skills), and (c) one believes that engaging in the activity will promote the development of one's best potentials and will further one's goals and purposes in life (i.e., self-realization values). The reduction in strength of one or more of these variables should be accompanied by a corresponding reduction in the experience of intrinsic motivation. Correspondingly, an increase in strength of one or more of these variables should be accompanied by an increase in the experience of intrinsic motivation. These patterns of corresponding changes were demonstrated in the HLM analysis conducted here for both the intervals between Time 1 and Time 2 and between Time 2 and Time 3. In doing so, these findings serve to provide added empirical evidence for each of the three theories utilized here. It should be noted that the finding of correlated changes over time between the predictor and subjective experience variables takes us beyond the significant zero-order correlations at a single point in time that have been obtained both here and in previous research (Waterman et al., 2003). Whereas zero-order correlations at a single point in time may be due to any a variety of potential unassessed and confounding variables, the demonstration of correlated changes implies that any potential confounding variables must also be changing in a comparable fashion. The pool of potential confounding variables subject to such changes is considerably smaller than is that present in cross-sectional research. As a consequence, the present longitudinal findings allow for increased confidence that the predictor variables account for experiences of intrinsic motivation.

However, the demonstration that changes in the predictor variables are paralleled by corresponding changes in the subjective experience variables is itself a correlational association and does not establish a sequence to the changes in the two sets of variables in cases where such changes occur. It cannot be ruled out that changes in the subjective experience variables serve to bring about changes in perceptions associated with self-determination, the balance of challenges and skills, and self-realization values. It is also possible that changes in the predictor and subjective experience indices occur in a cyclical fashion. Given the six-week time lags between assessment points, the present study was not well suited to testing for sequentiality in changes for the predictors and subjective experience indices. Because it is likely that changes in the predictors are followed soon thereafter by changes in the subjective experience indices, demonstrating sequentiality may require conducting assessments on a daily, perhaps even hourly, basis. Diary studies, in which participants are asked to subjectively evaluate particular activities on multiple occasions, may be the most appropriate method by which to investigate sequentiality.

To the extent to which inter-item correlations and Cronbach's  $\alpha$  can be taken as appropriate indices of internal consistency reliability (see Cronbach, 2004; for an extended treatment of this issue), the fact that the various predictor and subjective experience indices were not equally internally consistent may represent an additional potential limitation. Nonetheless, it should be noted that, despite these differences in internal consistency, the predictor and subjective experience indices have behaved as would be theoretically expected across multiple datasets, including the three assessment points in the present study and more than seven independent datasets used in other studies (Waterman et al., 2003, *in press*).

In summary, the present study has extended findings from previous research on the relationships between theoretically derived predictor and subjective experience measures

of intrinsic motivation. Whereas prior studies have demonstrated correlational associations between the predictor and subjective experience variables at one point in time, in the present longitudinal study, changes in the predictor variables were demonstrated as being accompanied by corresponding changes in the subjective experience indices. The results obtained here provide further support for intervention efforts designed to help individuals identify intrinsically motivated activities by increasing opportunities for self-determination, drawing attention to emerging competencies, and promoting an increased focus on self-realization values. To the extent to which such efforts are successful in changing perceptions of the fit between person and activity variables, changes in the way in which activities are subjectively experienced, and motivated, can be anticipated.

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