Journal of Leisure Research
1998, Vol. 30, No. 3, pp. 380-389

Measuring Flow Experiences in Daily Life: An Examination of the Items Used to Measure Challenge and Skill

Judith E. Voelkl
University of Iowa
Gary D. Ellis
University of Utah

Researchers have identified potential problems with the traditional measurement of challenge and skill on the self-report forms used in the experience sampling method (ESM) (Ellis, Voelkl, & Morris, 1994; Moneta & Csikszentmihalyi, 1996). The purpose of this study was to compare the effectiveness of two different approaches to measurement of challenge and skill. One approach was based on the traditional measurement of challenge and skill in relation to the activity in which participants were engaged and the second approach was based on measurement of challenge and skill in relation to participants' focus of attention. Thirty six undergraduate students were randomly assigned to one of two conditions: (a) measurement of challenge and skill in relation to activity or (b) measurement of challenge and skill in relation to what they were thinking about. In the first condition (i.e., challenge and skill in relation to activity), the contribution of the challenge-skill relationship was found to be significant in predicting level of affect and self-affirmation. In the second condition, (i.e., challenge and skill in relation to attention), the contribution of the challenge-skill relationship was not found to be significant in predicting level of affect or self-affirmation.

KEY WORDS: *Flow, optimal experience, challenge, skill, measurement, experience sampling method*

When reporting on flow or optimal experiences individuals identify a number of dimensions, including a merging of action and awareness, clear goals and feedback, focused attention, loss of self-consciousness, altered sense of time, a sense of control, and perceived match between challenges and skills (Csikszentmihalyi, 1975, 1988, 1990, 1993; Jackson, 1992; Jackson & Marsh, 1996). Emerging from the flow experiences containing these dimensions are high levels of enjoyment and a nurturing of one's self identify (Csikszentmihalyi, 1975, 1988, 1990, 1993).

For the past two decades researchers have strived to understand how the flow model fits the day to day experiences of people. The experience sampling method (ESM), which involves participants carrying a pager or beeper watch and responding to items on a self-report form when "beeped"

Judith Voelkl is with the Department of Sport, Health, Leisure, and Physical Studies at the University of Iowa; Garry Ellis is with the Department of Parks, Recreation and Tourism at the University of Utah. Address correspondence to Judith E. Voelkl, Ph.D., Department of SHLPS, E102 Field House, University of Iowa, Iowa City, IA 52242-1111.

(e.g., what they are doing, level of challenge, level of skill, affect), has provided a method for gathering extensive data on daily experiences. Previous studies have focused on how the dimension of the challenge-skill relationship predicts levels of enjoyment and various dimensions of the flow experience, such as attention, control, loss of self-consciousness and an awareness of time (e.g., LeFevre, 1988; Massimini & Carli, 1988; Massimini, Csikszentmihalyi, & Carli, 1987; Moneta & Csikszentmihalyi, 1996).

In a recent critique on the use of ESM data to examine flow experiences in daily life, Ellis, Voelkl, and Morris (1994) identified several issues including problems with the measurement of challenge and skill and loss of information on individual differences when scores are standardized. Ellis, Voelkl, and Morris (1994) and Moneta and Csikszentmihalyi (1996) have proposed statistical analyses that allow ESM data to be analyzed based on the original flow model without losing information on individual differences. Questions remain, however, as to the valid measurement of challenge and skill (Ellis, Voelkl, & Morris, 1994). Participants are typically asked to record perceived challenge and skill in relation to the "activity" they were involved in just prior to being beeped. However, Csikszentmihalyi (1975) has indicated the complexity of challenge and skill: "at any given moment, people are aware of a finite number of opportunities which challenge them to act" (p. 50). The very "finite number" of challenges may create difficulty for a participant who is responding to one item measuring challenge and one item measuring skill. For example, a social scientist participating in an ESM study who is paged while walking to work and contemplating a difficult methodological issue, may report low level challenge and skill in relation to the activity of walking rather than the high level challenge and skill that is experienced while contemplating a methodological problem. Further evidence of the complexity of measuring challenge and skill was found in 500 ESM self-reports on which respondents indicated 49% of the experiences captured them doing something different than what they were thinking about (Voelkl & Ellis, 1998).

Given the complexities inherent in measuring challenge and skill, as well as Csikszentmihalyi's indication that an individual's focus of attention is critically important in the experience of flow (Csikszentmihalyi, 1988; 1990), Ellis, Voelkl, and Morris suggested that researchers consider rewording challenge and skill items to target perceived challenge and skill in relation to the participant's attention or concentration. Therefore, the purpose of the present study was to compare variance explained across two conditions: (1) traditional measurement in which the activity serves as the context for measuring challenge and skill and (2) a reformulated condition in which the focus of attention serves as the context for measuring challenge and skill.

Model Conceptualization

Previous ESM studies examining flow experiences in daily life have varied in terms of the conceptualization of flow via the challenge-skill relation-

ship and the dependent variables selected.[1] For the purpose of the present study, the conceptualization of flow is based on Csikszentmihalyi's original flow model (see Figure 1) which indicates that flow experiences occur when perceived challenge and perceived skill are in balance. A majority of the previously conducted ESM studies have conceptualized flow via "channels" representing the relationship between standardized mean scores on perceived challenge and perceived skill. Channels were created by Massimini and his colleagues following their discovery that the challenge-skill relationship based on the original flow model did not predict the other dimensions of flow (Csikszentmihalyi, 1988). More recent work has indicated a move back to the original model in order to understand optimal experiences in daily life (Ellis, Voelkl, & Morris, 1994; Moneta & Csikszentmihalyi, 1996), with analyses conducted on raw scores in order to prevent inaccurate representation of the challenge-skill relationship that has been found with standardized scores (Ellis, Voelkl, & Morris, 1994).[2]

In regard to dependent variables, previous work has consistently used the challenge-skill relationship as the predictor or independent variable for numerous dependent measures, including intrinsic motivation, loss of a sense of time, clarity of goals, attention, concentration, arousal, affect, creativity, excitement, satisfaction, openness, control, clarity, and self-affirmation (e.g., Carli, Delle Fave, & Massimini, 1988; Massimini & Carli, 1988). Many of the dependent variables in previous studies (e.g., altered sense of time, attention, control) constitute dimensions of flow rather than experiential outcomes. Csikszentmihalyi (1988; 1990) has indicated that the dimensions of flow occur simultaneously and include a balance of challenge-skill, merging of action and awareness, clear goals and feedback, focused attention, loss of self-consciousness, altered sense of time, and a sense of control, while the experiental outcomes of flow include affect, enjoyment, and self-affirmation. For the purpose of the present study, the experiental outcomes of engagement in flow experiences were measured using the variables of affect and self-affirmation. This allowed us to examine whether the dimension of

[1]See Ellis, Voelkl, and Morris (1994) for further discussion on the conceptualization of flow and selection of the indicators of flow in previous studies using the experience sampling method.

[2]The reformulated flow model is based on standardized scores (Csikszentmihalyi, 1988; Massimini, Csikszentmihalyli, & Carli, 1987). Experiences that contained challenge and skill scores above a respondent's standardized means of zero are identified as 'flow' experiences and those experiences containing challenge and skill below the mean are identified as 'apathy' experiences. When a respondent's scores on challenge are above his or her mean and skill below his or her mean, experiences are identified as 'anxiety.' Conversely, when challenge is below the mean and skill above the mean, the experience is identified as 'boredom.' Although researchers continue to use the reformulated model, criticism for the model has focused on loss of information on the individual due to use of standardized scores (Ellis, Voelkl, & Morris, 1994; Moneta & Csikszentmihalyi, 1996) and the potential for inaccurate identification of flow experiences due to use of standardized scores (Ellis, Voelkl, & Morris, 1994). Respondents typically report a higher mean on skill than challenge and the use of standardized scores may inaccurately equalize a respondent's mean challenge with his or her mean skill. See Ellis, Voelkl, and Morris (1994) for further discussion of the reformulated and original flow models.

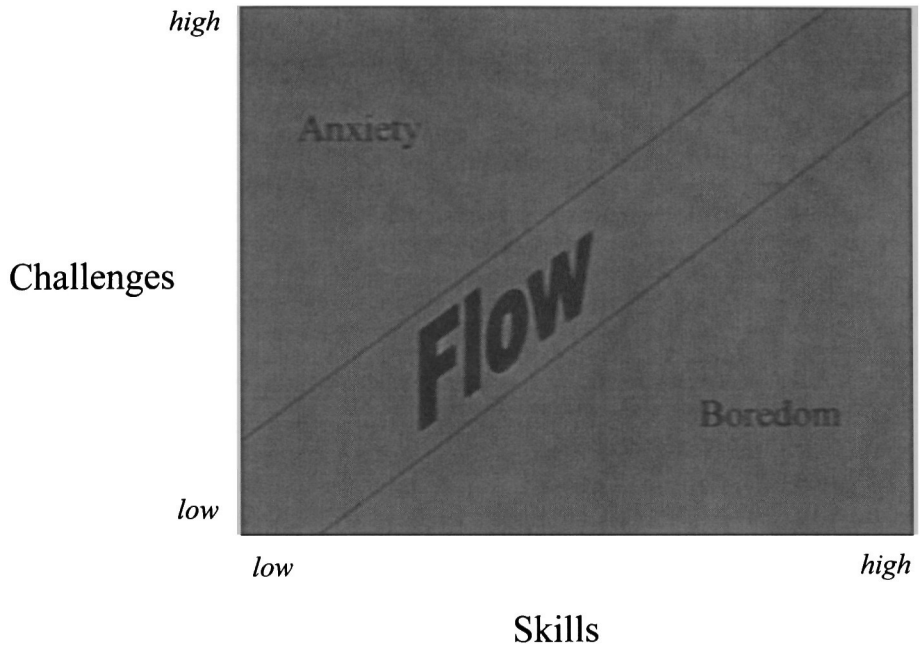

Figure 1. Original flow model. (Adapted from Csikszentmihalyi, 1975; 1990.)

challenge-skill measured in two different ways would be a significant predictor of affect and self-affirmation.

Method

Participants

Thirty six undergraduate students enrolled in a therapeutic recreation course at a university located in the midwest participated in this study. The sample consisted of 11 men and 25 women. Participants ranged in age from 20 to 49 with a mean age of 23.5 years. Forty-two percent of the participants were juniors and 58% were seniors.

Procedure

Each participant consented to participation in the study. Participation involved wearing a "beeper" watch for four days that was programmed to "beep" the participant at five random times each day between the hours of 8:00 am and 10:00 pm. Upon hearing the "beep," participants were instructed to complete a self-report form that contained items on current activity, location, companionship, perceived challenge, perceived skill, affect, and self-affirmation (Larson & Csikszentmihalyi, 1983; Larson & Richards,

1994). The 36 participants responded to 492 of the 720 programmed "beeps", resulting in a response rate of 68.3%.

Participants were randomly assigned to one of two conditions. In response to each "beep", half of the participants completed self-report forms with "challenge" and "skill" operationalized to measure the degree of challenge and skill in relation to what they were doing (i.e., current activity). The remaining participants completed self-report forms with "challenge" and "skill" operationalized to measure the degree of challenge and skill experienced in relation to what they were thinking about at the time of the beep (i.e., attention). The eighteen participants assigned to the first condition did not significantly differ from those eighteen assigned to the second condition on variables of age, gender, year in school, rate of response to "beeps" (i.e., 69% and 68%), or reported activity involvement while participating in the experience sampling method.

Measurement

Measurement of challenge and skill. Measurement of challenge and skill was operationalized in two different ways. Consistent with traditional practice, half of the participants completed self-report forms with items used to measure perceived challenge and perceived skill using two 7-point Likert type scales, "How skillful did you feel in what you were doing?" and "How challenged did you feel by what you were doing?". The other half of the participants completed self-report forms with two 7-point Likert type scales used to measure perceived challenge and perceived skill related to their attention: "How skilled were you in what your attention was focused on?" and "How challenged were you in what your attention was focused on?".

Measurement of affect. Consistent with previous ESM studies (e.g., Ellis, Voelkl, & Morris, 1994), three 7-point semantic differential items were used to measure affect: happy-unhappy, cheerful-irritable, and friendly-angry. The alpha reliability coefficient was .79 for that three item scale.

Measurement of self-affirmation. Consistent with previous ESM studies (e.g., Ellis, Voelkl, & Morris, 1994), three 7-point Likert-type scales were used to measure self-affirmation of the self: confident, proud, and satisfied. The alpha reliability coefficient was .76 for that three item scale.

Individual differences. Individual differences were represented through the use of criterion scaling (Ellis, Voelkl, & Morris, 1994; Pedhazur, 1982). A single vector was created that was comprised of each participant's mean on the criterion variable of the dependent variable (i.e., affect and self-affirmation). Pedhazur has shown that a criterion scaled vector includes the same information for regression analysis that would be obtained through the creation of separate coded vectors to represent each participant, though degrees of freedom must be adjusted in formulas for conducting significance tests. The resulting vector contains variation that may be attributable to individual differences as well as a degree of measurement error (Voelkl & Ellis, 1990).

Analysis of Data

The means and standard deviations of the independent and dependent variables were examined. For the regression analyses, criterion scaling was used to represent individual differences. The balance of challenge-skill relationship was included in the model by creating a vector of the absolute difference between the challenge and skill variables (Moneta & Csikszentmihalyi, 1996). The measures of affect and self-affirmation were individually regressed on skill, challenge, the challenge-skill vector, and the criterion scaled vector representing individual differences. The contributions to the variance of the challenge-skill predictor was tested through regression procedures. The procedures involved first building a full model and then assessing the significance of the change in R^2 when the vectors representing the independent variables were removed from the equation. Although the independent variable of interest in the present study was the challenge-skill relationship, we also examined the independent variables of challenge and skill. Inclusion of challenge and skill in the analyses is in line with continued efforts to understand the "simpler interpretations" of challenge and skill serving as significant predictor variables (Csikszentmihalyi & Moneta, 1996, p. 281). Analyses were conducted for each of the two conditions: (1) data based on the measurement of challenge and skill in relation to activity and (2) data based on measurement of challenge and skill in relation to attention.

Results

The means reported in Table 1 indicated that the data is consistent with previous research with participants reporting that their skills outweigh their level of perceived challenge in daily experiences (Ellis, Voelkl, & Morris, 1994). Skill outweighs challenge in both condition 1 and condition 2.

In the first condition challenge and skill were measured in relation to activity (see Table 2). The regression analyses conducted with the dependent variable of affect explained 17.6% of the variance. When the challenge-skill predictor was dropped from the analysis, explained variance dropped to 14.38%. In an F-test, adjusting for the degrees of freedom for the criterion

TABLE 1
Means and Standard Deviations

Means	Entire Sample	Condition 1	Condition 2
Challenge	3.14 (1.97)	2.96 (2.07)	3.33 (1.85)
Skill	4.66 (1.95)	4.63 (2.05)	4.68 (1.85)
Self-Affirmation	12.54 (4.47)	12.87 (4.51)	12.21 (4.42)
Affect	13.69 (3.13)	13.65 (3.09)	13.72 (3.18)

Entire sample N = 492; Condition 1 N = 247; Condition 2 N = 245.

TABLE 2
Summary of Regression Analyses with Dependent Measure of Affect

Condition 1	R^2	change	df	F	p
Full Model	.1760	—	20,224	2.39	.01
dropped from model:					
Person	.0766	.0994	17,224	1.59	n.s.
Skill	.1264	.0496	1,224	13.49	.001
Challenge	.1568	.0192	1,224	5.22	.05
Challenge-Skill	**.1438**	**.0322**	**1,224**	**8.76**	**.01**
Condition 2	R^2	change	df	F	p
Full Model	.2259	—	20,222	3.23	.001
dropped from model:					
Person	.0647	.1612	17,222	2.71	.001
Skill	.2173	.0086	1,222	2.46	n.s.
Challenge	.2107	.0151	1,222	4.33	.05
Challenge-Skill	**.2255**	**.0003**	**1,222**	**.10**	**n.s.**

scaled vector, the contribution of the challenge-skill relationship was found to be significant ($F_{1,224} = 8.76$, $p < .01$). In the second condition, with challenge and skill measured in relation to attention, the full model explained 22.59% of the variance. Explained variance dropped to 22.55% with the challenge-skill predictor was dropped from the equation and was not found to be a significant predictor of level of affect ($F_{1,222} = .1$, n.s.).

In the regression analysis conducted with the dependent variable of self-affirmation, data from condition 1 explained 54.79% of the variance (see Table 3). When the challenge-skill predictor was dropped from the analysis, explained variance dropped to 49.25%. In an F-test, adjusting for the degrees of freedom for the criterion scaled vector, the contribution of the challenge-skill relationship was found to be significant ($F_{1,193} = 24.09$, $p < .001$). In the second condition, with challenge and skill measured in relation to attention, the full model explained 52.02% of the variance in self-affirmation. Explained variance dropped to 51.8% when the challenge-skill predictor was dropped from the analysis. The contribution of the challenge-skill relationship was not found to be significant ($F_{1,197} = .92$, n.s.).

Discussion

Csikszentmihalyi (1975, 1990; Moneta & Csikszentmihalyi, 1996) has viewed challenge and skill as multidimensional. In an attempt to better understand the type of challenge and skill that predicts flow experiences in daily life, we compared measures of challenge-skill in relation to activity to challenge-skill in relation to focus of attention. Our findings indicated that

TABLE 3
Summary of Regression Analyses with Dependent Measure of Self-Affirmation

Condition 1	R^2	change	df	F	p
Full Model	.5479	—	20,193	11.91	.001
dropped from model:					
Person	.3953	.1526	17,193	3.90	.001
Skill	.3751	.1728	1,193	75.13	.001
Challenge	.5319	.016	1,193	6.96	.01
Challenge-Skill	**.4925**	**.0554**	**1,193**	**24.09**	**.001**
Condition 2	R^2	change	df	F	p
Full Model	.5202	—	20,197	25.00	.001
dropped from model:					
Person	.3037	.2165	17,197	5.29	.001
Skill	.4672	.0530	1,197	22.10	.001
Challenge	.5198	.0004	1,197	.19	n.s.
Challenge-Skill	**.5180**	**.0022**	**1,197**	**.92**	**n.s.**

challenge-skill in relation to activity was a significant predictor of level of affect and self- affirmation. Contrary to expectations, challenge-skill in relation to focus of attention was not found to be a significant predictor of affect or self-affirmation.

The measure of the challenge-skill relationship in relation to attention did not conform to or support Csikszentmihalyi's theory of optimal experience. However, the independent variables of challenge and skill provided simpler explanations for the experiential outcomes of affect and self-affirmation (Moneta & Csikszentmihalyi, 1996). The independent variable of challenge was a statistically significant predictor of affect and the independent variable of skill was a statistically significant predictor of self-affirmation. It appears that challenging cognitions directly impact daily affect, while attention placed on one's skills affirms one's self-identity.

Although our findings using measures of challenge and skill in relation to attention were contrary to expectations, it seems necessary to continue to examine the various types of challenges and skills that predict the experiential measures of flow (i.e., affect, enjoyment, self-affirmation). The complexity of measuring challenge and skill is evident in a recent ESM study that found on approximately 50% of the self-report forms respondents reported that what they were doing differed from what they were thinking about (Voelkl & Ellis, 1998). Future ESM research based on larger samples and using self-report forms with expanded measurement of challenge and skill are needed. More specifically, continued research endeavors may strengthen our understanding of the multi-dimensional nature of challenge

and skill if the various conceptualizations of challenge and skill (e.g., attention, physical, emotional) are all contained in one self-report form so that all items can be responded to by each participant.

When considering future directions for research examining valid measurement of challenge and skill, it is instructive to reflect upon Csikszentmihalyi's concerns with efforts to rigorously measure flow experiences:

> I guess I have always worried about "breaking the spirit" of flow by defining it too soon or too precisely...The important thing, in my opinion, is not to *reify* flow. The moment we say that "flow is the balance of challenges and skills" or that "flow is a score of 'x' on the Flow Questionnaire," we have lost it. We have mistaken the reflection for the reality. The concept of flow describes a complex psychological state that has important consequences for human life. Any measure of flow we create will only be a partial reflection of this reality. (Csikszentmihalyi, 1992, p. 183).

It is possible that part of the challenge in attempting to rigorously measure flow experiences may be that our ESM measures do not capture their true meaning for individuals or the full dimensions. It seems, however, if service providers are to make progress in learning how to assist participants in creating flow experiences (Jackson & Marsh, 1996), we must strive to better understand the dimensions of flow and how those dimensions interact in daily experiences.

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