

From Environmental Factors to Outcomes: A Test of an Integrated Motivational Sequence¹

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Research based on self-determination theory (SDT; E. L. Deci & R. M. Ryan, 1985, 2000) has shown that motivation is influenced by the social environment and also leads to outcomes. Based on such research, R. J. Vallerand (1997) has posited the existence at different levels of generality of an integrated motivational sequence where environmental factors (e.g., success/failure) influence perceptions of competence, autonomy, and relatedness (psychological mediators), which in turn determine to what extent one exhibits self-determined motivation. Motivation then leads to outcomes. The present study tested the validity of this integrated sequence at the situational level using an experimental design. Participants (N = 359) were randomly assigned to conditions of success or failure on a leisure task and elements of the integrated sequence were assessed. Structural equation modeling analyses provided support for the postulated motivational sequence. Results are discussed in light of SDT.

KEY WORDS: intrinsic motivation; self-determination; integrated motivational sequence.

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Over the past 30 years, a great deal of research has focused on two types of motivation, namely intrinsic and extrinsic motivation (Deci & Ryan, 2000; Vallerand, 1997). *Intrinsic motivation* generally refers to performing an activity as an end in and of itself—for the pleasure and satisfaction derived from this participation (e.g., Deci, 1975; Deci & Ryan, 1985; Lepper, Greene, & Nisbett, 1973). On the contrary, *extrinsic motivation* refers to engaging in an activity as a means to an end; that is, in order to obtain something positive or to avoid something negative outside the activity (Deci, 1975; Kruglanski, 1978). Many important theoretical contributions have been made in this field (e.g., Bandura, 1986; Csikszentmihalyi & Nakamura, 1989; Deci & Ryan, 1985, 1991; Dweck & Leggett, 1988; Lepper & Greene, 1978). Of particular interest is the work of Deci and Ryan (1985, 1991, 2000) who have proposed that intrinsic and extrinsic motivations are not necessarily negatively related but may be better seen as reflecting various degrees of a *self-determined motivation* which entails doing something out of choice and/or pleasure rather than out of external obligation and/or internal pressure. Within this perspective, motivation research has typically focused on either the determinants *or* the consequences of self-determined motivation. The purpose of the present research was to look at both the determinants and the consequences of self-determined motivation in an integrated motivational sequence.

After a brief definition of self-determined motivation according to self-determination theory (SDT; Deci & Ryan, 1985), we present a review of research on the determinants and consequences of self-determined motivation. Then, we propose a hypothesized integrated motivational sequence.

SELF-DETERMINED MOTIVATION, ITS DETERMINANTS, AND ITS CONSEQUENCES

In addition to postulating the existence of intrinsic motivation, self-determination theory (Deci & Ryan, 1985, 2000) also posits a multidimensional view of extrinsic motivation. More specifically, SDT defines four types of extrinsic motivation: external regulation and the introjected regulation refer to controlled (or non-self-determined) motivation (i.e., doing an activity *by obligation* in order to obtain something positive or to avoid something negative outside the activity; e.g., Deci & Ryan, 1985) while the identified regulation and integrated regulation refer to autonomous (or self-determined) motivation (i.e., doing an activity *by choice* in order to obtain something positive or to avoid something negative outside the activity; e.g., Deci & Ryan, 1985). These four types of regulatory processes fall along a self-determined continuum from the less to the most self-determined motivation, that is external, introjected, identified, and integrated regulation. Intrinsic motivation, the prototype of self-determined activity, is placed at the self-determined pole of this continuum while amotivation (i.e., the relative absence of motivation)

is placed at the opposite pole (for a complete review of SDT, see Deci & Ryan, 2000).

On the other hand, SDT posits that the environment influences motivation through its impact on perceptions of competence, autonomy, and relatedness. Indeed, according to SDT, people have fundamental needs of autonomy, competence, and relatedness. Experiencing perceptions of competence, autonomy, and/or relatedness (i.e., an indication that one's needs are being fulfilled) is hypothesized to facilitate self-determined motivation as people are likely to return freely to the activities that satisfy their psychological needs. Consequently, environmental factors that foster perceptions of competence, autonomy, and relatedness enhance self-determined motivation. Conversely, environmental factors that impair such perceptions have a negative effect on self-determined motivation.

Much laboratory research has demonstrated that the highest form of self-determined motivation, namely intrinsic motivation, may be negatively affected by a host of environmental factors such as negative feedback (e.g., Thill & Mouanda, 1990; Vallerand & Reid, 1984, 1988; Whitehead & Corbin, 1991) and rewards (Deci, Koestner, & Ryan, 1999). Other environmental factors such as choice (Zuckerman, Porac, Lathin, Smith, & Deci, 1978) and positive feedback (Thill & Mouanda, 1990; Vallerand & Reid, 1984, 1988) have been shown to have a positive impact on intrinsic motivation (see Deci & Ryan, 1985; Vallerand, 1997, for reviews of studies dealing with the effect of environmental factors on intrinsic motivation).

Much research in real-life settings has also shown that motivation is related to important outcomes ranging from school performance and dropout behavior (e.g., Guay & Vallerand, 1997; Vallerand, Fortier, & Guay, 1997), to voting behavior (Koestner, Losier, Vallerand, & Carducci, 1996), persistence in exercise behavior (Pelletier, Fortier, Vallerand, & Brière, 2001; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002), and marital happiness (Blais, Sabourin, Boucher, & Vallerand, 1990). More important, experimental research provides support for the causal effect of motivation on such outcomes (Amabile, 1985; Cury, Wagner, & Grothaus, 1990; Lepper & Cordova, 1992). That is, motivation causes outcomes. According to SDT, the more self-determined the motivation, the more positive the consequences (see Vallerand, 1997 for a complete review of the empirical evidence).

In sum, research based on SDT has demonstrated that motivation is influenced by factors from the environment through their impact on perceptions of competence, autonomy, and relatedness. In turn, motivation leads to outcomes. Based on the above, Vallerand (1997) proposed that the following integrated motivational sequence: "Environmental factors → Psychological Mediators → Self-determined Motivation → Consequences" can exist at three levels of generality: the global (or personality), contextual (or in general in a specific life domain such as education or leisure), and the situational (at a given point in time with respect to a specific

activity) levels. However, two points are in order. First, the integrated sequence has only been tested at the contextual level. Such research has yielded support for the integrated sequence at the contextual level in various life domains as diverse as work (Baard, 1994; Richer, Blanchard, & Vallerand, 2002), exercise and health (Pelletier et al., 2001; Sarrazin et al., 2002; Williams, Grow, Freedman, Ryan, & Deci, 1996), and education (Guay & Vallerand, 1997; Vallerand et al., 1997). However, such research has typically assessed the perceptions of environmental factors rather than manipulating them (see Vallerand, 1997 for a review). It is thus not clear if environmental factors actually trigger the motivational causal sequence or if they are a consequence of some of the variables in the sequence. For instance, highly self-determined individuals may perceive environmental factors as being more autonomy supportive than less self-determined individuals do. And second, no study has tested the entire sequence at the situational level. Although research has validated subparts of this causal sequence (for a review, see Vallerand, 1997), this does not mean that the integrated sequence does take place automatically at the situational level. For instance, it could be possible that objective factors that have been found to influence motivation also cause outcomes. Thus, it is important to determine if the integrated sequence is operative at the situational level. Studying the integrated sequence using an experimental design in which environmental factors are manipulated should lead to an improved understanding of the processes through which environmental factors affect motivation and its consequences at the situational level.

THE PRESENT RESEARCH

The purpose of this research was to test the validity of the integrated sequence “Environmental Factors → Psychological Mediators → Motivation → Consequences,” when environmental factors are experimentally manipulated. Specifically, performance feedback was manipulated so that participants who engaged in a hidden-figure task were randomly assigned to a success or failure condition. Perceptions of competence and autonomy, situational motivation, and various motivational consequences (e.g., concentration and intentions to persist in the specific activity) were then assessed. This allowed us to test the causal sequence with structural equation modeling analyses. In line with SDT, it was hypothesized that the success/failure feedback would trigger the perceived competence process (Deci & Ryan, 1985) and thus would influence perceptions of competence accordingly, with success increasing and failure decreasing perceptions of competence. The success feedback was also hypothesized to affect perceptions of autonomy because doing well at an activity should lead people to feel free to experience some sense of autonomy and freedom while doing the activity, especially since the success feedback in the present study was non-controlling in nature (see Ryan, 1982). Because the success/failure feedback was hypothesized to make the perceived

competence process salient, it was hypothesized that the effects of success would be stronger on perceptions of competence than on those of autonomy. In turn, both perceptions of competence and autonomy were expected to be related to self-determined motivation. Finally, motivation was expected to positively predict the consequences of concentration and future intentions of persisting in the activity. It was predicted that the more self-determined the motivation, the more positive the consequences would be.

METHOD

Participants and Overview

A total of 389 undergraduate students completed the experimental task within the confines of an introductory psychology class. The data from 31 students, who either did not follow the instructions or did not complete the questionnaire correctly, were excluded from analyses. This left a total of 358 students remaining ($N_{\text{men}} = 30$; $N_{\text{women}} = 322$; $N_{\text{unspecifield}} = 6$; with a mean age of 20 years). The participants were randomly assigned in class to one of two experimental conditions: 186 to the success condition and 173 to the failure condition.

Participants were told that they would work on five NINA puzzles. They then worked on three puzzles, were told that they would continue later on, and received some performance feedback. They were then asked to complete a questionnaire that contained scales assessing how participants felt at that point in time. Participants indicated their perceptions of competence and autonomy, and level of concentration, as well as their situational motivation and intentions to persist toward the activity at that precise point in time, knowing that they would continue on the task. These procedures allowed us to test the integrated sequence at the situational level.

Procedure

The experiment was conducted in class at the end of a lecture. The experimenter explained that the study involved a hidden-figure task called “the NINAs,” which consists of finding the word “NINA” embedded in cartoon-like drawings by Al Hirschfeld. Previous studies have found this task to have a high level of intrinsic interest (Harackiewicz, 1979; Plant & Ryan, 1985; Ryan, Mims, & Koestner, 1983).

Participants first worked on a practice drawing. They were then told that they would have 10 min to complete five puzzles (2 min per puzzle). After the third puzzle, they were interrupted in order to complete a questionnaire measuring their feelings *during* the game. Participants were told that following completion of the questionnaire, they would return to the task to complete the last two puzzles (the

last two puzzles were therefore not completed). Since, participants thought that they would actually do the last two puzzles, this procedure allowed us to measure the psychological concepts of the integrated sequence at that point in time, that is at the situational level.

The questionnaire asked participants to indicate their scores (the number of “NINAs” found) for each drawing as well as their total score for the first three puzzles. They were then asked to compare their total score with “the average number of NINAs found by students in general” (i.e., “16.1 NINAs”; the same information was given to all participants). The drawings were altered to create two conditions. In the success condition, a total of 30 actual “NINA” words were hidden in the three drawings, whereas, in the failure condition, only three could be found. Consequently, participants in the *success* condition could potentially find more than 20 NINAs overall (in our study, $M = 21.32$ puzzles; $SD = 4.15$), and experienced success. Conversely, participants in the *failure* condition had the possibility of finding not more than two or three hidden words (in our study, $M = 2.44$ puzzles; $SD = 1.17$) and thus experienced failure. Following reception of the feedback, participants were asked to complete various scales assessing the variables in the model.

Measures

Participants were asked to report, on seven-point scales, their perceptions of competence (e.g., “While doing the ‘NINAs’, I feel good at this game”; adapted from Losier, Vallerand, & Blais, 1993) and autonomy (e.g., “While doing the ‘NINAs,’ I feel free to do this game”; adapted from Blais & Vallerand, 1992), and their level of concentration, a cognitive consequence, on a seven-point scale (e.g., “While doing the NINAs, I am concentrated”).⁵ The Cronbach alpha for the competence scale (three items) was .84, the zero-order correlation between the two perceived autonomy items was .39, and the Cronbach alpha for the concentration scale (three items) was .77.

Participants also completed the Situational Motivation Scale (SIMS) by Guay, Vallerand, and Blanchard (2000). The scale assesses one’s current or “state” motivation toward a given activity and contains 16 items measuring four subscales (with four items each): intrinsic motivation (IM; $\alpha = .91$), autonomous (identified) regulation (AR; $\alpha = .71$), controlled (introjected/external) regulation (CR; $\alpha = .78$), and amotivation (AM; $\alpha = .64$). Previous research has found this scale to be valid and reliable (see Guay et al., 2000). The different motivation subscales were combined into one self-determined motivation index. Four separate indexes were thus computed by attributing a specific weight to each item and then summing the products. Consequently, the IM and AR subscales (higher self-determined forms

⁵We used the words “While doing the NINAs . . .” because in their minds, participants were still doing the NINA task; they still had two more puzzles to do). Consequently, these words were meant to refer to the present.

of motivation) were assigned the scores of +2 and +1, respectively, whereas AM and CR subscales (less self-determined forms of motivation) were attributed the weights of -2 and -1, respectively. There were four items for each motivational construct and consequently the index was computed using the following formula: $[(2 \times \text{IM}) + \text{AR} - \text{CR} - (2 \times \text{AM})]$. This index reflects the person's relative level of self-determined motivation, such that a positive score indicates that a person's motivational profile is self-determined, whereas a negative score reflects non-self-determined motivation. Research reveals that this index displays high levels of reliability and validity (e.g., Grolnick & Ryan, 1987; Vallerand & Bissonnette, 1992; Vallerand et al., 1997; see also Vallerand, 1997). The Cronbach alpha for the self-determined motivation index was .87.

Finally, behavioral consequences were measured using questions adapted from those used in previous studies (e.g., Calder & Staw, 1975; Weinberg, 1979): "If you had the choice and the possibility, would you continue doing the NINAs or would you do something else?" (nine-point scale), "If you had the choice and the possibility, with what intensity would you do the NINAs?" (nine-point scale), and "If you had the choice and the possibility, how much more time would you spend doing this activity?" (21-point scale, from "0" to "20 and more" minutes). The Cronbach alpha based on the sum of the z-score transformation of the three items was .76.

In the follow-up session participants were fully debriefed. Their questions were also answered and they were thanked for their participation.

RESULTS

Preliminary Analyses

A preliminary multivariate analysis of variance (MANOVA) was performed on all measures. Mean scores for each scale, namely perceptions of competence and autonomy, concentration, and behavioral intentions were used, as well as the mean score of the four self-determined motivation indexes. Evaluation of the assumptions of normality, the homogeneity of variance-covariance, linearity, and multicollinearity were all satisfactory. Using the Wilks criterion, the combined measures were significantly affected by performance feedback manipulation, $F_{(5,353)} = 65.64$, $p < .0001$. The results reflected a modest relationship between condition (success vs. failure) and the combined measures, partial $\eta^2 = .16$.

To investigate the impact of the feedback on the individual measures, univariate ANOVAs were performed. In line with our main prediction, participants in the success condition reported having higher perceptions of competence ($M = 5.25$) than participants in the failure condition ($M = 3.12$), $F_{(1,357)} = 302.68$, $p < .0001$. A main effect of the feedback condition was also obtained also on perceptions of autonomy ($F_{(1,357)} = 10.21$, $p < .002$). Participants in the success condition reported having higher perceptions of autonomy ($M = 5.07$) than

participants in the success condition ($M = 4.55$). Finally, participants in the success condition had higher levels of self-determined motivation ($M_{\text{motivation}} = 2.24$ vs. -0.68 , $F_{(1,357)} = 26.97$, $p < .0001$), concentration ($M_{\text{concentration}} = 5.41$ vs. 4.72 , $F_{(1,357)} = 26.87$, $p < .0001$), and behavioral intentions ($M_{\text{intentions}} = 0.19$ vs. -0.20 , $F_{(1,357)} = 21.57$, $p < .0001$) than participants in the failure condition.

Structural Equation Modeling of the Integrated Sequence

The adequacy of the proposed integrated sequence was assessed through structural equation modeling (SEM) using the EQS program (version 5.6 for UNIX; Bentler, 1995). This statistical procedure made use of the covariance matrix and allowed the proposed model to be tested in a simultaneous analysis in order to determine the extent to which it is consistent with the sample data (for more details on the SEM procedure see Byrne, 1994).

The proposed model contained one single-indicator, exogenous construct (the “success/failure condition” which was dummy coded; success, 1; failure, 0) and five endogenous latent variables (perceived competence, perceived autonomy, self-determined situational motivation, concentration, and intentions to persist in the activity). Even if multivariate normality was satisfactory, we used the Satorra–Bentler adjustment of the chi-square ($SB-\chi^2$; Satorra & Bentler, 1988) because normality was not perfect. The other fit indices that we used were the Bentler and Bonett’s (1980) normed fit index (NFI), the Bentler and Bonett’s (1980) non-normed fit index (NNFI), the Satorra–Bentler adjustment of the comparative fit index (CFI*⁶; Bentler, 1990; Satorra & Bentler, 1988), and the root mean square error of approximation index (RMSEA; Steiger, 1990; see also Browne & Cudeck, 1989). Finally, the Akaike’s (1987) information criterion (AIC) was useful for non-nested model comparisons, the model with the smallest AIC being preferred (e.g., Kline, 1998).

Figure 1 presents the standardized solutions for the structural and measurement models.⁶ The model estimates indicated a good fit for the model ($\chi^2_{df=99, N=358} = 187.93$, $p < .001$; NFI = .92; NNFI = .95; CFI* = .96; RMSEA = .054). More specifically, the independent variable “success/failure condition” was strongly and positively related to participants’ perceptions of competence ($\beta = .75$) and autonomy ($\beta = .19$). In turn, perceived autonomy ($\beta = .52$) and competence ($\beta = .22$) were positively related to self-determined situational motivation. Finally, self-determined situational motivation was positively related to concentration ($\beta = .38$) and intentions to persist in the activity ($\beta = .67$). All path coefficients and factor loadings were significant (z -values > 1.96).

In order to further test the validity of the integrated motivational sequence “Success/Failure → Psychological Mediators → Motivation → Consequences,”

⁶The measurement model, without experimental variables and structural relations, fitted adequately the data: ($\chi^2_{df=79, N=358} = 169.78$, $p < .001$; NFI = .92; NNFI = .95; CFI* = .96; RMSEA = .057).

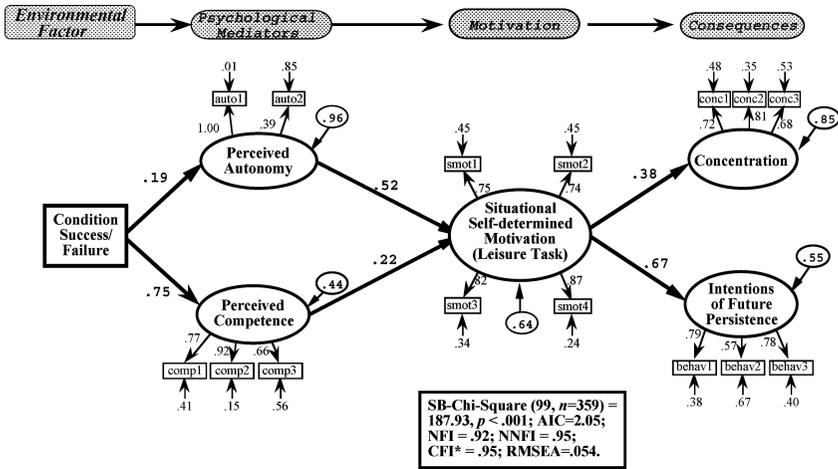


Fig. 1. Results of the measurement and structural models of the integrated motivational sequence. Numbered, abbreviated names are the indicators that make up the latent variables. All coefficients are standardized to facilitate interpretation and are significant at t > 1.96.

we tested five alternative models based on different permutations of the three groups of variables that followed the environmental factor variable (EF), that is psychological mediators (ME; i.e., perceptions of competence and autonomy), situational self-determined motivation (MO), and consequences (CO; i.e., concentration and intentions to persist). Thus, the hypothesized model is represented as “EF → ME → MO → CO”, and the four alternative models are “EF → ME → CO → MO”; “EF → MO → ME → CO”; “EF → MO → CO → ME”; “EF → CO → ME → MO”, and “EF → CO → MO → ME”. In general, given two models, the one with the lowest absolute AIC is the one preferred (e.g., Kline, 1998).⁷ Thus, as can be seen in Table I, the model estimates for the alternative models were all inferior to those of the proposed model.

Finally, we also calculated the power of these structural equation modeling analyses. Following recommendations from MacCallum, Browne, and Sugawara (1996), we examined power of analyses based on RMSEA statistics with df = 99 and N = 359. The power was very high. This reveals that, with our sample size, there is a 99% probability of being able to reject the hypothesis that fit is bad (RMSEA ≥ .10). Thus, one should be confident in the present results.

DISCUSSION

The purpose of the present study was to test the validity of the integrated motivational sequence “Environmental factors → Psychological Mediators →

⁷Unfortunately, no significance test exists to compare two models according to their AIC.

Table I. Goodness of Fit Summary for Structural and Measurement Models of the “Environmental Factors → Psychological Mediators → Motivation → Consequences” Sequence and Alternative Models

Models	SB- χ^2	df	SB- χ^2 /df	AIC	NFI	NNFI	CFI*	RMSEA
Hypothesized sequence model								
EF → ME → MO → CO	187.93	99	1.898	2.05	.92	.95	.96	.054
Alternative sequence models								
EF → ME → CO → MO	231.62	97	2.388	53.49	.90	.92	.94	.066
EF → MO → ME → CO	415.99	98	4.245	247.77	.83	.83	.85	.099
EF → MO → CO → ME	423.94	98	4.326	266.56	.82	.82	.85	.102
EF → CO → ME → MO	413.36	97	4.261	248.23	.83	.83	.86	.100
EF → CO → MO → ME	391.61	99	3.956	225.17	.84	.84	.87	.096

Note: AIC, Akaike (1987) information criterion; NFI, Bentler–Bonett normed fit index; NNFI, Bentler–Bonett non-normed fit index; CFI*, robust comparative fit index; RMSEA, root mean square error of approximation. EF, environmental factor (success/failure performance feedback); ME, psychological mediators (i.e., perceptions of competence and autonomy); MO, situational self-determined motivation; CO, consequences (i.e., concentration and intentions to persist).

Motivation → Consequences” at the situational level using an experimental design. The present findings provide strong support for the proposed sequence. Specifically, objective success on the “NINA” task led to higher perceptions of competence and autonomy than experiencing objective failure. In turn, perceptions of competence and autonomy on the NINAs were related to self-determined motivation for this activity. Finally, the more self-determined their situational motivation, the more individuals experienced concentration and stronger intentions to persist at the activity. These findings lead to a number of implications.

A first implication is that the results provide strong support for Deci and Ryan’s (1985, 1991) SDT with respect to how the environment influences motivation. SDT posits that the influence of the social environment on self-determined motivation is mediated by perceptions of competence and autonomy. SDT posits that people have fundamental needs of autonomy, competence, and relatedness. Experiencing perceptions of competence, autonomy, and/or relatedness provides an indication that one’s needs are being fulfilled when partaking in a given activity, thereby leading the person to want to freely reengage in the activity in the future. Thus, need satisfaction is hypothesized to facilitate self-determined motivation. Results from the present study showed exactly that. In an individual activity setting (where relatedness would not be expected to have an impact), the role of perceptions of competence and autonomy as mediators of the relationship between objective performance feedback and situational motivation was demonstrated. Indeed, the model representing the proposed integrated sequence was strongly supported as it yielded a very good fit to the data. In addition, the proposed model proved to be superior to several alternative models. Therefore, there is strong evidence to suggest that the impact of performance feedback on self-determined motivation is indeed mediated by perceptions of competence and autonomy.

These findings are in line with past research that has shown that subjective perceptions of the environment (e.g., teachers, parents, etc.) are related to self-determined motivation (e.g., Pelletier et al., 2001; Sarrazin et al., 2002; Vallerand et al., 1997). However, because these studies used a correlational design, a rival hypothesis is that having a self-determined motivation may lead one to subjectively interpret the environment in a more positive fashion. The experimental design used in the present study rules out this rival hypothesis. One study that used a path analysis to test the role of mediators between performance feedback and intrinsic motivation within the confines of an experimental design is that of Vallerand and Reid (1984). In accord with the present findings, these authors showed that positive performance feedback increased, while negative feedback decreased both perceptions of competence and intrinsic motivation relative to pretest assessments and to a control group. More important, however, it was found that feedback led to increases in perceptions of competence which were found to predict increases in intrinsic motivation over and beyond the impact of the feedback, thereby supporting the mediating function of perceived competence. However, perceptions of autonomy were not assessed in that study. And this leads to our second implication.

A second interesting aspect of the present results is that both perceived competence and perceived autonomy were found to be affected by the success/failure manipulation. Why should perceived autonomy be also affected by the feedback manipulation? At least three answers are possible. First, it is possible that a halo effect has taken place and that the mere fact that one has succeeded or failed has colored all participants' perceptions, including perceptions of autonomy. While this hypothesis is plausible, we feel that it is unlikely to have taken place in the present study because such an effect should lead to similar success/failure effects on all variables. However, the results of the structural equation modeling analyses revealed that an ordering of the variables in line with the proposed model seemed to have taken place. Furthermore, the present findings are in line with past research which has shown that manipulating or measuring success/failure and/or environmental control is typically associated with both perceptions of competence and autonomy (see Vallerand, 1997). We thus feel that we need to look elsewhere in order to understand the effect of success/failure on perceptions of autonomy. A second hypothesis is that it is possible that receiving objective proof of one's competence leads one to experience feelings of freedom and autonomy. Indeed, if I am good at something, I may feel like I can exercise my autonomy in doing the activity the way I choose much more than if I am incompetent. In this latter case, I would feel like I need more guidance in doing the activity. Thus, as initially suggested by Deci (1975), it would appear that the two needs of competence and autonomy are closely linked and play complementary roles in self-determined motivation. A third and final potential answer is that performance feedback entails two dimensions: one dealing with competence, and one dealing with autonomy. Indeed, as shown by Ryan (1982), self-administered feedback (as in the present study) can be controlling or non-controlling with the latter type of feedback increasing

intrinsic motivation. Unfortunately, Ryan (1982) did not test for the mediating effects of perceptions of competence and autonomy. Although the present study did not manipulate the controlling/non-controlling aspect of the feedback, the fact that perceptions of autonomy were found to mediate the impact of feedback on self-determined motivation is consistent with the findings of Ryan (1982). It would appear that for an informational context to be effective in promoting self-determined motivation, both perceptions of competence and autonomy need to be affected. Future research is needed in order to test this hypothesis.

A third implication of the present results deals with the relative impact of perceptions of competence and autonomy on self-determined motivation. While perceived competence has been shown to have an effect on situational self-determined motivation (Harackiewicz & Larson, 1986; Vallerand & Reid, 1984, 1988; Whitehead & Corbin, 1991), perceived autonomy has typically been found to have a stronger effect (see Guay & Vallerand, 1997; Pelletier et al., 2001; Sarrazin et al., 2002; Vallerand et al., 1997). Such a finding was replicated in this study in which constraints in SEM analysis showed that situational self-determined motivation was significantly more strongly related to perceived autonomy ($\beta = .52$) than to perceived competence ($\beta = .21$), $\chi^2_{\text{difference}} = 5.935$, $p < .015$. Future research is needed in order to determine if these findings hold in various contexts, activities, and cultures. For instance, it may be possible that the need for relatedness, which was not assessed in the present study, become a more important motivational determinant in interpersonal contexts (e.g., intergroup relationships).

It should be noted, however, that although perceived autonomy seemed to be more strongly related to self-determined motivation than perceived competence, the latter still proved to be a more important overall mediator than perceived autonomy. Indeed, if we take into consideration the impact of feedback on both types of perceptions, and the relationship of both perceptions to motivation, the total mediating effect of feedback on motivation was stronger through perceived competence ($.75 \times .22 = .165$) than through perceived autonomy ($.19 \times .52 = .099$). Thus, in line with SDT, these findings underscore the fact that the perceived competence process of cognitive evaluation theory (Deci & Ryan, 1985), which was triggered in the present study through the feedback manipulation, proved to be the main process through which motivation was affected.

A final finding worthy of note of the present study is that empirical support was obtained for the proposed causal sequence in its entirety using an experimental design. This represents a stringent test of the sequence as the experimental manipulation of success/failure could have affected all parts of the sequence to the same degree. The fact that it did not, and that results supported the specific ordering of the elements of the model, yields validity to the integrated sequence. Such validation provides a novel contribution to the understanding of the *entire motivational episode* at the situational level and the psychological processes through which the environment leads to motivation, and in turn, how the latter is related to outcomes.

Thus, the present study allows us to chart the processes through which the environment affects motivation and outcomes. Such an analysis provides support for Vallerand's (1997) extension of SDT at the situational level. Future research is needed in order to test the integrated sequence at the contextual level with objective environmental factors.

Although the present results support our integrated motivational sequence, it is possible to find in the motivation literature alternative models. One of the most well known is the Sheldon and Elliot's (1999) self-concordance model. Specifically, the authors propose that the social context can influence goal selection (self-determined or not), which influences resulting need-satisfaction, which impacts positive outcomes. Such sequence corresponds to one of the alternative models that we have tested: the "EF → MO → ME → CO" sequence (see Table I). Results showed that this model yielded a worse fit than the proposed model. The difference may involve the fact that personal goals are self-selected and proactive motivational units which organize subsequent behavior in ways that either provide positive experiences and final outcomes or not, whereas situational motivation is something that results from the situation, and which is influenced by the need-supports within the situation. As well, the motivational sequence proposed by Sheldon and Elliot was examined at the contextual level (i.e., education, leisure, etc.), whereas the present study was conducted at the situational level. These conceptual and methodological issues could explain why our results support a different motivational sequence than Sheldon and Elliot's model. Future research is necessary in order to determine the conditions under which each model applies.

The present study has some limitations. One limitation concerns perceptions of relatedness. Although relatedness must be considered as an important determinant of motivation (Deci & Ryan, 1991; Vallerand, 1997), it was not assessed in the present study. Unfortunately, the context of the experiment (i.e., performing a leisure task *individually* with no opportunity to interact with others) did not allow for the possibility of relatedness to operate and therefore it was not measured. On the other hand, when individuals engage in an activity in a context in which an interpersonal (or group) perspective is important, perceptions of relatedness with others should then come into play and affect situational motivation. Future research is needed in order to test this hypothesis. A second limitation of the study concerns the external validity of the study. Participants in this study were psychology, mostly female, students and it is not clear if the present findings generalize to the general population. Further research is needed in this regard. A third limitation is that although an experimental design was used, it pertained only to the feedback manipulation. The rest of the integrated sequence was assessed in a correlational design. Therefore, although the present findings are in line with past experimental research, causality inferences for the rest of the motivational sequence should be made with caution. A final limitation concerns behavioral outcomes which were essentially self-reported rather than observed.

In sum, the present study provided support for the integrated sequence “Environmental factor → Psychological Mediators → Motivation → Consequences” at the situational level. The present findings contribute to our understanding of the psychological processes through which self-determined motivation is linked to its determinants and outcomes while individuals are currently engaged in an activity and pave the way to future research.

APPENDIX

Table A1. Estimated Correlation Matrix for Latent Variables

	1	2	3	4	5	6
1. Condition success/failure	—					
2. Competence	.75	—				
3. Autonomy	.19	.14	—			
4. Motivation	.26	.29	.55	—		
5. Concentration	.10	.11	.21	.38	—	
6. Intentions of future persistence	.18	.20	.37	.67	.26	—

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