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Motivational Determinants of Flow: Contributions From Self-Determination Theory

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ABSTRACT. The study examined the relationships between different types of situational motivation and flow and situational motivational determinants (perceptions of autonomy, competence, and relatedness) and the experience of flow. Immediately following a swim practice, 203 Canadian master's-level swimmers completed a questionnaire that assessed different variables. Results indicated that situational self-determined forms of motivation (intrinsic motivation and self-determined extrinsic motivation) and perceptions of autonomy, competence, and relatedness were positively related to flow, whereas amotivation was negatively related to flow.

THE MANNER IN WHICH HUMAN BEINGS experience the world has long been a topic of interest in psychology. During the past few decades, researchers on states of consciousness have produced an impressive body of knowledge (Farthing, 1992; Lee, Ornstein, Galin, Deikman, & Tart, 1976; Tart, 1975; Wolman & Ullman, 1986). Although much has been learned about states of consciousness, numerous questions remain unanswered from the vantage points of people conducting research on this subject and people having firsthand experience with a wide range of psychological states.

The Flow State

One theoretical perspective in this area stems from the work of Csikszentmihalyi (1975a, 1975b, 1990) on flow. The value of Csikszentmihalyi's approach

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can be seen from scores of empirical studies in a variety of life domains, including work and leisure (Csikszentmihalyi, 1975a; Csikszentmihalyi & LeFevre, 1989; Wells, 1988), education (Carli, Delle Fave, & Massimini, 1988; Csikszentmihalyi, Rathunde, & Whelan, 1993; Larson, 1988; Nakamura, 1988), and sport and physical activity (Grove & Lewis, 1996; Jackson, 1992, 1995; Jackson & Roberts, 1992; Stein, Kimiecik, Daniels, & Jackson, 1995). According to Csikszentmihalyi (1975b, p. 36), *flow* is a highly enjoyable psychological state that refers to the "holistic sensation people feel when they act with total involvement (in an activity)." While in this state, they become completely immersed in the activity to the point of losing awareness of time, their surroundings, and all other things except the activity itself.

Csikszentmihalyi (1990) and Jackson and Marsh (1996) identified nine characteristics of the flow state: (a) the existence of a balance between the perceived skills of an individual and the perceived challenges of a situation, (b) a merging of action and awareness, (c) the presence of clear goals, (d) the presence of unambiguous feedback, (e) concentration on the task at hand, (f) a sense of control over oneself and the environment, (g) a loss of self-consciousness, (h) a transformation of time, and (i) the autotelic or enjoyable nature of the experience. Delineating the characteristics of flow has aided researchers in understanding the phenomenology of this psychological state, although it has only provided clues as to how flow states actually occur.

Thus, researchers have attempted to identify and examine antecedents of flow. In a cross-cultural study, Massimini, Csikszentmihalyi, and Delle Fave (1988) asked individuals to identify precursors to flow. They found that a wide range of variables, including the nature of the activity, concentration on the task, and a positive mood, were perceived as being determinants of the flow state. Similarly, in two qualitative investigations conducted with elite-level athletes, Jackson (1992, 1995) found that factors such as precompetitive and competitive planning, a positive mental attitude, and physical readiness facilitated the experience of flow.

Another antecedent of flow that emerged from the Jackson (1992, 1995) and Massimini et al. (1988) studies was motivation. Indeed, results suggested that individuals who were highly motivated experienced high instances of the flow state. Some researchers have specifically examined the relationship between motivation and flow and found a positive link between intrinsic motivation and the experience of this psychological state (Csikszentmihalyi & LeFevre, 1989; Graef, Csikszentmihalyi, & McManama-Gianinno, 1983; Haworth & Hill, 1992). The relationship between intrinsic motivation, extrinsic motivation, perceived freedom, and flow was also assessed by Mannell, Zuzanek, and Larson (1988). They hypothesized that freely chosen activities in which individuals are intrinsically motivated lead to the highest instances of flow. Contrary to their expectations, their results indicated that extrinsically motivated individuals who freely chose to engage in leisure activities actually reported the highest instances

of flow. The findings of Mannell et al. appear to contradict those of other studies (Csikszentmihalyi & LeFevre, 1989; Graef et al., 1983; Haworth & Hill, 1992) and raise questions about the manner in which extrinsic motivation and flow are related.

Jackson and Roberts (1992) assessed the relationship between motivation (i.e., goal orientations) and flow in a recreational sport setting. In their investigation, goal orientations were measured at a contextual level, whereas flow was assessed at a situational level. Results indicated that a task-involved goal orientation was positively related to the flow state. Following a similar line of inquiry, Stein et al. (1995) conducted three studies that examined the relationship between goal orientations, perceptions of competence, confidence, and flow. Contrary to Jackson and Roberts, Stein et al. assessed all of the variables at a situational level. The importance of assessing situational antecedents in comparison with contextual antecedents was discussed by Stein et al. They reasoned that situation-specific measures (e.g., antecedents) showed a stronger relationship with situational outcomes (e.g., flow) than contextual measures; this is also similar to the reasoning of Rotter (1975). Contrary to predictions, no significant relationships were found between any of the situational antecedents and the flow state. Accordingly, the relationship between situational motivational antecedents and flow has yet to be understood.

Self-Determination Theory

A contemporary motivational theory that appears germane for the examination of this issue is self-determination theory (SDT; Deci & Ryan, 1985, 1991). This motivational perspective is particularly salient for examining the relationship between motivation and flow because it distinguishes among different forms of motivation on the basis of the degree to which they can be considered self-determined. By doing so, SDT allows for a further refinement of the intrinsic–extrinsic or task–ego dichotomies that categorize motivation into one of two types. Deci and Ryan posited four main types of motivation that exist along a self-determination continuum. The four forms of motivation (from most self-determined to least self-determined) are intrinsic motivation, self-determined extrinsic motivation, non-self-determined extrinsic motivation, and amotivation. *Intrinsic motivation* refers to engaging in an activity for its own sake, because of an interest, or for the pleasure and satisfaction derived from the experience (Deci, 1975). For example, individuals who engage in sport for the fun and enjoyment associated with the activity exemplify intrinsic motivation.

Extrinsic motivation refers to behaviors that are considered a means to an end (Deci & Ryan, 1985). The fundamental goals of extrinsically motivated behaviors are to receive rewards or avoid punishment. Deci and Ryan further classified extrinsic motivation into two types: self-determined extrinsic motivation and non-self-determined extrinsic motivation. Self-determined extrinsic

motivation is characterized by engaging in an activity because of personal choice. An example of this type of motivation is when individuals willingly participate in an activity (e.g., a sport) because it is valued and perceived to be of importance. Non-self-determined extrinsic motivation is exhibited when individuals place pressure on themselves to perform an activity or when their behaviors are perceived to be controlled by external factors (e.g., constraints or rewards). Individuals who feel a sense of guilt if they do not engage in physical activities or who exercise because of perceived pressures from others exemplify this type of motivation.

Finally, *amotivation* is characterized by the absence of intrinsic and extrinsic motivation. Individuals who feel that they have no sense of control over their actions exemplify this condition. Accordingly, individuals who are motivated in this way do not derive rewards or benefits from their participation in activities. In many ways, amotivation parallels the concept of learned helplessness (Abramson, Seligman, & Teasdale, 1978). In short, Deci and Ryan (1985, 1991) posited two forms of self-determined motivation (i.e., intrinsic motivation and self-determined extrinsic motivation) and two forms of non-self-determined motivation (i.e., non-self-determined extrinsic motivation and amotivation).

As a means of building on this motivational taxonomy, Vallerand (1997) posited that the different types of motivation exist at three hierarchical levels of generality: global, contextual, and situational. By describing motivation in this way, Vallerand developed a hierarchical framework for assessing the relationship between different levels of motivation and any number of variables. This conceptual framework appears germane for examining specific hypotheses concerning the relationship between situational motivation and flow.

Another reason for using SDT is that it accounts for determinants of motivation. According to Deci and Ryan (1991), there are three motivational determinants: perceptions of autonomy, perceptions of competence, and perceptions of relatedness. These motivational determinants can be traced directly to the psychological need for autonomy, competence, and relatedness, respectively. The need for autonomy refers to people's need to feel that they are the origins of their actions, and it encompasses the notion of choice (deCharms, 1968); the need for competence refers to individuals' desires to interact proficiently or effectively with their environment; and the need for relatedness refers to individuals' desires to feel connected with others and to experience a sense of belonging in a particular social context.

Past research on flow has revealed that perceptions of competence are positively related to the experience of this psychological state. Jackson and Roberts (1992) found that athletes who reported high levels of perceived competence experienced flow more often than athletes who reported low levels. If perceptions of competence and flow are indeed positively related, then according to SDT, perceptions of autonomy and perceptions of relatedness may also be positively associated with flow states. Thus, in addition to being able to assess the relation-

ship between different types of motivation and flow, SDT allows for an examination of the link between these three motivational determinants and the experience of flow.

An additional reason for using SDT is that it makes specific predictions concerning motivational consequences. It can be used to examine important outcomes, including flow. Indeed, much research has demonstrated that the two self-determined forms of motivation (intrinsic motivation and self-determined extrinsic motivation) lead to positive outcomes such as positive emotions (Frederick, Manning, & Morrison, 1996) and health-promoting behaviors (Williams, Grow, Freedman, Ryan, & Deci, 1996), whereas the two non-self-determined types of motivation (non-self-determined extrinsic motivation and amotivation) lead to negative outcomes such as the tendency to drop out of an activity (Vallerand, Fortier, & Guay, 1997).

SDT appears to be a salient basis for examining the relationship between motivation and flow because it accounts for different types of motivation as well as different levels of motivation (Vallerand, 1997). SDT also allows for a thorough examination of the relationship between situational motivational antecedents and the flow state. Finally, SDT has been used to examine a number of important outcomes and may thus be used to examine flow.

The purpose of our study was twofold. We examined the relationship between different types of situational motivation and flow and assessed the relationship between situational determinants of motivation (perceptions of autonomy, competence, and relatedness) and the experience of this psychological state.

Given the theoretical postulates underlying SDT as well as past research on motivation (Vallerand, 1997) and flow (Jackson & Roberts, 1992; Mannell et al., 1988; Stein et al., 1995), we hypothesized that self-determined forms of motivation (intrinsic motivation and self-determined extrinsic motivation) were positively related to flow, whereas non-self-determined forms of motivation (non-self-determined extrinsic motivation and amotivation) were negatively related to this psychological state. We also hypothesized that the three motivational determinants (i.e., perceptions of autonomy, competence, and relatedness) were positively and significantly related to the flow state.

Method

Participants

A total of 203 swimmers (105 men, 98 women) from eight master's-level swim clubs participated in our study. The average age was 36.4 years, and the swimmers had from 1 to 20 years (M = 4.1) experience with their respective clubs. On average, participants swam 3.7 times per week, and approximately half of the swimmers (n = 111) participated in competitions on a regular basis. The majority were Caucasian and of Canadian nationality.

Procedure

We obtained permission to conduct our research from administrators of the master's-level swim clubs during the fall of 1996. Participation in the study was voluntary, and the participants were ensured that their anonymity would be maintained at all times. They were informed about the general purpose of the study. A trained researcher administered a questionnaire to the participants immediately following a swim practice. The questionnaire required approximately 15 min to complete and was administered on the pool deck.

Questionnaire

The questionnaire contained a number of previously validated scales adapted to suit the swimming context. We used the questionnaire to assess situational motivational determinants, situational motivation, and flow. All of the items were measured by using a 7-point Likert-type scale, with answers ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Situational motivational determinants. We adapted the scales slightly by altering the manner in which the items were phrased. Instead of asking participants to respond in general, the participants were asked to relate how they felt during a specific swim practice. Situational perceptions of autonomy were assessed by using three adapted items from the Autonomy Perceptions in Life Contexts Scale (Blais & Vallerand, 1992). One such item was "I felt obligated to be at this swim practice." The standardized Cronbach's alpha coefficient for this scale was .54. We assessed situational perceptions of competence by using an adapted version of the Perceived Competence Scale for Children (Harter, 1982). This 3-item scale yielded a standardized Cronbach's alpha coefficient of .69. One such item was "I felt competent during this swim practice." Finally, we assessed situational perceptions of relatedness by using a modified version of the Perceived Relatedness Scale (Richer & Vallerand, 1996). These items are prefaced with the general statement "During this practice, in my relations with the members of my current swim team, I felt . . . " Examples of the three items used to assess perceived relatedness were supported, attached, and united. This scale yielded a standardized Cronbach's alpha coefficient of .81.

Situational motivation. We measured the different types of situational motivation by using an adapted version of the Situational Motivation Scale (Guay & Vallerand, 1995) composed of four subscales designed to measure intrinsic motivation, self-determined extrinsic motivation, non-self-determined extrinsic motivation, and amotivation. Participants were asked to respond to the general question "Why did you participate in this swim practice?" Examples from each 4-item subscale include: "Because swimming in this practice was really enjoyable" (intrinsic moti-

vation); "Because I chose to swim for my own benefit" (self-determined extrinsic motivation); "Because I felt I was expected to swim" (non-self-determined extrinsic motivation); and "I don't know; I don't think I gained anything from the experience" (amotivation). Standardized Cronbach's alpha coefficients for each of the situational motivation subscales ranged from .73 to .89 (M = .80).

Flow. We used the Flow State Scale (FSS; Jackson & Marsh, 1996) to assess the swimmers' experiences of flow. This instrument is composed of nine subscales, each corresponding to a different flow characteristic. The nine subscales (and a sample item from each) included (a) Challenge-Skill Balance ("I was challenged, but I believed my skills would allow me to meet the challenge"); (b) Action-Awareness Merging ("Things just seemed to be happening automatically"); (c) Clear Goals ("I knew clearly what I wanted to do"); (d) Unambiguous Feedback ("I had a good idea while I was performing about how well I was doing"); (e) Concentration on the Task at Hand ("My attention was focused entirely on what I was doing"); (f) Sense of Control ("I had a feeling of total control"); (g) Loss of Self-Consciousness ("I was not concerned with what others may have been thinking of me"); (h) Transformation of Time ("It felt like time stopped while I was performing"); and (i) Autotelic Experience ("The experience left me feeling great"). Each subscale was measured by using four items. Standardized Cronbach's alpha coefficients for the nine subscales ranged from .76 to .89 (M = .84). We also computed a general measure of flow by combining the nine subscales. This yielded a Cronbach's alpha coefficient of .94.

Results

Results of the correlational analysis (see Table 1) revealed that flow was significantly and positively related to intrinsic motivation, $r = .60$, $p < .01$, and self-determined extrinsic motivation, $r = .44$, $p < .01$. A significant, negative, and lower correlation was obtained between flow and amotivation, $r = -.20$, $p < .01$, and a nonsignificant association was found between non-self-determined extrinsic motivation and the experience of flow, $r = -.08$, $p = .259$.

With respect to the individual characteristics of flow, we found significant, positive relationships between the nine FSS subscales and the two self-determined types of motivation, with the exception of the correlations between Self-Determined Extrinsic Motivation and Loss of Self-Consciousness, $r = .09$, $p = .207$, and Transformation of Time, $r = .11$, $p = .108$, which were both nonsignificant. Non-self-determined extrinsic motivation was nonsignificantly related to the nine flow subscales, with the exception of its association with Clear Goals, $r = -.14$, $p < .05$, and Concentration on the Task at Hand, $r = -.23$, $p < .01$, which were both negative and significant. Amotivation was negatively and significantly related to Challenge-Skill Balance, $r = -.30$, $p < .01$; Clear Goals, $r = -.26$, $p < .01$; Con-

TABLE 1
Pearson Correlations Between Different Types of Situational Motivation, Situational Motivational Determinants, and Flow (N = 203)

Situational motivational variable	FSS subscale									
	Flow	Skill	Merg	Goal	Feed	Conc	Cont	Self	Time	Auto
IM	.60**	.54**	.24**	.46**	.27**	.47**	.44**	.22**	.25**	.75**
SDEM	.44**	.43**	.16*	.43**	.34**	.39**	.37**	.09	.11	.42**
NSDEM	–.08	–.03	.07	–.14*	–.08	–.23**	–.09	.01	.10	–.13
AMO	–.20**	–.30**	–.02	–.26**	–.12	–.30**	–.22**	.02	.18*	–.31**
Autonomy	.19**	.11	.07	.16*	.15*	.25**	.21**	.10	–.03	.16*
Competence	.46**	.63**	.27**	.35**	.26**	.32**	.50**	.13	–.07	.47**
Relatedness	.53**	.50**	.24**	.46**	.41**	.47**	.35**	.25**	.11	.49**

Note. FSS = Flow State Scale; IM = intrinsic motivation; SDEM = self-determined extrinsic motivation; NSDEM = non–self-determined extrinsic motivation; AMO = amotivation; Autonomy = perceptions of autonomy; Competence = perceptions of competence; Relatedness = perceptions of relatedness; Flow = overall measure of flow; Skill = challenge-skill balance; Merg = action-awareness merging; Goal = clear goals; Feed = unambiguous feedback; Conc = concentration on the task at hand; Cont = sense of control; Self = loss of self-consciousness; Time = transformation of time; Auto = autotelic experience.
*p < .05. **p < .01.

centration on the Task at Hand, $r = -.30$, $p < .01$; Sense of Control, $r = -.22$, $p < .01$; and Autotelic Experience, $r = -.31$, $p < .01$. It was positively and significantly associated with Transformation of Time, $r = .18$, $p < .05$. The remainder of the flow subscales were nonsignificantly correlated with this type of motivation.

We also compared the different types of situational motivation between the participants who reported a high incidence of flow and the participants who reported a low incidence of flow. The high and low groups were created by using the participants' overall scores on the FSS. In this regard, participants' scores were initially divided into three groups that corresponded to the 33rd and 66th percentile scores. Scores above the 66th percentile were included in the high incidence of flow group ($n = 67$); scores below the 33rd percentile were included in the low incidence of flow group ($n = 68$). Scores between the 33rd and 66th percentiles ($n = 68$) were omitted from the analysis.

Results of the multiple t tests (see Table 2) revealed that the swimmers who reported a high incidence of flow had significantly higher levels of intrinsic motivation, $t(112) = -9.12$, $p < .001$, and self-determined extrinsic motivation, $t(105) = -5.87$, $p < .001$, than the swimmers who reported a low incidence of flow. (We calculated an adjusted alpha level of .007 by dividing the desired alpha level of .05 by 7, the number of significance tests performed, to correct for Type I errors.) We found no significant differences between the high and low flow groups in

TABLE 2
Comparison Between High and Low Incidence of Flow Groups With Respect to Different Types of Situational Motivation and Situational Motivational Determinants

Situational motivational variable	Low flow ($n = 68$)		High flow ($n = 67$)			
	M	*SD*	*M*	*SD*	*t*	*p*
IM	4.58	1.18	6.14	0.76	−9.12	.000
SDEM	5.65	0.89	6.39	0.51	−5.87	.000
NSDEM	2.96	1.66	2.78	1.36	0.69	.491
AMO	1.67	0.94	1.33	0.61	2.45	.016
Autonomy	4.42	152	4.85	1.21	−1.84	.068
Competence	4.72	0.98	5.76	0.78	−6.83	.000
Relatedness	4.43	1.16	5.68	0.84	−7.15	.000

Note. The modified Bonferroni alpha was .007. IM = intrinsic motivation; SDEM = self-determined extrinsic motivation; NSDEM = non-self-determined extrinsic motivation; AMO = amotivation; Autonomy = perceptions of autonomy; Competence = perceptions of competence; Relatedness = perceptions of relatedness.

terms of non-self-determined extrinsic motivation, $t(127) = .69$, $p = .491$, and amotivation, $t(114) = 2.45$, $p = .016$. The correlational analysis indicated that the overall measure of flow was significantly and positively associated with perceptions of relatedness, $r = .53$, $p < .01$, perceptions of competence, $r = .46$, $p < .01$, and perceptions of autonomy, $r = .19$, $p < .01$ (see Table 1).

In terms of the individual flow characteristics, we found positive and significant relationships between the three situational motivational determinants and the nine FSS subscales, with the exception of the following (nonsignificant) correlations: between Perceived Autonomy and Challenge-Skill Balance, $r = .11$, $p = .131$, Action-Awareness Merging, $r = .07$, $p = .291$, Loss of Self-Consciousness, $r = .10$, $p = .154$, and Transformation of Time, $r = -.03$, $p = .697$; between Perceived Competence and Loss of Self-Consciousness, $r = .13$, $p = .057$, and Transformation of Time, $r = -.07$, $p = .290$; and between Perceived Relatedness and Transformation of Time, $r = .11$, $p = .133$. Results further revealed that perceived competence and perceived relatedness were more positively related to eight of the nine FSS subscales than perceived autonomy. The only exception in this regard was that the Transformation of Time subscale did not adhere to this pattern.

Multiple t tests revealed that participants in the high incidence of flow group reported significantly higher levels of perceived competence, $t(126) = -6.83$, $p < 0.001$, and perceived relatedness, $t(121) = -7.15$, $p < .001$, than those in the low incidence of flow group (see Table 2). No significant difference was found between the high and low flow groups with respect to perceived autonomy, $t(126) = -1.84$, $p = .068$.

Discussion

Overall, our results demonstrated that swimmers who were motivated in a self-determined manner (i.e., who engaged in practice for the pleasure and satisfaction associated with the activity or who chose to participate for their own benefit) reported the highest instances of flow. Conversely, swimmers who were motivated in a non-self-determined manner (i.e., who participated in practice because of internal or external pressures or who were not intrinsically or extrinsically motivated) reported the lowest instances of this psychological state. These findings suggest that self-determined forms of motivation may facilitate flow, whereas non-self-determined forms of motivation may have a detrimental influence on flow states.

Our results are congruent with the theoretical postulates underlying SDT and concur with the results of past studies in which intrinsic motivation has been positively associated with flow (Csikszentmihalyi & LeFevre, 1989; Graef et al., 1983; Haworth & Hill, 1992). Our findings also support a number of investigations in which self-determined forms of motivation have been linked to desirable outcomes such as academic performance (Fortier, Vallerand, & Guay, 1995),

maintenance of health-promoting behaviors (Williams et al., 1996), persistence (Vallerand et al., 1997), and positive emotions (Frederick et al., 1996). In addition, our results demonstrated that situational motivation (especially situational self-determined forms of motivation) was positively related to flow. This basic finding was contrary to the results of Stein et al. (1995), who questioned whether situational motivational antecedents were associated with flow states and whether antecedents of flow could, in fact be identified. Our findings clearly suggest that situational motivation is linked to flow and motivational antecedents of the flow state may indeed be identifiable.

Our results enabled us to better understand previous research dealing with motivation and flow. In the leisure study conducted by Mannell et al. (1988), individuals who were extrinsically motivated but freely chose to engage in leisure activities reported the highest instances of flow. The researchers concluded that this finding was contrary to their expectations. However, when examined in light of SDT, their results are congruent with those of our study. Mannell et al. assessed extrinsic motivation by using two questions related to performing an activity: (a) for one's long-term benefit, and (b) for others. According to SDT, individuals who freely chose to engage in an activity for their long-term benefit exemplify self-determined extrinsic motivation that should be positively related to any number of desirable outcomes, including the experience of flow. We found a significant and positive relationship between self-determined extrinsic motivation and the experience of flow. Our results support the findings of Mannell et al. and clarify the link between these two variables.

In terms of the individual characteristics of flow, our findings suggest that loss of self-consciousness and transformation of time may be less sensitive to the different types of situational motivation than the other flow characteristics, perhaps because of ambiguity concerning the individual characteristics of flow. Specifically, it is possible that certain components of flow are characteristics of it, whereas other components may act as antecedents of this psychological state. This may also be the result of the nature of the swimming context; it is possible that these two individual flow characteristics were less salient in the swimming context than in other settings. Future researchers might want to explore these possibilities.

We also assessed the relationship between situational determinants of motivation and the flow state. Our results were congruent with the contention that perceived autonomy, perceived competence, and perceived relatedness are important psychological needs (Deci & Ryan, 1985, 1991). These findings are in accordance with the results of past research in which perceived competence and flow were positively linked (Jackson & Roberts, 1992). However, results of our research were inconsistent with those obtained by Stein et al. (1995), who found no significant link between situational perceptions of competence and flow. Our findings suggest that these variables were positively related and indicate that situational perceptions of competence may have acted as antecedents of flow.

Results of our study also revealed that swimmers who felt most connected with teammates reported high instances of flow. Although the social nature of flow has received a limited amount of attention, feeling close or united with those around us may be an important variable in the experience of flow states. Future studies might assess the social nature of flow in group settings (e.g., within sport teams or interpersonal relations). In addition, the manner in which perceptions of autonomy were related to the experience of flow seemed to indicate that motivational determinants may be less important than perceived competence or perceived relatedness to swimmers' experiences of flow. Because no study has yet examined the relationship between perceived autonomy and flow, additional research is needed to assess this possibility.

From the vantage point of the individual characteristics of flow, transformation of time was not associated with the three motivational determinants in the same manner as the other flow characteristics. Again, this may be because of the manner in which the different characteristics of flow were formulated or the nature of the swimming context.

When interpreting the results of our study, it is important to consider a number of limitations. First, we assessed all of the variables at a single point in time. As such, it is impossible to draw conclusions regarding directionality and causal links between any of the measured variables. It is possible that situational motivation and the three motivational determinants directly influenced flow or that the experience of flow directly affected these motivational variables. It is also possible that a bidirectional relationship existed in this regard. Future studies in which the direction–causal nature of the relationships between situational motivational variables and flow are examined are needed.

Our results are limited by the scope of this investigation. Because we examined the experience of flow in the context of master's-level swimming, transferring these findings across settings must be done with caution. It is also possible that our findings may not be generalizable because of our small sample size.

Finally, a limited number of variables were assessed in the current investigation. We attempted to limit our study of flow to a strictly motivational perspective by using the theoretical postulates underlying SDT. There are certainly numerous other variables (including those of a motivational nature) that may also be associated with or have an important influence on flow. Future studies in which additional variables are examined, whether motivational or otherwise, might further illuminate the understanding of flow. In this regard, testing an extended model of flow may be a fruitful path to pursue.

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