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Flow Experience and Team Performance:

The Role of Team Goal Commitment and Information Exchange

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Abstract

While a number of studies show that the flow experience is related to different outcomes at the individual level, the role of flow in work teams remains unclear. This study contributes to the advancement of knowledge on flow by testing the relationships between this psychological state, team goal commitment and team performance. Data were gathered from 85 teams comprised of graduate and undergraduate students who participated in a project management simulation. The results show that the flow experience is positively related to team performance. This relationship is mediated by team goal commitment and moderated by the level of information exchange between team members. In practical terms, the results of this study show that managers should implement interventions fostering the flow experience in their teams, while at the same time encouraging information exchange between members.

Keywords: flow experience, team performance, team goal commitment, information exchange

Flow Experience and Team Performance:
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Flow experience has received increased attention over recent years (Nakamura & Csikszentmihalyi, 2009). According to Csikszentmihalyi (1990), flow is a state of deep absorption in an activity that is intrinsically enjoyable. During an episode of flow, individuals are so focused on the ongoing activity that they tend to forget their other concerns, lose track of time and feel a deep sense of well-being. In everyday language, the expressions "being in the zone" or "in the groove" are sometimes used to refer to an episode of flow.This psychological state may occur in various contexts, including sports and game-playing, Internet use, arts, education, and even, work. In fact, work can include several conditions that may lead to the flow state, such as well-defined goals and rules, stimulating challenges and continuous feedback (Fullagar & Kelloway, 2009).

Studies on flow in the workplace are still relatively rare and those that have been conducted mainly concern the antecedents of flow (e.g., Bakker, 2005; Demerouti, 2006; Fullagar & Kelloway, 2009; Nielsen & Cleal, 2010). Authors in the field of Positive Organizational Behavior (POB), in which research on flow at work is taking place, have so far focused little attention on outcome variables such as productivity, performance, and profitability (Hackman, 2009). This can probably be explained by the fact that the flow experience is traditionally considered an end in itself and not a means to achieve other outcomes (Wright, 2003). According to flow theory, this psychological state, characterized by full involvement in the present moment, contributes to people's well-being and personal fulfilment (Csikszentmihalyi, 1997). Csikszentmihalyi (1982, p. 13) even claims that flow is "the bottom line of existence (because) without it there would be little purpose in living."

In some fields, such as education or work, it may be pertinent to focus on the potential consequences of flow. As a certain number of studies have already demonstrated, the flow state can influence the outcomes that an individual obtains (e.g., Bakker, Oerlemans, Demerouti, Slot, & Ali, 2011; Eisenberger, Jones, Stinglhamber, Shanock, & Randall, 2005). In this study, we examine the possible consequences of flow on work performance. Considering that the flow experience contributes to optimizing the functioning of individuals (e.g., higher level of concentration, involvement, and motivation), we can expect that flow and performance are positively related. In addition, as a growing number of organizations are based on work teams (Hollenbeck, Beersma, & Schouten, 2012), the primary goal of this study is to determine the extent to which the flow experience can predict team performance. In connection with this goal, this study also investigates the mechanism by which the flow experience is able to increase the performance of work teams by considering members' commitment to team goals as a mediator. Some authors in fact claim that the flow experience increases determination and persistence in the activity being performed (i.e., goal commitment), which in turn contributes to increasing performance (Landhäußer & Keller, 2012). Finally, another goal of this study is to test a condition that may modulate the effect of flow on team performance, that condition being the level of information exchange between team members. Since information exchange constitutes an essential component of teamwork (Driskell, Goodwin, Salas &, O'Shea, 2006; Marks, Mathieu, & Zaccaro, 2001; Rousseau, Aubé, & Savoie, 2006a), the effect of flow on team outcomes may not be optimal when information sharing between members is inadequate.

Theoretical Background and Hypotheses

Flow Experience

The concept of flow was created in the 70s, when Csikszentmihalyii (1975) sought to understand what characterized the moments that some individuals, including climbers, music

composers and chess players, described as among the best in their lives. The results of this research have enabled him to develop the concept of "flow" which he defined as an "holistic sensation that people feel when they act with total involvement (Csikszentmihalyi, 1975, p. 36)." The concept of flow includes nine components (Csikszentmihalyi, 1990; Jackson & Csikszentmihalyi, 1999): challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, time transformation, and autotelic experience. As the flow experience corresponds to the interplay between these nine components, none of them is sufficient on its own (Jackson, 2012). These components are all necessary to describe the flow experience.

The first component, challenge-skill balance, refers to the correspondence between the skills required to perform an activity and the challenges of this activity. To experience flow, an individual must possess skills that are equal or almost equal to the challenge. The second component, action-awareness merging, refers to the fact that the individual is involved in the activity automatically and spontaneously, without needing to reflect on his or her behaviours. The third component, clear goals, means that the individual has a clear understanding of what needs to be done. The fourth component, unambiguous feedback, refers to the fact that the activity performed allows the individual to receive clear and immediate feedback on his or her performance. The fifth component, concentration on the task at hand, implies that the individual is fully invested in the activity, undistracted by peripheral factors. The sixth component, sense of control, corresponds to a feeling of quasi invulnerability in which the possibility of failing is not present in the mind of the individual. The seventh component, loss of self-consciousness, indicates that the individual is completely at one with the activity and is not concerned with the judgement of others. The eighth component, time transformation, corresponds to the fact that the notion of time is altered when the individual experiences an episode of flow. Depending on the

activity being performed, time may seem to pass more or less quickly. Lastly, the ninth and final component, autoletic experience, means that the activity is intrinsically motivating.

Flow in Teams

Many authors state that positive social interactions are particularly conducive to the flow experience (Jackson, 1995; Lin & Joe, 2012; Walker, 2010). However, few studies have considered this psychological state in a work team setting (e.g., Bakker et al., 2011; Heyne, Pavlas, & Salas, 2011; Ryu & Parsons, 2012). In organizations, a work team is a formal group composed of at least two individuals who are interdependent and collectively responsible for accomplishing one or several tasks defined by the organization (Gladstein, 1984; Sundstrom, De Meuse, & Futrell, 1990). In work teams, the interdependence between members can be described as positive, in the sense that the success of one depends on the success of others and that everyone's actions affect the achievement of common goals (Johnson & Johnson, 1989; 2005). Work teams are becoming increasingly popular in organizations given their merits, which include a possible increase in performance and creativity, a synergistic effect, and a reduction in production costs and the rate of absenteeism (Delarue, Van Hootegem, Procter, & Burridge, 2008; Larson, 2010; Richter, Dawson, & West, 2011). Given the success of work teams is not automatic, the determinants of their effectiveness arouse a lot of interest among researchers (see the literature review of Mathieu, Maynard, Rapp, & Gilson, 2008). It is also in this context that the authors of the most recent reviews of the literature on flow corroborate the value of better understanding the role of this psychological state in teams (Engeser & Schiepe-Tiska, 2012; Jackson, 2012).

Among the studies on flow carried out in team contexts, most are limited to seeing flow as a strictly individual phenomenon, without considering the possible effects of this phenomenon on team process and outcomes. However, some authors argue that within teams, flow can become a

collective phenomenon given that members share the same work experience and that this psychological state may have a "contagion effect" (e.g., Bakker et al., 2011). In social situations, flow does in fact tend to spread from one individual to another. In other words, when one individual experiences flow, the others with whom that person is interacting tend to also experience flow (Schiepe-Tiska & Engeser, 2012). For example, a study by Bakker (2005) shows that the more that music teachers experience flow, the more their students are likely to experience an episode of flow as well. According to Schiepe-Tiska and Engeser (2012), the more individuals who are interacting, the greater this contagion effect.

To explain the spread of the flow experience in groups, some authors refer to the phenomenon of emotional contagion (Schiepe-Tiska & Engeser, 2012; Walker, 2010). According to Hatfield, Cacioppo, and Rapson (1994), emotional contagion can be explained by "[t]he tendency to automatically mimic and synchronize facial expressions, vocalizations, postures and movements with those of another person and, consequently, to converge emotionally" (p. 5). This emotional convergence is more probable and greater when individuals are participating in a group activity, are interdependent in performing this activity and are interacting directly with one another, as is generally the case with work teams (Barsade, 2002; Tanghe, Wisse, & van der Flier, 2010).

Flow and Team Performance

When individuals are in a flow state, they function at full capacity and are more motivated to persevere in their activities, which leads them to achieve better outcomes (Engeser & Rheinberg, 2008). While most studies on flow and performance have been conducted at the individual level (see the literature review by Landhäußer and Keller, 2012), we have some empirical evidence concerning the relationship between flow and team performance. Some studies conducted among sports teams (e.g., Bakker et al., 2011) or using computer simulations

in groups (e.g., Admiraal, Huizenga, Akkerman & Dam, 2011; Heyne et al., 2011) in fact show that the more that team members report having experienced flow when performing their work, the better the team performance. Compared to previous studies, the present study enables us to test the extent to which flow is related to team performance in a context in which the individuals have to interact directly with one another to complete a project, as is often the case in organizations. Therefore, the following hypothesis is formulated:

Hypothesis 1: Team members' flow experience is positively related to team performance.

The Mediating Role of Team Goal Commitment

While researchers are paying more and more attention to the relationship between flow and performance, the mechanism by which this relationship operates has not yet been tested empirically, either at the individual level or at the team level. One potential mediating mechanism that is often mentioned is the degree of commitment of the individuals (Landhäußer & Keller, 2012; Nakamura & Csikszentmihalyi, 2009). As Lewis (1996) explains, when a person is in a flow state, he or she is intensely involved in a meaningful activity and is able to remain concentrated on this activity as long as necessary to achieve the goals set. To explain the link between flow and commitment, Nakamura and Csikszentmihalyi (2009) draw on the principle of positive reinforcement. According to these authors, "[…] experiencing flow encourages a person to persist in and return to an activity because of the experiential rewards it promises […]" (Nakamura & Csikszentmihalyi, 2009, p.199). In other words, the pleasure associated with the flow state acts as a reward and encourages the individual to persist in the activities so as to experience even more pleasure.

Empirically, research findings support the relationship between flow and commitment. For example, in education, some studies have associated flow with commitment and achievement during high school (Carli, Delle Fave, & Massimini, 1988; Nakamura, 1988). Also, a meta-

analysis performed by Wofford, Goodwin and Premack (1992), based on studies conducted in the laboratory and in an organizational setting, indicates that task involvement, an essential characteristic of the flow experience (Csikszentmihalyi, 1975, 1990), constitutes an antecedent to goal commitment. It should be noted that this meta-analysis was performed at the individual level.

As the level of analysis in this study is the work team rather than the individual, the mediator process proposed in the relationship between flow and performance is team goal commitment. In team settings, team goal commitment means that team members feel an attachment to the goals set to their team as a system and are determined to reach these goals (Weldon & Weingart, 1993). The concept of flow and of team goal commitment differ notably on the temporal level. Concentration on the task, a component of flow experience, refers to the level of absorption of individuals in their work at a specific time, while team goal commitment refers to the persistence in achieving the activity, in spite of obstacles and difficulties. Empirically, several studies support the relationship between team goal commitment and team performance (e.g., Aubé & Rousseau, 2005; Aubé & Rousseau, 2011; Hyatt & Ruddy, 1997; Mulvey & Klein, 1998; Whitney, 1994). This relationship can be explained by the fact that teams whose members are very committed to their goals devote their cognitive and behavioural resources to achieving these goals, while teams whose members are not highly committed to their goals tend to lack focus and to devote their efforts to more peripheral activities (Aubé & Rousseau, 2005).

On the whole, there is theoretical and empirical support for the relationship between, on one hand, flow and team goal commitment and, on the other hand, team goal commitment and performance. On this basis, we propose in this study that the more that members experience flow in performing their work, the more they commit to achieving their goals, which in turn increases team performance. Despite the fact that commitment is often mentioned as being the principal

mechanism by which flow influences performance, this mediator effect is yet to be tested. The following hypothesis of mediation is therefore formulated:

Hypothesis 2: Team goal commitment plays a mediator role in the relationship between flow experience and team performance.

The Moderating Effect of Information Exchange between Members

In this study, we put forward that information exchange between members has a moderating effect on the relationship between flow and team performance. Here, information exchange refers to the degree to which team members both share the information necessary to perform their team tasks and make sure they properly understand the information they receive (Janz, Colquitt & Noe, 1997; Mesmer-Magnus & DeChurch, 2009). As opposed to a work environment in which everyone performs tasks that are assigned to them on an individual basis, a teamwork context demands that individuals communicate with one another to perform their work (Van der Vegt, Emans & Van de Vliert, 2000; Wageman, 1995; 2001). Based on a comparative analysis of several models of work team functioning, Rousseau et al. (2006a) present information exchange as being an essential component of teamwork. Thus, if team members work individually on their tasks without communicating with one another, the flow experience should not translate into better team outcomes. However, if team members work together and share the information they need to do their work, the effect of flow on team performance should be optimized. In other words, in order for the flow experience to contribute fully to team performance, team members must communicate with one another, even if they are absorbed by the tasks they are performing. Lack of information exchange would weaken the beneficial effects of the flow experience on team performance. Consequently, we expect that information exchange moderates the relationship between team members' flow experience and team performance.

Hypothesis 3: Information exchange among team members has a moderating effect on the relationship between flow and team performance, such as this relationship is stronger when the level of information exchange is high.

Method

Sample and Procedure

Data were gathered from 85 teams (395 members) composed of undergraduate and graduate students from a Canadian business school participating in a project management simulation as part of their course work. Team size varied from 4 to 6 members. Of the 395 participants, 49% were women and 51% were men. Their mean age was 28.7 (*SD* = 6.5).

The project that the participants had to perform in teams was to build a scale model of a road vehicle using Meccano pieces (i.e., a construction system). Each team had six and a half hours to complete their project. In order to make the simulation as realistic as possible and to optimize the ecological validity of the study, a scenario was submitted to the teams at the beginning of the day. This scenario informed the participants that they were working for a highly specialized transportation firm dealing with high risk substances and devices. Their clients were mainly multinational firms and governments, which solicited their services to transport modules for nuclear power plants, space shuttles, oil exploration facilities and oil refineries. As part of the simulation, the mandate was to design, build and test a vehicle to transport a fragile module for the petroleum industry.

Participants had to remain in the university throughout the duration of the simulation. However, they were autonomous in the management of their allotted time. Some teams decided to take breaks while others did not. During the simulation, teams could order parts and tested the performance of their vehicle on a test track. Members of each team were interdependent in terms of the task, in the sense that they had to combine their efforts to produce the requested vehicle.

Throughout the simulation, members of each team had to jointly make decisions and solve problems they encountered in the development of their vehicle. Each team had to produced a single vehicle, which was its only deliverable.

At the end of the simulation, the vehicle built by the team had to be able to successfully travel two given routes, the second route being more rugged than the first. This objective was communicated to participants in the scenario presented at the beginning of the simulation. Teams reach their goal completely when the vehicle is able to travel both paths without overrun.

Measures

Except for team performance, data were gathered through questionnaires completed by team members at the end of the simulation, immediately after the delivery of their vehicle. The questionnaires filled out by the members dealt with 1) the degree to which they experienced flow during the simulation, 2) information exchange between team members, and 3) team goal commitment. Since the participants were French speaking, the measures were administered in French. Scale items are provided in appendix. Team performance was graded by a research assistant when the vehicle was presented at the end of the simulation.

Flow. Flow was measured using the 9-item scale by Martin and Jackson (2008). Each item corresponds to one of the nine components of flow (Csikszentmihalyi, 1990; Jackson & Csikszentmihalyi, 1999). A 7-point answer scale (1 = strongly disagree to 7 = strongly agree) was used. This scale was translated from English to French by using the translation–back translation method (Brislin, 1980).

Information exchange. Information exchange between team members was assessed with two items developed for this research. Each item was linked to a 5-point scale ranging from *not true at all* (1) to *totally true* (5).

Team Goal Commitment. Team goal commitment was evaluated using 3 items developed by Klein, Wesson, Hollenbeck, Wright, and DeShon (2001) and adapted to a team setting by Aubé and Rousseau (2005). Each item refers explicitly in its formulation to the team goal. Participants were instructed to indicate the extent to which they agreed with each item, using a five-point scale (1 = *not true at all* to 5 = *totally true*).

Team Performance. Team performance refers to the extent to which the vehicle created by the team meets the requirements determined at the beginning of the simulation (i.e., successfully complete the two routes). The level of team performance is evaluated by a research assistant on a scale ranging from 1 to 6 (1 = *the vehicle did not start* to 6 = *the vehicle completed the two routes*). Given that each team has to provide a single outcome (i.e., the vehicle), the score represents the level of performance of the team as a system.

Potential Control Variable. Team size (i.e., the total number of members in each team) is considered in this study as a potential control variable because it may have a confounding effect by influencing both team functioning and outcomes (e.g., Curral, Forrester, Dawson, & West, 2001; LePine, Piccolo, Jackson, Mathieu & Saul, 2008).

Results

Data Aggregation and Preliminary Analyses

Although each participant completed a questionnaire, the level of analysis of the variables in the study is the team. Consequently, the individual scores of flow, team goal commitment, and information exchange were aggregated to the team level by calculating the average of individual scores for each team. In order to ensure within-group interrater agreement was high enough to justify data aggregation, r_{wg} indices were calculated (James, Demaree, & Wolf, 1984, 1993). As shown in Table 1, the average r_{wg} is .85 for flow experience, .89 for team goal commitment, and .82 for information exchange, which means that all of these values are above the recommended

.70 cutoff value (George, 1990). These results support the aggregation of individual scores to team scores for flow, information exchange, and team goal commitment.

Descriptive statistics (means and standard deviations), reliability estimates and correlations for the study variables are also presented in Table 1. Given that the data regarding flow, team goal commitment, and information exchange were collected from the same source (i.e., team members), we carried out confirmatory factor analyses (CFAs) to demonstrate the distinctiveness of the three constructs. We used AMOS 20.0 software and the maximum likelihood method to estimate the parameters. We assessed the goodness of fit of the expected three-factor model (a priori model) and compared it with a one-factor model that gathers all the items within one latent variable. The results indicate that the expected three-factor model had a better fit to the data in comparison with the one-factor model (see Table 2).

Moreover, we conducted another CFA by adding to the three-factor model a latent factor to account for potential method variance (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). Results indicated that all path loadings from the latent common methods variance factor were not significant ($p > .05$). Therefore, we concluded that common method bias was not an important threat in the data. Furthermore, we assess the possibility of mulicollinearity using the tolerance index and the variance inflation factor (VIF). The values of these two indices are within acceptable parameters (tolerance: .63 to 89; VIF: 1.13 to 1.60); indicating that multicollinearity is not a problem in this study and that the variables (i.e., flow, team goal commitment, and information exchange) may be considered distinctly in the analysis.

Testing the Mediation Model

Results show that flow experience is positively and significantly related to team performance, which supports Hypothesis 1 (see Table 1)[1]. Hypothesis 2 concerns the mediating mechanism that explains the relationship between flow and team performance. Specifically, it states that the relationship between flow and team performance is mediated by team goal commitment. This hypothesis was tested by a path analytic procedure using Amos 20.0 software and the maximum likelihood method to estimate the parameters of the models. Team size was considered as a control variable by including two direct paths from team size to team goal commitment and team performance.

Results show that the hypothesized model has a very good fit: $\chi^2 = 3.07$, χ^2 /degrees of freedom ratio = 1.53, the Tucker-Lewis index (TLI) = .92, the comparative fit index (CFI) = .97, and the standardized root mean square residual (SRMR) = .04. Moreover, as expected, the path estimates are significant for the relationships between flow and team goal commitment (standardized estimate = .52, $p < .001$) and between team goal commitment and team performance (standardized estimate = .40, $p < .001$). We also assessed the indirect effect in the mediation model by using the bootstrapping strategy as recommended by Preacher and Hayes (2008). Based on a 1,000 bootstrap sample, results indicate that the indirect effect of flow on team performance is significant (estimate = .72, $p = .001$, bias-corrected 95% confidence interval of .38 to 1.21).

Furthermore, we compared the hypothesized model (Model A) with two alternative models: a model in which team goal commitment is considered as an antecedent of flow instead

[1] A regression analysis was carried out by including team size as a control variable, but the results were essentially the same as those produced by the correlation analysis.

of a consequence (Model B) and a partial mediation model that involves the addition of a direct path from flow to team performance (Model C). Results indicate that neither these two alternative has a significantly better fit than the hypothesized model (Model B: χ_{diff}^2 [1] = 3.43, p = .06; Model C : χ_{diff}^2 [1] = 2.93, p = .09). The values of fit indices regarding Model B are clearly unsatisfying: $\chi 2$ = 6.50, $\chi 2$ /degrees of freedom ratio = 6.50, the Tucker-Lewis index (TLI) = .21, the comparative fit index (CFI) = .87, and the standardized root mean square residual (SRMR) = .26. Concerning Model C, the path coefficient regarding the relationship between flow and team performance is not significant (p > .08). Taken together, these results mean that the relationship between flow and team performance is fully mediated by team goal commitment, which supports Hypothesis 2.

Testing the Moderation Hypothesis

According to Hypothesis 3, information exchange is likely to moderate the relationship between flow and team performance. In order to test this hypothesis, we used hierarchical multiple regression analysis as suggested by Cohen, Cohen, West, and Aiken (2003). The variables were introduced into the regression model in two successive steps. In the first step, flow and information exchange were added to the regression model. In the second step, we entered a cross-product interaction term involving flow and information exchange. It should be noted that the scores of flow and information exchange were centred in order to reduce the multicollinearity between the variables and the interaction term. A moderating effect is found when the coefficient regression of the interaction term is significant.

The results of the hierarchical multiple regression analysis in Table 3 reveal that information exchange moderates the relationship between flow and team performance. Indeed, the interaction term is significant (β = .23, p = .04) and explains 4% of team performance variance. In order to assess whether the form of the moderation is consistent with Hypothesis 3,

we plotted the regression model at three values of information exchange, namely the mean, one standard deviation below the mean and one standard deviation above the mean of the moderating variable (Cohen et al., 2003). Figure 1 depicts that the form of the moderation is consistent with Hypothesis 3. Indeed, as the level of information exchange decreases, the strength of the relationship between flow and team performance decreases also. Consequently, these results support Hypothesis 3.

Discussion

This study contributes to the advancement of knowledge on flow in many respects. Since it is based on a project management simulation, the study helps us better understand the role of flow experience in a work context, a priority research avenue according to several authors (Fullagar & Kelloway, 2009; Jackson, 2012). Second, the emphasis of this study was placed on the consequences of flow rather than on its antecedents. Since flow is often considered an end in itself, the effects of this psychological state have definitely been less documented that its determinants. Third, this study is distinctive in that it was conducted in a team context. Although the flow state tends to spread from one individual to another (Schiepe-Tiska & Engeser, 2012), as is the case with emotions, studies on flow have more often been conducted at the individual level (Engeser, 2012).

Empirically, the results obtained in this study corroborate the relevance of taking into account the phenomenon of flow to explain work team performance. More specifically, the results show that flow predicts 12% of the team performance variance and that this relationship is fully mediated by members' commitment to team goals. These result support the conceptual model proposed by Landhäußer and Keller (2012), which presents commitment as being at the heart of the relationship between flow and performance. In addition to shedding light on the mediator effect of team goal commitment, this study also identified a factor that may cause

variation in the role of flow in teams. In particular, the results show that the more that team members communicate in the performance of their work, the stronger the relationship between flow and team performance. Considering the interdependent link that unites team members, they should not cut themselves off from their co-workers and should continue to share the information needed to perform their tasks, even if they are in a flow state and are therefore very absorbed in their activity. As indicated by the results of some studies, the experience of flow may result in reducing the focus of attention and cut individuals from the outside world (Schüler, 2012; Thatcher, Wretschko, & Fridjhon, 2008). This psychological state may, however, be quite compatible with the teamwork and the exchange of information, to the extent that members are aware of their interdependence and consider interactions with colleagues as important to their work activities (Heyne et al., 2011; Lin & Joe, 2012). The identification of the moderating effect of information exchange helps us better understand under what condition flow contributes the most to predicting team performance, and it corroborates the importance of taking into account work design in studies on flow (Sawyer, 2007).

Study Strengths

This study has several strengths. First, the inclusion of an objective measure, team performance, contributes to reduce common bias variance (Podsakoff et al., 2003). More specifically, the fact that the dependent variable was not evaluated by team members minimizes the probability that the strength of the relationships between performance and the other variables of the study are over-evaluated. Another methodological strength of this study has to do with sample size. For a study conducted among work teams, the sample is quite sizeable (n = 85 teams), thus enabling us to achieve an appropriate level of statistical power for the analyses. In this research study, the sample size is in fact well above that of samples in previous studies on flow and team performance (e.g., the studies by Admiraal et al., 2011, Bakker et al., 2011, and

Heyne et al. (2011) are respectively based on samples of 54, 39 and 45 teams). Moreover, the fact that this study was conducted using a standardized simulation makes it possible to control task characteristics. Studies show that task characteristics are related to flow experience (e.g., Fullagar & Kelloway, 2009; Neilsen & Cleal, 2010) and performance (e.g., Demerouti, 2006; Kuo & Ho, 2010).

Future Research

Given the encouraging results obtained in the present study, some avenues of research are proposed to further develop knowledge about the experience of flow in the context of work teams. As the study of flow in work teams is in the beginning phase (Engeser & Schiepe-Tiska, 2012; Jackson, 2012), it would be interesting in future research to continue in the same vein by focusing on other possible consequences of flow in relation to team functioning (e.g., cooperation, collaboration) and effectiveness (e.g., quality of group experience, innovation, and team viability). In addition, as this study corroborates that flow is not only an individual phenomenon, but also a collective phenomenon, it would be interesting in future research to study the group factors that may foster the flow state in teams, such as team composition, and group norms.

At the methodological level, future studies should be based on a longitudinal protocol that includes several measurement times in order to test with a greater level of certainty the nomological net (antecedents and consequences) of the flow experience in work teams. As emphasized Landhäusser and Keller (2012), it should be kept in mind that the relationships between flow and its consequences can sometimes be bidirectional. In this study, it is conceivable that the team goal commitment can also feed flow experience by facilitating, for example, the concentration of the individual to perform the activity. A study involving several measurement times would better identify causal links between these variables.

Moreover, even if asking participants to assess their experience after task completion is a prevalent practice in flow research (e.g., Bakker, 2005; Demerouti, 2006; Eisenberger et al., 2005), it would be possible to increase the accuracy of the flow measure by using the Experience Sampling Method (ESM; Hektner, Schmidt & Csikszentmihalyi, 2007). This method, also based on the use of questionnaires, produces data on a participant's experience at different times in a day or an activity, which helps to reduce recall biases and enables researchers to measure the fluctuation of the flow state over time. Another way to evaluate the flow experience while reducing mnemonic biases and without interrupting participants in their task would be to use psychophysiological measures (e.g., electrodermal activity, cardiovascular measures). Without replacing the self-reported measures that are a highly appropriate way to evaluate subjective experiences, psychophysiological measures enable the researcher to triangulate the results and to obtain a more complete understanding of the flow experience (Peifer, 2012).

Finally, considering that this research was conducted with project teams whose members carry out their work together and in the same place, it would be appropriate to replicate the findings of this study with other types of teams (e.g., virtual teams) performing different tasks (e.g., additive tasks). It would also be pertinent, as Heyne et al. (2011) point out, to carry out studies on flow among work teams in organizational settings. By conducting studies in the workplace, researchers could test whether the results obtained in this study can be replicated in a natural environment, and could take into account certain organizational variables (e.g., organizational culture, HR management practices).

Conclusion and Practical Implications

The results of this study corroborate the importance of fostering flow experience among work team members. More specifically, this study shows that flow is not only a determinant of individual performance, but also a determinant of team performance. Hence, team managers

should put in place ways to foster flow in their teams. The interventions must however be compatible with the specific nature of this method of work organization. Compared to a context in which individuals work on individual tasks, team members are interdependent with regard to the work to be done (Hollenbeck et al., 2012). Thus, interventions to foster flow should promote, or at least not compromise, interactions between members. Accordingly, interventions recognized as fostering the flow experience in a team context should take into account the fact that members depend on one another and that they need to communicate with one another to do their work (e.g., setting stimulating shared goals, giving regular collective feed-back). By taking this approach, managers both create work conditions conducive to having their employees experience flow, and promote team performance.

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Table 1

Means (M), Standard Deviations (SD), Average r_{wg},, Reliabilities, and Correlations between Variables

Variable	*M*	*SD*	r_{wg}	1	2	3	4	5
1. Flow	4.84	.42	.85	(.72)				
2. Team goal commitment	4.39	.30	.89	.50**	(.80)			
3. Information exchange	4.24	.38	.82	.25*	.40**	(.81)		
4. Team performance	2.82	1.55	--	.32**	.40**	.18	--	
5. Team size	4.64	.60	--	-.06	.02	.09	.19	--

Note. Reliability estimates (Cronbach's alphas) are in parentheses.

*$p < .05$, two-tailed. **$p < .01$, two-tailed. $N = 85$ teams.

Table 2

Model Fit Summary of Confirmatory Factor Analyses

Model	χ^2	χ^2 / *df*	TLI	CFI	SRMR
Three-factor model	$\chi^2(74)$ = 111.94*	1.51	.89	.91	.077
One-factor model	$\chi^2(77)$ = 202.50*	2.63	.64	.70	.108

χ^2 = chi squared, χ^2 */ dl* = ratio chi squared / degree of freedom, TLI = *Tucker-Lewis index*, CFI = *comparative fit index*, SRMR = *standardized root mean square residual*.

* $p < .01$. $N = 85$ teams.

Table 3

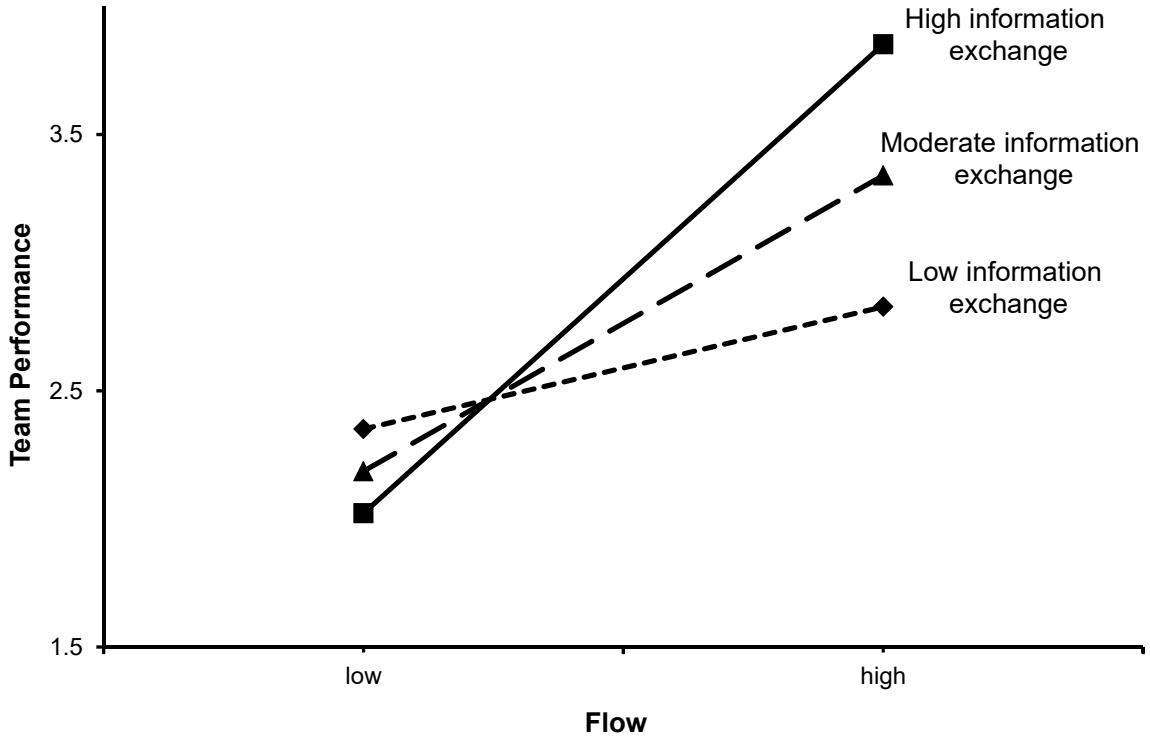
Moderating Effect of Information exchange on the Relationship between Flow and Team Performance

Model		*B*	*SE B*	β	ΔR^2
Step 1	Flow	1.15	.37	.33**	
	Information exchange	.26	.44	.06	.125**
Step 2	Flow	1.35	.38	.39**	
	Information exchange	.37	.44	.09	
	Flow X Information exchange	1.99	.94	.22*	.044*

* $p < .05$, two-tailed. ** $p < .01$, two-tailed. $N = 85$ teams.

Figure Caption

Figure 1. Relationship between flow and team performance for low, moderate, and high levels of information exchange



Appendix

Scale Items Adapted or Created for This Study [a] [b]

Short flow (adapted from Martin & Jackson, 2008)

1. I felt I was competent enough to meet the high demands of the situation.
2. I did things spontaneously and automatically without having to think.
3. I had a strong sense of what I want to do.
4. I had a good idea while I am performing about how well I am doing.
5. I was completely focused on the task at hand.
6. I had a feeling of total control.
7. I was not worried about what others may be thinking of me.
8. The way time passed seemed to be different from normal.
9. The experience was extremely rewarding.

Team goal commitment (adapted from Klein et al. [2001] by Aubé & Rousseau [2005])

1. We were committed to pursuing the team's goal.
2. We thank it was important to reach the team's goal.
3. We really cared about achieving the team's goal.

Information exchange [c]

1. We shared with each of the members information useful for the work
2. We made sure we correctly understood our co-workers' point of view.

Notes. [a] In this study, the measures were administered in French.
[b] The items are formulated in the past given that the participants should refer to their experience during the simulation.
[c] Scale developed for this study.