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Flowing Together: A Longitudinal Study of Collective Efficacy and Collective Flow Among Workgroups

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ABSTRACT. The aim of this study is to extend the Channel Model of Flow (Csikszentmihalyi, 1975, 1990) at the collective level (workgroups) by including collective efficacy beliefs as a predictor of collective flow based on the Social Cognitive Theory (Bandura, 1997, 2001). A two-wave longitudinal lab study was conducted with 250 participants working in 52 small groups. Longitudinal results from Structural Equation Modeling with data aggregated at the group level showed, as expected, that collective efficacy beliefs predict collective flow over time, both being related reciprocally. Findings and their theoretical and practical implications in the light of Social Cognitive Theory are discussed.

Keywords: collective flow experience, collective efficacy beliefs, collective challenges and skills

INDIVIDUALS USUALLY EXCHANGE AND SHARE RELATIONSHIPS, as well as aspects of their affective life and cognitions, and most of these experiences happen inside groups. In the present study, we focus on social interactions within small groups and more specifically on the affective experiences of flow as a social and collective construct. Traditionally flow is supposed to occur at the individual level being an optimal and momentary experience in connection with a specific activity whereby "individuals" are totally focused and absorbed in the activity at

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hand and experience enjoyment while performing this activity (Csikszentmihalyi, 1990; Ghani & Deshpande, 1994). In the current study, we will investigate that flow experiences could also happen at the group level as a kind of shared positive experience.

Flow experiences are traditionally explained by the "*channel model*" (Csikszentmihalyi, 1975, 1990), which has been adapted to work settings (Csikszentmihalyi & LeFevre, 1989). More particularly, a combination of a high level of challenges and a high level of skills is assumed to lead to an increase in the likelihood of experiencing flow. In the same vein, *collective flow* seems to be more likely to occur when a group is performing at the peak of its abilities (Sawyer, 2003). In this regard, a recent multi-sample study (Walker, 2010) even showed that social flow is more enjoyable than solitary flow, thereby supporting the claim that doing it together is better than doing it alone.

From our point of view, performing at the peak of one's own abilities is an important prerequisite to experience flow in groups, but it is even more important for the members of the group to believe that they can do well. According to the *Social Cognitive Theory* (Bandura, 1997, 2001), people's shared beliefs in their collective power to produce the desired results (collective efficacy beliefs) may influence the way group members perceive challenges, according to the group skills, and this may in turn lead people in groups to experience collective flow. Moreover, the other way around is also possible. We mean that experiencing flow as a cognitive but also as an affective psychological positive state (such as collective flow, in this case) could be a source of future efficacy beliefs.

Despite this rationale, little is really known about the role of collective efficacy beliefs in increasing the likelihood of the collective flow experience and, in turn, its reciprocal effect (i.e., the role of collective flow in increasing collective efficacy beliefs over time). The aim of the current study is therefore to analyze the occurrence of group flow experiences by considering efficacy beliefs as both antecedents *and* consequences of flow experiences at the collective (i.e., group) level of analysis. This is what we call the *Extended Channel Model of Flow*.

Collective Flow Experiences at Work

Individual emotions have been widely studied over the past few decades. However, a multi-level perspective is needed when analyzing the emotions in a broader way. Thus, according to the 5-level model of emotion in organizations described by Ashkanasy (2003), in this study we shift from level 2 (individual differences) to level 4 (promulgation of positive emotions at the group level of analysis), both conceptually and methodologically speaking.

Flow experience in work settings can be understood as an optimal experience at work that is characterized by emotional components such as enjoyment and happiness, as well as motivational and cognitive components (Salanova, Bakker, & Llorens, 2006). These flow components are described by Bakker (2005) as

absorption, work enjoyment and intrinsic work motivation. *Absorption* refers to a state of total concentration, whereby employees are totally immersed in their work. Time passes quickly and they forget everything around them (Csikszentmihalyi, 1990). Employees who enjoy their work and feel happy make positive judgments about the quality of their working life (Veenhoven, 1984). This enjoyment or happiness is the outcome of cognitive and affective evaluations of the flow experience (Diener, 2000). Finally, intrinsic motivation, or intrinsic interest, refers to performing a certain work-related activity with the aim of experiencing the pleasure and satisfaction inherent in the activity (Deci & Ryan, 1985).

Further research has also tried to identify the core elements of the flow experience. Thus, in the study by Rodríguez-Sánchez, Cifre, Salanova, and Åborg, (2008) it was shown that the core psychological components of flow were absorption and enjoyment, an intrinsic interest in the task being a kind of requirement prior to starting a specific activity and then experiencing flow (i.e., being absorbed in the activity and enjoying doing it). Moreover, other studies also conceptualize the so-called "core of flow" as the peak experience of being fully absorbed and immersed at work with positive feelings such as enjoyment (Rodríguez-Sánchez, Salanova, Cifre, & Schaufeli, 2011; Rodríguez-Sánchez, Schaufeli, Salanova, Cifre, & Sonnenschein, 2011).

Hence, based on previous research (Bakker, 2005; Salanova et al., 2006) and on further empirical evidence of the core of flow, we conceptualize the core of the flow experience as made up of absorption and enjoyment. It is important to note that the *absorption* component is a broad concept that refers to a state of total concentration whereby people are totally immersed in their activity, whereas it also includes other psychological components of flow such as loss of sense of time, less awareness of self, difficulty to detach from the activity, having new perspectives of the tasks, and so on. In this situation, time flies and workers forget everything else around them (cf. Csikszentmihalyi, 1990). Finally, and more importantly, people also enjoy doing the activity that they are currently engaged in (Ghani & Deshpande, 1994). This involvement in the activity is so strong that nothing else seems to matter at that moment (Csikszentmihalyi, Rathunde, & Whalen, 1993).

A similar psychological process occurs at the group level, i.e. collective flow, which has been described as "a collective state that occurs when a group is performing at the peak of its abilities" (Sawyer, 2003, p. 167). Although the literature on flow as a collective phenomenon is scarce, important steps have recently been taken to differentiate individual/solitary versus collective/social flow (Walker, 2010). One may think that collective or social flow is an experience that is equivalent to solitary or individual flow, as the basic conditions for flow for individuals (matching challenges and skills) have to be fulfilled first.

However, although analogous processes occur in both individual and collective flow, there are some unique characteristics at the social level. These are

grounded in social psychological processes that have to do with emotional contagion among the group members when doing group tasks. Emotional contagion theory posits that people have the innate, inner tendency to mimic facial expressions, postures, and emotions, thereby synchronizing with each other physically and emotionally. This is a rather unconscious process that takes place in an automatic manner (Bavelas, Black, Lemery, & Mullett, 1987; Hatfield, Cacioppo, & Rapson, 1993). In a more conscious process, empathic crossover also provides people working together with a mechanism by which to share a common, affective-motivational shared state. While interacting with a colleague, people are able to recall a similar situation as well as how that event made us feel and so express a similar affective state as the one our colleague is displaying (Westman, 2001). We understand that flow experiences could spread from one member of a group to 'infect' another or other members, so that flow becomes a collective social experience. Moreover, in highly interdependent and interactive situations such as working in groups, people serve as agents of flow for each other and that is why individual flow, while quite enjoyable, is not as enjoyable as collective flow (Walker, 2010).

Hence, this collective shared experience could occur when groups are performing tasks that are sufficiently interdependent and challenging and in accordance with their shared perception of group skills. Although the literature dealing with the phenomenon of collective shared flow or "co-flow" is still scarce (Nakamura & Csikszentmihalyi, 2002), research shows that groups experience collective flow during team sports (Russell, 2001) or while performing math activities in groups (Armstrong, 2008). However, little empirical research has been carried out on the conditions required to experience collective flow among work groups.

To explain the occurrence of collective flow experiences, we took the antecedents of the flow experience as our starting point. Csikszentmihalyi (1975) developed the "Channel Model of Flow," in which flow is assumed to occur when higher challenging activities match the higher person's skills. Indeed, results of empirical analyses of this model have shown that the flow experience is only likely to occur at the individual (Csikszentmihalyi & LeFevre, 1989) and the collective levels (Armstrong, 2008; Walker, 2010) when both challenges and skills are matched at the highest levels. In fact, it is the combination of moderate to high challenges and high skills that leads to flow experiences (Massimini & Carli, 1988; Rodríguez-Sánchez et al., 2011; Llorens, Salanova, & Rodríguez-Sánchez, 2013). Interestingly, Wigfield and Eccles (2001) partially disagreed with the premises of flow theory and contended that people do not necessarily value challenging tasks optimally but, instead, tend to value tasks which they believe they can succeed in. Additionally, one of the conditions that Walker (2010) found in his studies was that "the collective competency of the group is sufficient to dispatch challenge, and group members have task-relevant knowledge & skills about each other" (p. 9). Thus, it would be interesting to know more about the relationships between collective flow and beliefs on group efficacy while performing the tasks at hand.

Collective Efficacy Beliefs and Co-Flow

As previously mentioned, in accordance with Social Cognitive Theory, we understand *collective efficacy* to mean "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1997, p. 447). Even though collective efficacy is a group-level property, the "minds of the individual members who make up the group are the locus of collective efficacy assessment" (Stajkovic, Lee, & Nyberg, 2009, p. 815), and, as a result, the aggregation of individual assessment to evaluate collective efficacy becomes the method preferred by Bandura (1997).

This collective efficacy differs both conceptually and in its results from concepts that are in some respects similar, such as team potency. To sum up, according to Hirschfeld and Bernerth (2008), *team potency* "is a team's perception of its capability to perform well across various tasks", while *team efficacy* (*collective efficacy* in our study) "is a team's perception of its capability to perform well on a given task" (p. 1429). Their outcomes are also different. According to a meta-analysis performed by Stajkovic et al. (2009), collective efficacy fully mediates the relationship between group potency and group performance. Our study focuses on these collective efficacy beliefs.

Moreover, we understand that people's shared beliefs in their collective power to produce the desired results (collective efficacy beliefs) could influence the way people in groups perceive challenges, according to their group skills, and could in turn lead people in groups to experience collective positive experiences such as collective flow or co-flow. Research at the individual level of analysis has found that students with high self-efficacy beliefs spent more time on learning activities and they experienced more flow than those with low self-efficacy beliefs (Bassi, Steca, Delle Fave, & Caprara, 2007). In other words, self-efficacy beliefs clearly influence how people perceive both the challenges of the tasks and the skills they have to perform in order to complete the tasks successfully. In addition, Salanova et al. (2006) found in work settings that self-efficacy beliefs had a positive reciprocal influence on flow among teachers over time.

Thus, it seems that experiencing flow doing a task might predict the efficacy beliefs about the task performance in the future. Considering the affective component of flow, the psychological mechanism underlying this process remains clear from the Social Cognitive Theory: "Moods states can bias attention and affect how events are interpreted, cognitively organised, and retrieved from memory" (Bandura, 1997, p. 111). In this sense, people make positive evaluative judgments when they are in good mood (i.e., flow in our case) and negative ones when they are in bad moods. Then, the role of positive affect (one of the components of flow, such as enjoyment) is clearly a key role when predicting efficacy beliefs. Moreover, recent research at the individual level has shown how efficacy beliefs relate to flow not only directly but also indirectly through the challenges/skills combination, which in turn leads to flow experiences (Rodríguez-Sánchez et al., 2011). In other words, the combination of perceived challenges and skills seems

to be an antecedent or necessary prerequisite of the flow experience (Nakamura & Csikszentmihalyi, 2002) and, although they are necessary, they are not the only prerequisites of the flow experience. For instance, situational conditions (i.e., clear goals and immediate feedback) and also personal conditions (i.e., efficacy beliefs) are important antecedents that can enhance flow (Bassi et al., 2007; Salanova et al., 2006; Sawyer, 2003; Walker, 2010).

However, more empirical evidence is needed to test what kind of relationship exists at the collective level (i.e., between collective efficacy beliefs and co-flow). So far, the need for empirical studies to analyze both antecedents (i.e., the combination of challenges and skills, and collective efficacy beliefs) of flow experiences simultaneously has been stressed in earlier research. For instance, Walter and Bruch (2008) argued in favor of the existence of a reciprocal linkage between positive group affective similarity and group relationship quality, which gives rise to a dynamic, self-reinforcing upward spiral that they called the positive group affect spiral. Tellingly, they also indicated the need for more longitudinal research to confirm this spiral. Following this lead, research by Salanova, Llorens, and Schaufeli (2011) suggested the existence of gain cycles and spirals in workgroups that include collective efficacy beliefs, positive affect and collective task engagement (a concept closely related to co-flow). Therefore, it seems it is now time to analyze these gain cycles while taking into account co-flow experiences.

Therefore, in the current study, we attempted to extend the Channel Model by understanding how efficacy beliefs are an antecedent, as well as a consequence, of co-flow (reciprocal relationships), while also extending the model in the study of flow among groups as a collective characteristic.

Based on previous research, we expect that:

Hypothesis 1: The extended channel model, which includes collective efficacy beliefs as a predictor of collective flow experiences, fits the data better than the original channel model.

Hypothesis 2: Collective efficacy and collective flow are indirectly related through the combination of collective challenges and skills over time. The more collective efficacy there is, the higher the combination of challenges and skills will be and so the higher flow will be over time.

Hypothesis 3: Collective efficacy beliefs and collective flow are reciprocally related in a kind of virtuous cycle over time; that is, the more collective efficacy there is at T1, the more collective flow experiences there will be at T2, and vice versa.

Method

Sample and Procedure

A longitudinal laboratory study was carried out among 250 university students (85% women), who voluntarily participated in three laboratory tasks, with a time lag of one week between each task. Students were randomly distributed across 52 small groups with an average of five students in each. All participants

were informed that their group belonged to the Socio-Cultural task force of their university. The main objective of this service was to develop and promote a creative project about socio-cultural activities. As a group, their goal was three-fold. First, the group had to develop the official program for the so-called Cultural Event Week at the university (Task 0). Second, they had to develop the timetable for that particular week (Task 1) and, finally, they had to design the posters that would be used to promote the Cultural Events Week (Task 2). Therefore, the group had to carry out three creative tasks. In Task 0 (Training task) participants first worked individually, developing their own ideas about five possible activities to be performed in the cultural week. They then went on to work as a group, pooling all the activities and choosing the ten activities considered the most appropriate for the cultural week, while bearing in mind that originality and feasibility would be valued. In Task 1, participants had to distribute the ten selected activities on a weekly timetable that ran from Tuesday to Friday, taking into account what days and what times would be the most favorable for each of the proposed activities. In this task, the originality and viability of the activities were valued. Finally, in Task 2, the group had to design the poster for the cultural week. This poster would be used to promote the cultural week and would be posted around the university and in certain parts of the city. In this task, the originality of the poster design was valued.

It is important to note that this cultural week does actually take place each year at this university and that students often participate in the arrangements for it. As a result, the above tasks were entirely plausible for them. Moreover, the three tasks were related to each other due to the fact that the full task was to develop a creative project during those two weeks as a kind of Socio-Cultural task force. This full goal in turn consisted of three sub-goals corresponding to the three tasks (task 0, task 1, and task 2). All of them were creative tasks (and thus not completely different) and, therefore, they all called for similar collective skills to perform them.

To sum up, all the groups met for three sessions (of three hours each) to perform three different tasks: two idea generation tasks (at T0 and T1) and a group decision task (T2). The first creative task was considered a "training task," or task 0, to test group functioning, and therefore only task 1 and task 2 were analyzed. After finishing tasks 1 and 2, participants filled in a self-report questionnaire with the study variables. Hence, we had two sets of questionnaires for each group member (after task 1 and after task 2). All the groups successfully completed the three sessions and, therefore, they all participated in the study.

Measures

Collective Efficacy Beliefs

We measured "collective efficacy beliefs" by averaging individuals' own perceptions of collective efficacy, as recommended by Earley (1993) using the scale developed by Salanova, Llorens, Cifre, Martínez, and Schaufeli (2003). The

scale consisted of five items ranging from 0 ("never") to 6 ("always"). An example of these items is "I feel confident about the capability of my group to perform this task very well."

Collective flow experience was considered a latent factor with two indicators: a group task absorption scale made up of 6 items (Salanova et al., 2003) and a group task enjoyment scale (two self-constructed items adapted to the laboratory task). An example of a group task absorption item is "When the group is working, we forget everything else around us" and an example item referring to group task enjoyment is: "The group members enjoy themselves while doing the task." The group task absorption scale includes aspects of collective flow experience, such as high attention to group members, loss of sense of time, less awareness of self, surrender of self to group, looking for new perspectives, and so forth (Salanova et al., 2003). These aspects, such as shared intense collective flow experiences with the group tasks, but feelings of joy, elation, and enthusiasm are also shared through group performance. These aspects are also viewed as important referents to differentiate solitary flow from social flow (see Walker, 2010). How often they experienced absorption and enjoyment with the group task was indicated on a seven-point frequency rating scale ranging from 0 ("never") to 6 ("all the time").

We measured the *group challenge and group skills* as a multiplicative composite with two self-constructed items: one referring to the level of challenge that the group task implied for group members ("To what extent has this task had been a challenging task for the group?") and the other concerning the skills that the group perceived they had that allow them to cope with the tasks ("To what extent did the group feel skilled to perform this specific task?"). In both cases, participants indicated the extent to which they agreed with each sentence on a seven-point rating scale (0 = not challenging/not competent at all, 6 = very challenging/very competent). It is important to notice that the balance between challenge and skills is relevant to this composite, but it should also be noted that both challenges and skills need to be at a moderate to high level (see Massimini & Carli, 1988).

Data Analyses

First, we performed the aggregation indices of the team measures in order to know if we can aggregated the data at the group level of analyses. Also, we computed internal consistencies (Cronbach's α) and performed descriptive analyses at the individual level.

The Structural Equation Modelling (SEM) method was then employed to test our hypotheses using the AMOS 18.0 software application. Five competitive statistical models were tested: (1) the Stability Model (M1) without cross-lagged structural paths, but with temporal stabilities and synchronous correlations among variables at T1 and among variables at T2; (2) the Causality Model (M2), which includes additional cross-lagged structural paths from T1 collective efficacy beliefs to T2 collective challenges and skills and to T2 collective flow (note that collective

flow is considered a latent factor made by two indicators: absorption and enjoyment), as well as from T1 collective challenges and skills to T2 collective flow; (3) the Reversed Causation Model (M3), which includes additional cross-lagged structural paths from T1 collective flow to T2 collective challenges and skills and to T2 collective efficacy beliefs, as well as from T1 collective challenges and skills to T2 collective efficacy beliefs; (4) the Reciprocal Model (M4), which includes reciprocal relationships among collective efficacy beliefs, collective challenges and skills and collective flow, thus including all the paths of M2 and M3; and (5) the Constrained Model (M5), in which different parameters are constrained to be equal in order to control for the stability between the constructs from T1 to T2. The measurement errors of the corresponding indicators of T1 and T2 were allowed to co-vary over time (Pitts, West, & Tein, 1996).

Different fit indices were tested: the $\chi 2$ Goodness-of-Fit Statistic, the Goodness-of-Fit Index (GFI), the Adjusted Goodness-of-Fit Index (AGFI), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Incremental Fit Index (IFI), and the Tucker-Lewis Index (TLI). Values below .08 for RMSEA indicate an acceptable fit, while for the remaining indices values greater than .90 indicate a good fit (Hoyle, 1995). Finally, we computed the Akaike Information Criterion (AIC; Akaike, 1987) to compare non-nested competing models; the lower the AIC index is, the better the model fits the data.

Finally, repeated measures Multivariate Analyses of Variance (MANOVA) were conducted to determine whether there were significant differences in the intra-subject dynamics in the variables of the study (collective efficacy, collective challenge and skills and collective flow–absorption and enjoyment) over time. Subsequent univariate Analyses of Variance (ANOVA) and intra-subject contrasts were also performed in order to investigate the trends of each variable over time.

Results

Aggregation of Team Measures

Individual team members responded to team-referent items for each construct being measured, in accordance with the referent-shift model (Chan, 1998). This model is generally preferred over the individual-referenced, direct-consensus method, which may not be able to capture the team-level construct (Klein, Conn, Smith, & Sorra, 2001). Team-level measures were obtained by aggregating responses at the team level – a procedure recommended by the aggregating indices. ICCs were calculated to compare within-team and between-team response variances (ICC[1]) and to assess the reliability of team-level means (ICC[2]) for each scale (Bliese, 2000). Additionally, r_{wg} scores were calculated to assess within-team agreement for each construct (James, Demaree, & Wolf, 1993). For ICC(1), a range of .05 to .20 is considered acceptable and for ICC(2), a value of .80 or higher is generally acceptable (Bliese, 2000). In the case of r_{wg} a value of .70 or higher is considered adequate (Glick, 1985).

TABLE 1. Aggregation of Team Measures (ICC1 and ICC2) ($N = 52$)

Variables	ICC (1)	ICC (2)
1. Col. Efficacy T1	.16	.49
2. Col. Efficacy T2	.20	.55
3. Col. Absorption T1	.18	.53
4. Col. Absorption T2	.13	.41
5. Col. Enjoyment T1	.18	.52
6. Col. Enjoyment T2	.15	.46

Table 1 shows the results of the aggregation at the team level regarding indices ICC(1) and ICC(2). Moreover, the results showed average r_{wg} values for the referent-shift consensus of the judgments of the variables that ranged from .68 to .87 across the two waves in all the study variables. Moreover, these judgments were also consistently high within each wave, with an average value of agreement on the variables of .75 at T1 and .72 at T2, thus indicating substantial agreement among team members.

Note that ICC(2) values are slightly lower than the criterion. As noted by Bliese (1998), ICC(2) values are a function of ICC(1) values and group size. In the present study, there was an average of five respondents per group. This relatively small group size results in a slightly less reliable mean (i.e., a lower ICC[2] value). Since this unreliability is likely to attenuate relationships observed at the group level, we can say that the ICC(2) values were less than optimal. In light of all the evidence regarding the r_{wg}, ICC(1) and ICC(2), we proceeded to create aggregate measures of the study variables at the team level.

Descriptive Analyses

Table 2 displays the results of the descriptive analyses, which are the internal consistencies (Cronbach's α) and intercorrelations of the scales. All α-values met the .70 criterion. As expected, the pattern of correlations shows that all scales were significantly and positively related, both synchronically and longitudinally. The results of Harman's single factor test with CFA (Iverson & Maguire, 2000) on T1 variables revealed that the fit of the single factor model was quite poor. Further analyses revealed that its fit was significantly poorer than the model with two related latent factors and the observed balance variable [$\Delta\ \chi^2(2) = 174.458$, $p < .001$]. Consequently, we do not consider common method variance to be a serious problem in our current dataset.

TABLE 2. Means (M), Standard Deviations (SD), Internal Consistencies (Cronbach's *a*), and Zero-Order Correlations ($N = 250$)

Variables	M	SD	α	1	2	3	4	5	6	7	8	9	10	11
1. Col. Efficacy T1	6.89	.99	.93	—										
2. Col. Efficacy T2	6.86	1.03	.95	.72	—									
3. Col. Absorption T1	4.31	.56	.89	.61	.48	—								
4. Col. Absorption T2	4.27	.63	.91	.53	.55	.75	—							
5. Col. Enjoyment T1	4.16	.63	.67	.58	.47	.79	.68	—						
6. Col. Enjoyment T2	4.23	.73	.70	.55	.59	.65	.83	.65	—					
7. Col. Challenge T1	4.38	.69	—	.35	.30	.55	.52	.48	.46	—				
8. Col. Challenge T2	4.31	.79	—	.30	.33	.41	.51	.35	.47	.62	—			
9. Col. Skills T1	4.35	.66	—	.50	.43	.54	.45	.52	.45	.39	.29	—		
10. Col. Skills T2	4.26	.53	—	.37	.49	.38	.50	.35	.53	.42	.48	.38	—	
11. Col. ChallXSkills T1	19.63	4.99	—	.50	.42	.62	.55	.59	.51	.81	.52	.83	.45	—
12. Col. ChallXSkills T2	19.13	4.70	—	.37	.43	.39	.52	.38	.54	.60	.84	.35	.82	.55

Note. Col. = Collective; T1 = Time 1, T2 = Time 2; all variables superior to .30 were significant at $p < .01$.

TABLE 3. Original Channel Model Fit ($N = 52$ Groups): Structural Equation Modeling Analyses

Model	χ^2	df	GFI	AGFI	RMSEA	CFI	IFI	TLI	AIC	Difference test
M1. Stability	36.50	6	.85	.46	.31	.89	.89	.72	66.50	
M2. Causality	27.69	5	.88	.40	.30	.92	.92	.75	59.69	a = 8.81 (1)**
M3. Reversed	34.69	5	.84	.32	.34	.89	.89	.67	66.69	a = 1.81 (1)ns
										a = 7 (0)
M4. Reciprocal	26.07	4	.87	.29	.33	.91	.92	.69	60.07	a = 10.43 (2)**
										a = 1.62 (1)ns
										a = 8.62 (1)***

Note. $\chi 2$ = Chi-square; df = degrees of freedom; GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; IFI = Incremental Fit Index; TLI = Tucker-Lewis Index; AIC = Akaike Information Criterion.
ns = non-significant; a = Chi-square difference.
*$p < .01$. **$p < .005$. ***$p < .0025$.

Hypothesized Structural Model

First of all, the *Original Channel Model*, including the multiplicative combination of collective challenges and skills as a predictor of collective flow experience, was tested using longitudinal SEM with two waves. The results (see Table 3) showed that the fit indices of the models were poor. So even when constraining the model, the Channel Model presented some deficiencies that led us to reject it. The RMSEA also exceeded the .08 criterion in all the models tested (Browne & Cudeck, 1993).

Then we tested the second model, i.e. the *Extended Channel Model* by including collective efficacy beliefs. As seen from Table 4, the statistical models that included collective efficacy indicated a good fit. Moreover, the constrained *reciprocal model* (M5), which includes only the significant paths (see Figure 1), was superior to the rest of the models, with all fit indices meeting their corresponding criteria. In this reciprocal model the AIC index was also the lowest, thereby suggesting the relevance of the causal cross-lagged path from T1 collective efficacy beliefs to T2 collective flow, and also the reverse path from T1 collective flow to collective efficacy at T2.

These results confirm *Hypothesis 1*, where we expected the *Extended Channel Model* (which also included collective efficacy as a predictor of collective flow experience) to show a better fit to the data than the *Original Channel Model* (which only included the combination of challenges X skills). However, results only partially confirmed *Hypothesis 2*, since collective efficacy at T1 led directly to collective flow at T1 and at T2, and indirectly through the combination of collective

TABLE 4. Extended Channel Model Fit ($N = 52$ Groups): Structural Equation Modeling Analyses

Model	χ^2	df	GFI	AGFI	RMSEA	CFI	IFI	TLI	AIC	Difference test
M1. Stability	83.45	26	.81	.60	.21	.90	.91	.83	141.45	
M2. Causality	67.91	23	.83	.59	.19	.92	.93	.85	131.91	a = 15.54 (3)**
M3. Reversed	45.66	23	.86	.67	.14	.96	.96	.92	109.66	a = 37.39 (3)***
										a = 15.54 (0)
M4. Reciprocal	38.86	25	.88	.73	.10	.98	.98	.96	98.86	a = 44.59 (1)***
										a = 29.05 (2)***
										a = 6.8 (2)*
M5. Constrained	31.42	24	.90	.77	.07	.99	.99	.98	93.42	a = 52.03 (2)***
										a = 36.49 (1)***
										a = 14.24 (1)***
										a = 7.44 (1) *

Note. $\chi 2$ = Chi-square; df = degrees of freedom; GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; IFI = Incremental Fit Index; TLI = Tucker-Lewis Index; AIC = Akaike Information Criterion.
ns = non-significant; a = Chi-square difference.
$^*p < .05$. $^{**}p < .005$. $^{***}p < .001$.

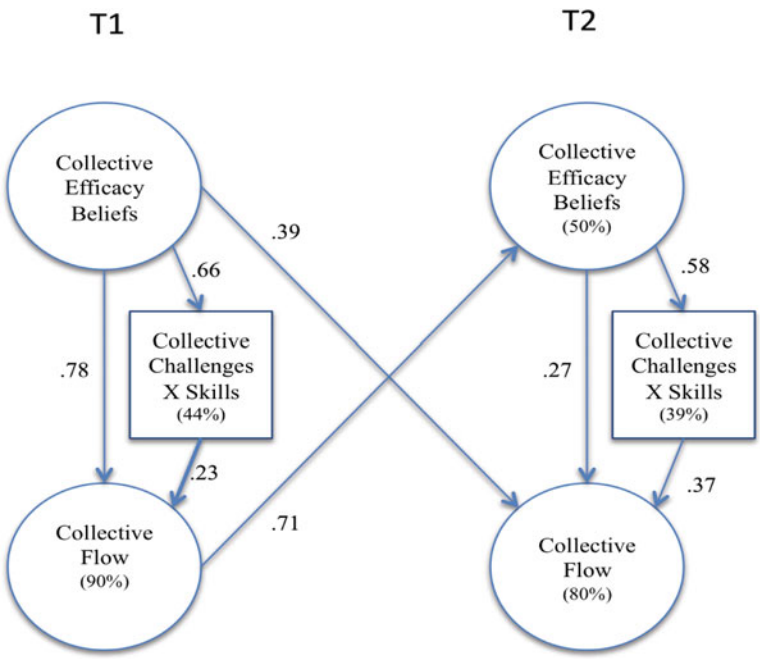

FIGURE 1. Structural path coefficients of the longitudinal Extended Channel Model (*N* = 52 groups). Only significant paths are shown in this figure. Explained variance between parentheses. (Color figure available online).

challenges X skills, but only at T1. Thus, results confirmed the synchronic as well as the longitudinal relationships between collective efficacy beliefs and collective flow. However, the relationship between the combination of collective challenges X skills and collective flow was not significant over time due to only synchronic relationships were found (in T1 and in T2).

Moreover, *Hypothesis 3* was partially confirmed, since collective efficacy beliefs and collective flow were both reciprocally related. However, a repeated measures MANOVA test considering the main variables showed non-significant multivariate effects for the main effect of time (T1, T2), Wilk's Lambda = .899, F(4, 48) = .27 n.s., multivariate $\eta 2 = .101$. The subsequent univariate follow-up repeated measures ANOVAs indicated that there was no main effect of time for all the variables in the study, i.e. for collective efficacy F(1, 51) = .045, n.s.; collective challenge and skills F(1, 51) = 1.231, n.s.; collective enjoyment F(1, 51) = 1.01, n.s.; and collective absorption F(1, 51) = .63, n.s. To date, although positive and reciprocal relationships have been found among collective efficacy and flow over

time, there were not significant increments in mean values of collective efficacy and collective flow from T1 to T2.

Discussion

The current study focuses on collective efficacy beliefs as a potential antecedent of collective flow, thereby extending the original *Channel Model* (Csikszentmihalyi, 1975, 1990). Results provide partial evidence to support our predictions. In particular, *Hypothesis 1*, which assumed that the fit of the *Extended Channel Model* is superior to that of the *Original Channel Model*, was confirmed. But *Hypotheses 2* and *3*, which both refer to the virtuous cycle over time, were only partially confirmed, since results showed that the relationship between collective efficacy beliefs and collective flow was synchronic and cross-lagged (in the sense of a reciprocal influence), whereas the relationship between the combination of collective challenges X skills and collective flow was not confirmed over time. The increment (H3) in the mean values of the studied variables over time was not confirmed neither.

Findings show the superiority of collective efficacy beliefs in their prediction of collective flow over time. And, interestingly, a feeling of collective flow at the group level also predicts how efficacious the group will feel over time. Then, our findings suggest a kind of reciprocal relationship between efficacy and flow over time. As expected, findings provide empirical support and confirm the idea that experiencing collective flow is not only due to the combination of high challenges X high skills, but also a belief in one's skills as a means to overcome the challenge in the activity at hand in the future.

This finding is based on the predictions of Bandura's Social Cognitive Theory (2001), which claims that the beliefs individuals and/or groups hold about their efficacy influence their perception of both their skills and the challenges they must cope with. In line with this theory, the power of efficacy beliefs is demonstrated in the current study in two ways. First, groups with high collective efficacy beliefs are very likely to experience more flow (synchronically and over time). And, second, groups with high collective efficacy beliefs perceive more challenges immediately and feel more competent (skilled), which in turn has an impact on synchronic collective flow experiences. Hence, these findings support the idea that efficacy beliefs influence how people/groups feel, as well as the perception of their own capabilities to cope with challenges.

Theoretical and Practical Implications

Our findings have two main theoretical implications. First, the results regarding the relationship between collective efficacy beliefs and collective flow over time confirm the idea that positive affect (i.e., flow) is a consequence of feeling efficacious, but also is a source of efficacy beliefs over time (Bandura, 1997,

2001), that is to say, the positive experience of collective flow at T1 is positively related to collective efficacy at T2. As Bandura (1997) concluded, "... mood and efficacy beliefs are related both concurrently and predictively" (p. 113). Second, the results concerning the role of the combination of challenges and skills support the idea (although only synchronically but not over time) that the combination of challenges X skills is always a prerequisite of the immediate flow experience, since it is closely related to the specific task at hand. That is, according to the Channel Model of Flow (Csikszentmihalyi, 1975, 1990), the combination of high challenges and skills is an immediate and necessary antecedent to experiencing flow. In sum, including efficacy beliefs in the *Channel Model* is indeed a step forward, which Bassi et al. (2007) also began to develop. The combination of Social Cognitive Theory and the Channel Model has proved that the more complete model including collective efficacy is better at explaining the optimal experiences in groups, especially over time.

Unfortunately the relationship between the combination of collective challenges X skills and collective flow was not confirmed over time. This might be explained by the fact that, although the two tasks were quite similar (creative tasks), challenges and skills are closely related to the very specific task at hand, and its consequent flow experience. Therefore, the difference in challenges and skills that are required for the different tasks could be the reason why the collective efficacy belief of performing a task in the future can be developed and transferred in time, but not the specific challenges and skills needed to perform particular tasks, at least at the group level.

However, in studying collective phenomena, more research is required on the concept of collective flow. It needs to be studied from a broader perspective, especially because it should be considered as something more than the sum of individuals' flow experiences. Additionally, apart from the task, more antecedents and conditions such as feedback from the fellow group members could be influencing this collective experience. In fact, some recent research (Walker, 2010) suggests that collective flow consists of a far broader array of experiences. For instance, Walker mentioned that such additional components of collective flow include high attention to group members, loss of sense of time, less awareness of self, surrender of self to group, emotional communication, group desire to repeat the experience, and so forth. More research considering further components of collective flow, and especially the intensity, should be conducted in the future to unravel this intriguing phenomenon at the collective level.

From a practical perspective, the results obtained provide practical evidence of the need to (re)design group tasks in order to increase perceptions of shared challenges and skills. Thus, only those tasks characterized by high challenges performed by highly skilled groups will provide groups with the chance to immediately experience flow (Csikszentmihalyi, 1990; Eisenberger, Jones, Stiglhamber, Shanock, & Randall, 2005). The opportunity to work in contexts characterized by

challenging tasks with matching levels of skills will foster healthy groups with more collective flow experiences over time. In that sense, group training (increasing the levels of collective efficacy beliefs among groups) plays a pivotal role in generating this collective flow over time.

Limitations and Future Research

Despite the relevance of this study, the results must be interpreted with caution, considering its limitations, the first of which is the use of self-report questionnaires to collect the data. Use of such a method may mean that our results are affected by common method variance. However, we checked the potential impact of common method variance on our data (see Podsakoff, Mackenzie, Lee, & Podsakoff, 2003) and all results were negative. More importantly, we use self-report measures because we really think that all group members are best suited to self-report shared flow and efficacy beliefs because they are the ones who are aware of the subtle things they do in their group task that make them "flowing" and efficacious. We are also interested in "perceived collective flow" and efficacy beliefs and so self-reports are theoretically the most relevant method of measurement.

Second, our study lacks objective performance measures. Although it was not the aim of our study, and it was not included in the laboratory design, in future research knowing how this relationship between collective efficacy and flow has an impact on performance over time might be of interest for theoretical and practical purposes.

Third, this study is limited to a laboratory workgroup context. Since the main hypotheses regarding causal relationships between collective efficacy and collective flow were confirmed, it would be interesting and relevant for future research to test these findings with "real teams" working in "real organizations" in order to determine their ecological validity.

Finally, a large proportion of the sample was made up of women and accordingly the groups also contained mostly women. This means that results should be interpreted with caution because we can only generalize findings to similar group characteristics (groups with more women than men). Future research may address how group characteristics (such as gender diversity) influence the conditions required to experience collective flow.

Final Note

This study represents a step forward in the research on the collective nature of flow and efficacy beliefs relationships. It closes the gap highlighted in previous studies regarding the analysis of flow antecedents by longitudinal studies at the collective (group) level of analysis. This study extends the Channel Model of Flow at Collective level, demonstrating the key role played by the Collective Efficacy Beliefs as antecedent of collective flow over time. Also the reciprocal relationships between collective flow and collective efficacy beliefs over time were shown. However, the role of task challenges and group skills on collective flow

over time keeps unclear, probably due to the specificity of the tasks. Although more studies are needed, this study means a first step toward the empirical study of collective flow at work, and provides some tips about the key elements that have to be considered when promoting flow experiences at work—not only in individuals but also in groups.

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