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Cogent Psychology (2019), 6: 1643962

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Received: 01 May 2019
Accepted: 05 July 2019
First Published: 17 July 2019

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Reviewing editor:
Juliet Wakefield, Psychology, Nottingham Trent University, United Kingdom

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Abstract: Research has shown that the psychological experience of flow delivers great benefits in all aspects of life, including work settings. But, flow is typically studied at the individual level, even though work often comprises complex tasks performed in teams. Therefore, the focus of this study is on team flow, defined as a shared experience of flow during the execution of interdependent personal tasks in the interest of the team, originating from an optimized team dynamic and typified by seven prerequisites and four characteristics. We developed and tested the Team Flow Monitor as an instrument to assess team flow and related outcomes. The empirical findings of 110 teams support the operationalization of team flow as a second-order model that consists of two factors. Moreover, team flow related positively to individual and team outcomes. These findings suggest that team flow can serve as an important indicator in the management of work teams.

Subjects: Testing, Measurement and Assessment; Social Psychology; Work & Organizational Psychology

Keywords: flow; happiness; teams; team performance; team flow; multilevel theory

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PUBLIC INTEREST STATEMENT

Professional organizations and institutions increasingly try to benefit from team collaborations to boost their performance. Simultaneously, they are taking an active interest in the well-being of their employees. Research on flow has shown that flow leads to increased performance, job satisfaction, happiness, creativity, and meaning. Creating a climate conducive to team flow experiences might have many benefits for the individual, the team, and the organization. But, the research field lacks an instrument to measure flow at the team level and monitor the possible benefits of team flow. Thus, we have created and validated an instrument to serve that purpose.

1. Introduction

As a result of increased competitiveness, technological development, and globalization, the problems organizations face today are so complex that a single individual does not possess sufficient knowledge to solve them (Kozlowski & Bell, 2003). As a result, teams have been emerging as a source of creativity, productivity, and innovation in the workplace, and their effectiveness is now considered one of the major determinants of organizational success. Consequently, the business world needs to know how to enable teams to deliver optimal performance and to work together as a coherent unit. An emerging field of team research suggests that the key to optimized team performance may lie in the experience of team flow (Sawyer, 2006, 2007; Van den Hout, Davis, & Weggeman, 2018).

Team flow (Van den Hout et al., 2018) is an extension of Csikszentmihalyi's (1975, 1990, 1997) research on optimal experience (which he called *flow*), and reflects a synergistic feeling of unity among team members while working toward a common purpose (cf. Sawyer, 2006). The shared flow experience is considered to be highly conducive to team effectiveness as it enables teams to perform at the peak of their abilities (Sawyer, 2006; Van den Hout et al., 2018). Multi-person forms of flow have mostly been researched in sports teams and music groups, showing positive relationships with group or team processes and outcomes (Bakker, Oerlemans, Demerouti, Slot, & Ali, 2011; Sawyer, 2003; Zumeta, Basabe, Wlodarczyk, Bobowik, & Páez, 2016). As of yet, though, relatively little research has examined the performance-enhancing effects of team flow in the work environment. Moreover, the studies that have been conducted in the work context have typically assessed individual rather than shared experiences of flow (e.g. Bakker, 2005; Demerouti, 2006; Fullagar & Kelloway, 2009; Nielsen & Cleal, 2010), which can disregard the synergistic and collective aspects that are often considered crucial to explaining the impact of team-level emergent states (e.g. cohesion, trust) on team effectiveness (Marks, Mathieu, & Zaccaro, 2001). Therefore, we argue that team flow is likely to have a much stronger explanatory power when it is conceptualized and operationalized as a shared phenomenon manifesting itself as a characteristic of the team as a whole rather than summing the experiences of individual members. But, this does leave a considerable research gap to be filled for measuring the collective team flow experience and determining its impact on team effectiveness in the work environment.

To fill this lacuna, the aim of the current research is to develop a measure of collective team flow specifically for the work context, and to empirically relate the collective team flow experience to both individual-level and team-level work outcomes (team performance, team positivity, and happiness). We do this based on a conceptualization of collective team flow recently developed by Van den Hout et al. (2018). In the following paragraphs, we briefly review the existing literature on (team) flow and the conceptualization of the team flow construct, introduce the newly-developed Team Flow Monitor, and present the empirical evidence obtained with the Team Flow Monitor for the prevalence and impact of team flow in a variety of work contexts.

2. Theoretical backgrounds

2.1. Flow at work

Flow is defined as "a holistic sensation people experience when they act with total involvement" (Csikszentmihalyi, 1975, p. 36; cf. Nakamura & Csikszentmihalyi, 2009). Flow is a gratifying experience of deep involvement in which an individual is completely absorbed in a task and experiences tremendous feelings of energy, focus, involvement, and success in the process of task completion (Csikszentmihalyi, 1990, 1996, 1997). At the individual level, the psychological experience of flow has a close relationship with higher-level performance (Landhäußer & Keller, 2012) and is seen as a motivating force for excellence (Engeser & Rheinberg, 2008). Unsurprisingly, there is increasing interest in flow and a general desire to understand how to promote flow in organizations (Fisher, 2010). Nevertheless, studies on flow in the workplace are still relatively rare, and those that have been conducted mainly concerned the prerequisites of flow rather than its consequences and

assessed flow at the individual rather than the team level (e.g. Bakker, 2005; Demerouti, 2006; Fullagar & Kelloway, 2009; Nielsen & Cleal, 2010).

2.2. Existing studies of flow in teams

Flow has been studied in collective settings, such as sports teams (Bakker et al., 2011; Jackson, 1995; Jackson & Eklund, 2004; Jackson, Kimiecik, Ford, & Marsh, 1998; Russell, 2001), music groups (e.g. Zumeta et al., 2016) and work groups (e.g. Salanova, Rodríguez-Sánchez, Schaufeli, & Cifre, 2014). Bakker et al. (2011), for example, studied team members' flow experiences among young soccer players and found that team members experienced more flow when their coaches offered more social support and performance feedback. Heyne, Pavlas, and Salas (2011) studied flow in teams performing a complex planning task in the lab and found positive links with both team processes and performance. Similar effects were found by Aubé, Brunelle, and Rousseau (2014) who studied flow in 85 student teams participating in a project management simulation. Their findings showed a positive correlation between team members' flow experiences and team performance, which was influenced by team goal commitment and the level of information exchange between team members. The more team members communicated, the stronger the relation. Finally, Keith, Anderson, Dean, and Gaskin (2014) found a positive relationship between team flow and team performance in a video game experiment.

Each of these studies highlights the positive potential of flow experiences in the team context and how to establish or enhance these effects. However, using measurement scales with items formulated at the individual level, these studies represented individual flow experiences in a team context rather than the collective flow experience of the team as a whole. This issue has been identified as a major weakness and further research is needed for the study of team flow (cf. Heyne et al., 2011). According to Sawyer, team flow "cannot be reduced to psychological studies of the mental states or the subjective experiences of the individual members" (2003, p. 46), as the phenomenon stems directly from the interactions occurring within the team, thereby positively influencing the experience and performance of the team as a whole. Consider the following example:

> Surgeons say that during a difficult operation they have the sensation that the entire operating team is a single organism, moved by the same purpose; they describe it as a 'ballet' in which the individual is subordinated to the group performance, and all involved share in a feeling of harmony and power (Csikszentmihalyi1990, p.65).

It is difficult to imagine an operating team performing at its peak when the subtle dynamics described here are being disturbed by one or two members "just not feeling it". Indeed, team sport athletes describe team flow with statements such as "we just clicked," "we were in the zone," and "there was chemistry among us," typically referring to it as a collective experience.

To the best of our knowledge, flow has been assessed as a collective team-level phenomenon in only two studies. Salanova et al. (2014) established a longitudinal, reciprocal relationship between collective efficacy beliefs and team flow based on a task absorption scale and a task enjoyment scale, leaving other elements of the flow experience unassessed. Zumeta et al. (2016) used an adapted version of the Jackson and Marsh's (1996) Flow State Scale to show that shared flow experiences promoted personal wellbeing and social cohesion in collective tambours/drummer (Tamborrada) gatherings. Both studies thus used adapted versions of existing individual-level (flow) scales, but offered limited discussion and analysis about the precise team-level conceptualization of the collective flow experience, and the measures were not adequately tested for psychometric validity. To move the research on team flow forward, scholars need a psychometrically-valid instrument that can assess the collective flow experiences in business teams from a solid theoretical conceptualization. In the following sections, the team flow construct is conceptually defined and distinguished from other related concepts.

2.3. The conceptualization of team flow

Extending Csikszentmihalyi's (1975, 1990, 1997) flow model to the team level, Van den Hout et al. (2018) have provided a detailed conceptualization of team flow as a collective flow experience. They define team flow as a shared experience of flow during the execution of interdependent personal tasks in the interest of the team, originating from an optimized team dynamic and typified by seven prerequisites and four characteristics. According to their conceptualization, team flow starts with the establishment of a collective ambition from which the team develops the other six prerequisites of team flow, namely: common goals, personal goals aligned to those common goals, high skill integration, open communication, safety, and mutual commitment. These prerequisites, once in place, lead to experiences of the characteristics of team flow, which are: a sense of unity, a sense of making progress together, mutual trust, and holistic focus. We provide a brief description of the team flow elements below and refer the reader to Van den Hout et al. (2018) for a more extensive discussion of these prerequisites and characteristics of the team flow concept.

The prerequisites of a team flow experience are:

(1) A *collective ambition* that constitutes the team's reason for existence, represents its members' shared values and mutual recognition, and instills in them a gratifying shared sense of intrinsic motivation to operate as a team (Posner, Kouzes, & Schmidt, 1985; Ready & Truelove, 2011; Weggeman, 2007).

(2) A clear *common goal*, internalized by all team members (cf. Sawyer, 2007), that is challenging, meaningful, compatible with members' individual goals, and growth-promoting.

(3) *Aligned personal goals*: specific goals for each team member that align with the team's collective ambition and contribute to its common goal. These personal goals should be proximal, challenging, clearly defined, meaningful, and specific, and should provide the individual with opportunities for growth and development (Locke & Latham, 2006; O'Leary-Kelly, Martocchio, & Frink, 1994).

(4) *High skill integration*: During task distribution, all members should be assigned tasks or roles that suit their individual preferences, talents, knowledge, and skills (Katzenbach & Smith, 1992; Salas, Cooke, & Rosen, 2008). To facilitate this, the team members should have high, but roughly comparable, levels of relevant skills, some of which are unique to each team member. Their roles on the team should be tailored to make the most of each team member's unique skill set. This ensures that individual abilities will be optimally utilized and combined to create synergy through collaboration.

(5) *Open communication*, which ensures that all team members know exactly how each of them contributes to the team (Sawyer, 2007). This way, each team member has their perspective broadened by the other members of the team, which has previously been identified as a condition of interpersonal flow (Snow, 2010). That requires unambiguous, constructive, and timely feedback about each individual's personal task, the joint team task, and the process of collaboration. This kind of feedback helps team members to build on their interactions and achieve the common goal efficiently and effectively (Guzzo & Salas, 1995) while also listening to each other and building familiarity (cf. Sawyer, 2007). It also provides "immediate feedback" about the joint progress being made (cf. Csikszentmihalyi, 1996).

(6) The *safety* required to create a team environment that celebrates success but allows for failure, which in turn gives teams the freedom they need to take necessary risks by making them feel it is safe to take action. Team members need this psychologically safe space to perform personal tasks in the interest of the team (cf. Edmondson, 1999). Creating a safe environment requires the elimination of unnecessary and unacceptable risks while allowing for and acknowledging the possibility that any team member may fail. The goals, after all, were chosen to be challenging so as to invite the application of high levels of skill. Safety within the team environment decreases each individual team member's worries about their

performance or peer censure (cf. Snow, 2010). As Sawyer (2007) notes, this uses the potential for failure to push the group towards the flow experience rather than scaring them away from it.

(7) *Mutual commitment*, which requires team members individually to commit to the common goals, to understand by which processes those goals are to be attained, to know how each member of the team will contribute to attaining them, and to stay informed about the current state of the project. Team members keep one another on task by using task-oriented behavior and accountability to create the ideal team dynamic for achieving the common goal (cf. Katzenbach & Smith, 1993).

In the presence of the abovementioned prerequisites, the following four characteristics of team flow may emerge:

(1) *Holistic focus*, which is a shared focus that occurs when the intense collaboration between team members gives rise to a collective consciousness as they strive towards the collective ambition, focusing on their cooperation as well as the achievement of their goals. This form of "holistic focus" is comparable with Snow's (2010) interpersonal flow condition of "having total concentration on the shared activity."

(2) A *sense of unity*, which involves a shared feeling that the team has merged to form a unit by expressing its collective ambition, which is a form of cohesion and a blending of egos (cf. Sawyer, 2007).

(3) A *sense of joint progress*, which is simply awareness of the team's constantly- effortless expanding catalogue of synergistic accomplishments.

(4) *Mutual trust*, which can be described as the willingness to be vulnerable, in this case by being entirely dependent on one another. This willingness arises out of a shared feeling of confidence that, together, the team can achieve its common task. When there is trust, team members do not worry about failure. They confidently take action because of the acceptance and support they receive in the safety of the team environment.

This conceptualization of team flow highlights that individual team members are experiencing individual flow simultaneously, along with a collective experience, while executing their personal tasks for the team's purpose. Moreover, it emphasizes the role of the team's own dynamics in facilitating the collective flow experience. Only when the seven prerequisites of team flow are present it is possible for the four characteristics of team flow to emerge.

2.4. The dimensional structure of team flow

In sum, we have conceptualized team flow as a shared experience during the execution of interdependent personal task, originating from an optimized team dynamic and typified by seven prerequisites and four characteristics. Together, the team flow prerequisites and characteristics will create a collective team experience in which all participating members are completely involved in their common activity, and are working together intuitively and synergistically toward the common purpose (cf. Sawyer, 2006, 2007). Therefore, we propose a second-order two-factor model for team flow in which the prerequisites and characteristics together represent the team flow concept. Additionally, we propose that the team flow prerequisites are requirements for the emergence of the team flow characteristics (see Figure 1). Hence, our first hypothesis is as follows:

Hypothesis 1a: The eleven elements of team flow form a second-order factor model with two factors representing the seven prerequisites and four characteristics of team flow.

Hypothesis 1b: The prerequisites for team flow relate positively with the characteristics of team flow.

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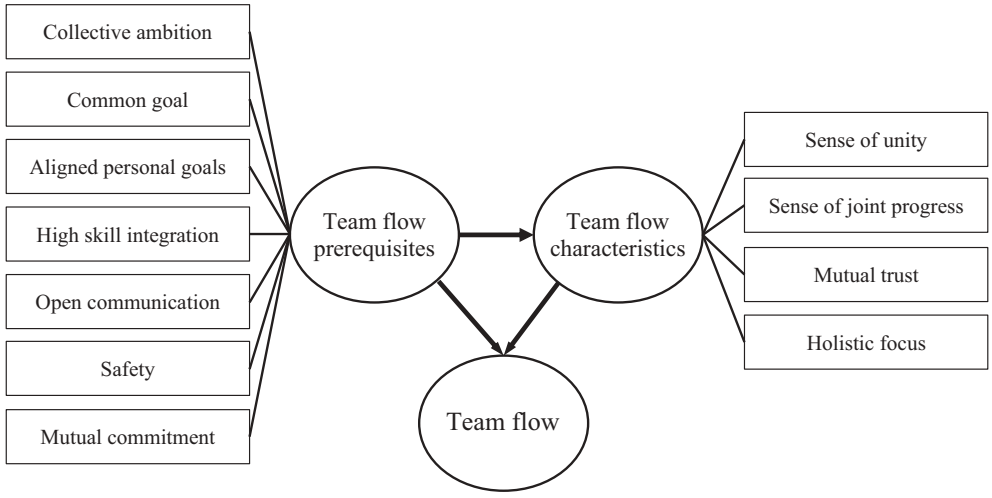

Figure 1. Second-order model of team flow.

2.5. The consequences of team flow

Given the positivity of the team flow experience, and the many benefits related to flow (see Csikszentmihalyi, 1990, for an overview), it is likely that team flow likewise engenders many positive results. For instance, in flow, one is fully committed to and focused on the task at hand, performing it seemingly without effort (effortless action; Csikszentmihalyi, 1990, 1996; Nakamura & Csikszentmihalyi, 2009). This optimal experience in which participants are deeply motivated to persist in their activities will tend to lead to better performance (Landhäußer & Keller, 2012). Moreover, acting on their intrinsic motivation (or desires) will also bring the team members satisfaction, enjoyment, and well-being, much as it does in the individual flow experience—it might even be possible that these post-flow feelings are stronger after they have been experienced at the team level. Research by Walker (2010) found that highly social and/or interactive games were experienced as more enjoyable by players than less interactive or more solitary games. One interpretation of that result is that people derive joy from the additional challenge of coordinating their performance with others. Csikszentmihalyi (1990) suggests a similar explanation regarding other dyadic activities, such as conversation. These stronger experiences of satisfaction, enjoyment, and well-being can also be enhanced by sharing them with teammates.

In flow, people operate in challenging situations where they have to show high levels of (sometimes new) skills to stay in control (Asakawa, 2004). In teams, teammates can support one another's skills by giving feedback that allows for real-time improvement on task performance, which enhances their ability to execute tasks. For instance, this was evident in a study by Aubé et al. (2014), where it was represented as the moderation of the level of information exchange between team members.

During the team flow experience, each member is contributing to the team's common purpose as part of the holistic focus, which is more likely to occur when all team members find that purpose meaningful and buy into it completely (which correlates with higher levels of intrinsic motivation; Appelbaum & Batt, 1994; Campion, Medsker, & Higgs, 1993). Meaningfulness is enhanced by teams perceiving their work to be worthwhile and important, and task meaningfulness at the group level correlates positively with collective performance (Stewart, 2006).

Higher performance due to team flow does not mean that the team "wins" necessarily, but rather that, all else being equal, the team performs better than it would have in a situation in which team flow is less prevalent. Indeed, when team members experience team flow, better performance becomes more likely due to the fact that team members can correct and support

each other with constructive or positive feedback. These higher performances connote mastery experiences that can enhance self-efficacy at both the personal and team levels (see Gully, Incalcaterra, Joshi, & Matthew, 2002, for a review; cf. Csikszentmihalyi, 1990, 1997), which can incite team members' motivation to exert more effort more persistently (cf. Bandura, 1982), to reconvene to tackle greater challenges (Sawyer, 2007), and to refrain from letting down their fellow team members (Lencioni, 2002).

To summarize, we contend that team flow is a strong predictor of team outcomes, such as team performance and team positivity, as well as team member outcomes, such as happiness and the percentage of time spent experiencing task flow (see Figure 2). This brings us to the following two hypotheses:

Hypothesis 2: Team flow (prerequisites and characteristics) will relate positively with individual-level work outcomes (i.e. happiness [Hypothesis 2a], time in task flow [Hypothesis 2b]).

Hypothesis 3: Team flow (prerequisites and characteristics) will relate positively with team-level outcomes (i.e. team positivity [Hypothesis 3a], team performance [Hypothesis 3b]).

In summary, team flow may be the best available indicator of team functioning, its absence signaling problems in the team dynamic long before other indicators (e.g. low motivation, low performance) reveal themselves. That makes it highly valuable for monitoring team functioning. The conceptualization of team flow as a shared experience of flow during the execution of interdependent personal tasks in the interest of the team offers an important new indicator for organizational theorists and practitioners seeking to capture and foster the experience of optimal team function. But, a valid assessment of the emergence of team flow and its consequences requires the development and validation of a dedicated instrument to measure collective flow experiences in the workplace.

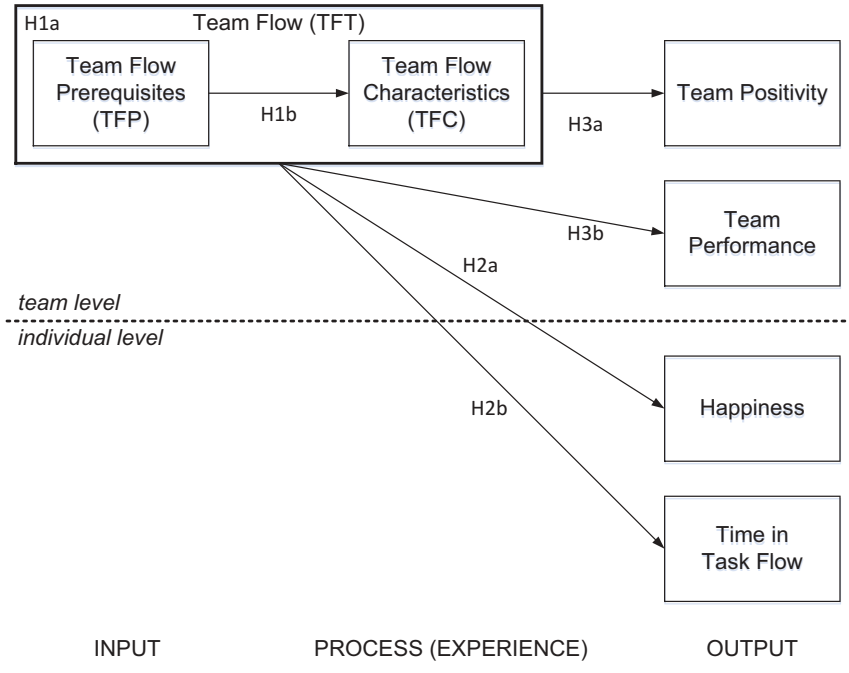

Figure 2. Hypotheses with the second-order construct of team flow.

3. Methods

3.1. The development of the team flow monitor

In the absence of a validated, team-level measure of team flow, we designed the Team Flow Monitor (TFM) based on the eleven elements of team flow described by Van den Hout et al. (2018; elements described above; creation process described below). After writing several items to reflect each construct, we added some outcome questions that would allow us to compare the individual and team experiences with performance (for students, we gathered additional data like grades). We validated the questionnaire using one sample to conduct an exploratory factor analysis (EFA) to assess whether the items load on factors and whether an eleven factor model obtains. We adjusted a few items based on these results, and ran a second sample for conducting a confirmatory factor analysis (CFA), assess the reliability of the scale, and test whether the constructs converge at the team level in a way that reflects team flow as a shared experience.

At the beginning of our instrument creation process, we defined several indicators for each of the eleven elements of team flow that were the basis for the first set of items in the TFM. We formulated equivalent items for Dutch and English versions of the TFM simultaneously. We evaluated the face validity of these items among several panel groups, including business students, team members, team leaders and managers from different firms, as well as organizational scholars. After several iterations of generating, evaluating, and revising items, an initial pool of 105 questions was selected that sampled the intended content domain. We named this questionnaire the Team Flow Monitor—version 1 (TMF-v1). It contained both closed and open questions. The closed questions (84 items investigating the eleven elements of team flow) were Likert-scale items to be answered on a scale from 1 ("strongly disagree") to 7 ("strongly agree"). Each of the 14 team flow constructs (seven prerequisites, four characteristics, and three sets consisting of all prerequisites, all characteristics, and all elements, respectively) had 6 to 11 questions devoted to it, as well as one face validity item that directly assessed the presence of the construct of interest (e.g. "a collective goal endorsed by everyone" to assess the presence of a collective goal). The TFM-v1 also contained 4 open questions to provide a more qualitative understanding of the obstacles that undermine team flow, influences that could foster team flow and examples of team flow experiences. Examples of the constructed items are: "*In the team in which I participate: … we agree on clear goals (a common goal); … personal goals are derived from the common goal (aligned personal goals); … every team member takes up a suitable challenge (high skill integration); … we receive feedback from one another that allows us to move forward (open communication); … we each feel that it is safe to perform our tasks (safety)*." Note that, consistent with Kozlowski and Klein's guidelines for conducting multilevel research, we explicitly referred to the team and used pronouns such as "we" and "us" to represent the collective nature of the team flow experience.

3.2. Data collection: sample 1

To validate the constructs that capture team flow, we sent the TFM-v1 to a sample of 368 students (Sample 1) comprising 54 student project teams of master students from Eindhoven University of Technology and first year bachelor students from the Rotterdam Business School. All teams collaborated on compulsory class assignments to deliver an advisory report. The baccalaureate students collaborated in groups of 6 to 8 students for about 8 weeks on a business report for an existing company containing recommendations on how to improve their business, focusing on organizational aspects like management, financials, and communications. The master students operated in groups of up to 5 students to conduct a semester-long research project in which they obtained and analyzed data from real-life teams working in the innovation sector and offered recommendations for improving team creativity and innovativeness. Out of the 368 students approached, a total of 252 responded. Their average age was 21.59 years (SD = 2.86), 151 respondents (59.9%) were male, and 101 (40.1%) were female. The average team size was 6.81, with a minimum of 5 and a maximum of 9 members. The average response per team was 68%. The participants of Sample 1 were sent a copy of the TFM-v1 to fill out during their team project

activities for the class assignment. Once the projects were completed, we obtained the grades for the team assignment from the teachers. These served as a measure of the team's performance.

3.3. Item evaluation and item reduction

Before we ran factor analyses, we reviewed a number of descriptive statistics to detect flaws in the database. To determine whether the items follow a normal distribution we calculated the skewness and kurtosis for each item, and accepted distributions with skewness ≤|1| and kurtosis ≤ |3| (*DeCarlo, 1997*; *De Vocht, 2000*). Based on these criteria, nine items were eliminated (four items from the "common goal" section, three items from "open communication," one from "safety," and one from "mutual trust"). We also checked the extent to which respondents used the full range of response categories for each item, which was the case for all items but three (one each from "shared focus," "safety," and "mutual trust"). These items can be said to have a slight restriction of range, but not enough to delete them.

3.4. Exploratory factor analyses (EFA)

We used the data collected from Sample 1 to conduct two separate exploratory factor analyses (EFA, principal axis factoring) with oblique rotation (Oblimin with Kaiser Normalization), one on the part of the TFM that measures the prerequisites and one on the part that measures the characteristics. We expected seven factors for the prerequisites and four for the characteristics. Following *Hinkin (1998)*, items with factor loadings of 0.40 or greater on the appropriate factor with no major cross-loadings were judged as representative of the construct under examination. An overview of the number of items per construct before and after elimination is provided below (see Table 1), along with the Cronbach's Alpha for the remaining items.

The results of the EFA on the items that measured the *prerequisites* of team flow showed the expected 7-factor solution. After eliminating the items that showed cross-loadings or factor loadings below 0.40, the EFA showed a clear distinction of the seven prerequisites with a KMO of 0.932 and the seven factors together explaining 70 % of the variance. But, because we felt that the remaining items for "safety" were suboptimally reflecting the theoretical construct, we adjusted the items slightly and formulated some additional items for further data collection (i.e. Sample 2).

Table 1. Exploratory factor analysis on sample 1

		# of items pre-EFAs	# of items post-EFAs	Cronbach's alpha of remaining items	Factor loading range (EFA)
Prerequisites of team flow					
1	Collective ambition	7	6	0.93	−0.893 – −0.638
2	Common goal	9	5	0.88	−0.791 – −0.534
3	Aligned personal goals	7	5	0.80	−0.814 – −0.408
4	High skill integration	6	4	0.90	−0.658 – −0.590
5	Open communication	11	5	0.91	0.511 – 0.839
6	Safety	6	3	0.66	−0.472 – 0.761
7	Mutual commitment	11	4	0.85	0.448 – 0.573
Characteristics of team flow					
8	Sense of unity	8	7	0.96	−0.896 – – 0.869
9	Sense of joint progress	7			N/A
10	Mutual trust	6	6	0.95	0.73 – 0.94
11	Holistic focus	8	7	0.92	N/A

Note. N = 252

The EFA on the items that measured the *characteristics* of team flow showed 3 factors, rather than the expected 4-factor solution. After eliminating the items that showed cross-loadings or factor loadings below 0.40, the EFA distinguished 2 factors, reflecting the characteristics "mutual trust" and "sense of unity," which together explained about 82% of the variance with a KMO of 0.944. The items that were used to measure "a sense of joint progress" also loaded on "mutual trust." The items that were used to measure "holistic focus" were not distinctive enough. Therefore, we adjusted the item wording slightly and added additional items to tap these constructs more clearly with CFA on Sample 2.

3.5. Data collection: sample 2

The item reduction efforts and the improvement of several scales by adding new items resulted in a 63-item scale, which we termed TFM-v2. We administered the TFM-v2 to a second sample of teams to complement the data in Sample 1. This additional data collection took place among 43 student project teams and 13 real-world work teams from 3 different organizations.

The student teams consisted of first-year bachelor students from the Rotterdam Business School. Students worked together in groups of 6 to 8 students for about 8 weeks to deliver an advisory report for entrepreneurs wanting to do business in Asian countries, much like the students sampled earlier. The students filled out the TFM-v2 during their team project activities for a class assignment. Once the projects were completed, we obtained the grades for the team assignment from the teachers.

The business teams comprised one human resource management team from an international engineering organization in heavy lifting, five teams of young professionals from a daycare organization for people with mental disabilities, and seven teams of teachers from a Dutch school for preparatory secondary vocational education (Dutch: VMBO). The teams participated on a voluntary basis. The human resource management team filled out the TFM-v1 (because the TFM-v2 had not been constructed at that time, but we used only the items that transferred to the TFM-v2 in the analysis) and the other work teams filled out the new TFM-v2.

In total, 309 respondents out of 425 invitees were added to Sample 1, which brought the total number of respondents for Sample 2 to 561 individuals. Sample 2 consisted of 110 teams. The average team size was 7.28 members (5 minimum, 14 maximum). The average response rate per team was 70%. All further analyses were performed on a full data set (561 individuals in 110 teams); missing values were imputed based on EM-estimates (Wu, 1983) to optimize the efficacy of the analyses

3.6. Confirmatory factor analyses

The primary purpose of running CFAs was to confirm the factors that emerged from the two EFAs and to test whether a model that distinguishes between the prerequisites and characteristics of team flow would fit the data better than a model suggesting a single team flow factor (Hypothesis 1). Moreover, to reduce the total number of items in the TFM, we selected the three or four most representative items per construct (based on the EFA) to be included in the CFAs, along with the items we adjusted for face validity on the factors pertaining to the characteristics.

CFAs were performed with Lisrel 8.54 (Jöreskog & Sörbom, 1996). Besides testing the hypothesized second-order two-factor model (i.e. seven prerequisites and four characteristics represented by two higher-order factors), we also tested a one-factor model (i.e. seven prerequisites and four characteristics represented by one factor). The models were evaluated with multiple indices of fit (Kline, 1998), including the χ^2 statistic, the Root-Mean-Square Error of Approximation (RMSEA; Steiger, 1990), the Comparative Fit Index (CFI; Bentler & Bonett, 1980), the Non-Normed Fit Index (NNFI; Bentler & Bonett, 1980), and the standardized root-mean square residual (SRMR; Hu & Bentler, 1998). Values of CFI approaching .95 and values no higher than .06 for RMSEA and SRMR indicate good model fit (Hu & Bentler, 1999). For the NNFI, the conventional indicator of good

fit is close to or above .90 (Hu & Bentler, 1999). Moreover, the χ^2 provides a statistical basis for comparing the relative fit of nested models (Bollen, 1989). Finally, internal consistency reliabilities were calculated.

The results of the CFAs are presented below (see Table 2). Both models provide a good fit for the data, but the chi-square difference test indicates a superior fit for the second-order two-factor model over the one-factor model ($\Delta \chi 2 = 125.9$, df = 1, $p < 0.001$). Hence, we conclude that a model that distinguishes between prerequisites and characteristics of team flow describes the data best. This implies that Hypothesis 1a is confirmed.

3.7. Internal consistency reliability

We used Cronbach's alpha to assess the internal consistency reliability of the items included in the CFA, which were all well above the .70 criterion (*Nunnally, 1978*). Table A1 in the appendix shows the final item set of the Team Flow Monitor (TFM) including reliability scales.

3.8. Convergence measures

Because team flow is conceptualized as a shared flow experience, the next step is to test if the proposed team flow constructs converge at the team level. We used three measures to test this convergence: The $r_{wg(j)}$, ICC(1), and ICC(2). The results can be found below (see Table 3). The $r_{wg(j)}$ statistic is a measure of within-collective agreement (*James, Demaree, & Wolf, 1984*), and is therefore a test of the first condition for convergence. James et al. recommend 0.70 as the threshold that groups must exceed for a researcher to claim that the collective converges on those variables. For Sample 2, the $r_{wg(j)}$ score is well above this threshold for each construct of team flow (see Table 3).

The interclass correlation coefficients ICC(1) and ICC(2) compare between-group variance to total variance across teams (Bartko, 1976; Bliese, 2000). These coefficients are omnibus indices of homogeneity. ICC(1) can be interpreted as the proportion of total variance that is explained by group membership. ICC(1) ranges between −1.00 and 1.00, with typical scores between .05 and .30. ICC(2) is an overall measure of the reliability of group means, where the desired lower threshold for scores is .70, but scores between .50 and .70 are considered acceptable. Although the $r_{wg(j)}$ were sufficiently, not all team flow constructs met the criteria for ICC(1) and ICC(2) (see Table 3). But, since this indicates a lack of between-group variance rather than a lack of within-group agreement, aggregation from the individual level to the team level is justified (cf. Gully et al., 2002). A lack of between-group variance reduces the chance of finding significant differences between teams, but the ICC(1) and ICC(2) scores on the composite measures (TFP, TFC, and TFT) satisfy the criteria for testing our hypotheses.

Table 2. Results of confirmatory factor analysis over sample 2

	CFA (1 factor)	CFA (2 factors)
Df	618	617
Chi-square	1774.21***	1648.31***
RMSEA	0.06	0.06
NFI	0.98	0.98
CFI	0.99	0.99
GFI	0.85	0.86
NNFI	0.99	0.99
SRMR	0.05	0.04
PGFI	0.75	0.76

Note. ***$p < .001$

Table 3. Convergence tests for team flow constructs

	ICC (1)	ICC (2)	$r_{wg(j)}$
Team Flow (TFT)	0.30	0.69	0.98
Team Flow Prerequisites (TFP)	0.27	0.65	0.97
Collective Ambition	0.27	0.65	0.81
Common Goal	0.19	0.54	0.85
Aligned Personal Goals	0.01	0.03	0.83
High Skill Integration	0.04	0.17	0.76
Open Communication	0.22	0.59	0.77
Safe Climate	0.25	0.63	0.87
Mutual Commitment	0.23	0.61	0.77
Team Flow Characteristics (TFC)	0.32	0.71	0.94
Sense of Unity	0.31	0.69	0.75
Sense of Joint Progress	0.28	0.66	0.85
Mutual Trust	0.33	0.71	0.78
Shared Focus	0.21	0.57	0.80

Note. N = 560 (110 teams)

3.9. Study variables

As our hypotheses cross two levels of analysis (individual and team), we specified each of our variables at one of those levels (as shown in Figure 1). The team flow concept and the team level outcomes (i.e. team positivity and team performance) describe team properties and were therefore either measured at or converged to the team level, the latter through composition of the individual scores (*Klein & Kozlowski, 2000*). The individual level outcomes (i.e. general level of happiness; current state of happiness, percentage of time experiencing task flow) are not expected to converge at the team level. Instead, they measure personal properties of individuals working in a specific team. As such, these variables have no composition or compilation process (*Klein & Kozlowski, 2000*) applied to them.

3.10. Measures

3.10.1. Team flow

We used the items of the TFM to assess team flow. Respondents answered on a scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"), so that higher scores indicate higher levels of team flow. We calculated the mean team score for each of the eleven team flow constructs based on high intergroup agreement (see convergence measures above). In addition, we calculated three composite scores, one for the seven prerequisites (TFP), one for the four characteristics (TFC) and one as a total score for team flow (TFT).

3.10.2. Team positivity

To assess team positivity, we asked team members to rate the ratio of negative statements to positive statements in this team. Respondents answered on a scale ranging from 1 ("very negative") to 7 ("very positive"). Scores were aggregated to the team level by calculating the average score of all the members in the team. Higher scores on this variable indicate that team members experienced more positivity than negativity in the team.

3.10.3. Team performance

We used the grades for the team projects, submitted to us by the relevant teachers, as an outcome measure for team performance. Each team was assigned a single score, so aggregation was not needed. Unfortunately, we did not have a comparable performance measure for the real-world business teams. We used estimated scores (i.e. EM-estimates) for these teams.

3.10.4. Happiness

We asked respondents two questions regarding happiness: "How happy are you today?" and "How happy have you felt in the past month?" to gauge their *happiness today* and their *happiness last month*, respectively. Respondents answered these questions on a scale ranging from 1 ("low happiness") to 10 ("high happiness").

3.10.5. Time in task flow

The percentage of time in task flow was assessed with a single item in which we asked team members to indicate the percentage of time that they personally experienced flow while working on their task for the team. In contrast to the team flow items, the item referred to the individual experiencing flow rather than the team.

3.11. Data analyses

To check whether the team-level outcomes were predicted by the team flow constructs, hierarchical linear regression analyses were performed using the combined team flow measure (TFT) as a predictor for team positivity and team performance. Since the TFT was the same for both studies, we combined the data from the two samples. Additional regression analyses were performed to determine the unique contribution of the combined prerequisites (TFP) against the combined characteristics (TFC) in the prediction of the outcome variables.

The cross-level relationships between team flow and the individual-level outcome variables were tested with Hierarchical Linear Modelling (HLM), using MLwiN. First, a null model was specified for each of the individual-level outcome measures. These null models were used as reference models and to check whether multi-level analysis was warranted. For the latter purpose, the ICC(1)-coefficient for the null model was computed as an indication of how much variance in the outcome measure was explained by team membership. High ICC(1)-values indicate that relationships between the dependent and independent variables need to be tested with multi-level analysis. Then we proceeded with the actual test of our hypotheses by adding variables to the model. Again, we tested the predictive validity of the combined team flow measure (TFT) as well as the unique contribution of the combined prerequisites (TFP) and the combined characteristics (TFC) in the equation.

4. Results

Correlations of the study variables at the team level (see Table A2 in the appendix) indicate that all team flow constructs are strongly related (all $r \geq .50$, $p < .001$). The scores on the team flow constructs were not related to mean age or to team size. However, since larger teams are known to experience more difficulties in orchestrating their collaboration, we controlled for team size in subsequent analyses.

Correlations at the individual level (see Table A3 in the appendix) show positive correlates between the individual level outcome variables "time in task flow" and both happiness measures ($r = .24$, $p < .01$ for current level of happiness; $r = .21$, $p < .01$ for general level of happiness). The current level of happiness and general level of happiness also correlated positively ($r = .54$, $p < .01$). There were no significant correlations between the control variables age and gender and the individual-level work-related outcome measures. Therefore, there was no need to control for age or gender in the multilevel analyses.

Hypothesis 1a suggested that the eleven team flow constructs would form a second-order factor model with two factors representing the seven prerequisites and four characteristics of team flow. As reported earlier, our CFAs indicated a superior fit of the second-order factor model with two factors over the model with one factor ($\Delta \chi 2 = 125.9$, df = 1, $p < 0.001$, see Table 2), which supports this hypothesis. In addition, the presence of a strong positive relationship between the team flow prerequisites and team flow characteristics ($r = .90$, $p < .001$; see Table A2), Hypothesis 1b is also supported by the data.

Hypothesis 2 predicted that team flow prerequisites and characteristics would relate positively to individual-level work-related outcomes like team members' personal flow experiences and happiness. The results of the HLM analysis for these individual-level work-related outcomes (see Table 4) indicate that 18% of the variance in team members' personal flow experiences could be explained by team membership. Entering the team flow composite score significantly improved the model; team flow served as a significant predictor for members' personal flow experiences when working on team tasks (B = 0.84; SE = 0.07; t = 11.41; p < .001), indicating that members experienced more personal flow when the team as a whole experienced more flow. We also tested the unique contributions of the team flow prerequisites and characteristics to individual flow experiences and found that team flow prerequisites (B = 0.55; SE = 0.14; t = 3.85; p < .001) and the team flow characteristics (B = 0.30; SE = 0.12; t = 2,61; p < .01) both contributed significantly to the prediction of individual flow experiences, thus confirming Hypothesis 2.

With respect to happiness, we found team membership explained about 12% of the variance in team members' current levels of happiness ("How happy are you today?") and about 13% of the variance in their general happiness levels ("How happy have you felt in the past month?"). Team flow showed to be a significant predictor for both time frames; team members reported higher levels of happiness when team flow was higher (B = 0.48; SE = 0.08; t = 6.26; p < .001 for current happiness and B = 0.53; SE = 0.07; t = 7.27; p < .001 for general happiness). Here, the team flow characteristics emerged as a stronger predictor of team members' reported levels of happiness than the team flow prerequisites. Team flow characteristics related positively with happiness (B = 0.32; SE = 0.12; t = 2.62; p < .01 for current happiness and B = 0.48; SE = 0.11; t = 4.19; p < .001 for general happiness), whereas no additional variance was explained by the team flow prerequisites (see Table 4). As such, these findings provide strong support for Hypothesis 2 that team flow is associated with positive individual-level work-related outcomes.

Hypothesis 3 suggested that team flow prerequisites and characteristics would relate positively with team-level work-related outcomes such as team performance and general positivity within the team. Indeed, we found that team flow (TFT) significantly predicted both team-level outcome measures (see Table 5). Linear regression analysis indicated that team flow (TFT; β = 0.75; t = 11.04; p < .001) explained 52% of the variance in team positivity. The results of a multiple regression analysis indicated that team flow characteristics (TFC: β = 0.39; t = 2.57; p < .05), and the team flow prerequisites (TFP: β = 0.37; t = 2.42; p < 0.05) contributed uniquely to the prediction of team positivity. Together, the two factors explained 52% of the variance in team positivity. Team flow (TFT) also showed a significant positive relationship with team performance (β = 0.36; t = 3.95;

Table 4. HLM analysis with MLwiN on individual-level work outcomes

	Dependent variables								
	Time in task flow (%)			**Happiness (Today)**			**Happiness (Last month)**		
	ICC(1)	***B***	***S.E.***	**ICC(1)**	***B***	***S.E.***	**ICC(1)**	***B***	***S.E.***
Model 1									
Team membership	.18			.12			.13		
Model 2									
Team flow (TFT)		.84***	.07		.48***	.08		.53***	.07
Model 3									
Team flow prerequisites (TFP)		.55***	.14		.14	.15		−.01	.14
Team flow characteristics (TFC)		.30**	.12		.32**	.12		.48***	.11

Note. N = 561; *p < .05; **p < .01; ***p < .001 (two-tailed)

Table 5. Results of hierarchical regression analysis on team-level work outcomes

	Dependent variables					
	Team positivity			Team performance (final grade)		
	F	Adj. R^2	β	F	Adj. R^2	β
	Simple linear regression analysis					
	40.75***	.52		5.83***	.12	
Team size			.12			−.04
Mean age			.15			.08
Team flow (TFT)			.75***			.36***
	Multiple linear regression analysis					
	30.40***	.52		4.87***	.12	
Team size			.12			−.04
Mean age			.15			.10
Team flow prerequisites (TFP)			.37*			.48*
Team flow characteristics (TFC)			.39*			−.12

Note. N = 110; ***p < .001; **p < .01; *p < .05 (two-tailed)

p < .001), explaining 12% of the variance in team performance. Here, team flow prerequisites (TFP; β = 0.48; t = 2.35; p < .05), but not the team flow characteristics (TFC; β = −0.12; t = −0.57; *ns*) significantly predicted team performance. Overall, these findings indicate that team flow is associated with higher levels of team performance and more positivity within teams, thus confirming Hypothesis 3.

5. Discussion

In light of the limited resources for conceptualizing and understanding team flow in the workplace, we created a theory-based means for assessing team flow. We built and validated our measure with the use of exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and a test of internal consistency reliability (Cronbach's alpha). We also proved the convergence of members' team flow perceptions, thus offering evidence for the existence of both individual and collective flow experiences that stem from the team's dynamic. Moreover, we found support for the second-order two-factor model of team flow, with seven constructs (collective ambition, common goal, aligned personal goals, high skill integration, open communication, safety, and mutual commitment) we consider team flow prerequisites and four constructs (sense of unity, sense of joint progress, mutual trust, and holistic focus) we consider team flow characteristics. Finally, team flow (prerequisites and characteristics) showed to be significantly related to work-related outcomes both at the individual level, in the form of individual task flow and happiness, and at the team level, in the form of team performance and general positivity within the team (see Figure 3). To improve team performance, the *prerequisites* for team flow are most relevant according to our results. For the experience of happiness, the presence of the *characteristics* of team flow is most relevant (see Figure 4). A positive team climate (with more positive than negative expressions) is predicted by both team flow prerequisites and characteristics, which is consistent with our theory that the prerequisites together foster a climate where effective collaboration is possible and the characteristics deliver the experience of a sense of unity, progress, trust, and shared focus. We have shown that team flow exists as a team-level construct and is related to a number of individual and team-level outcomes that are known to be very important for sustaining a healthy and productive work force.

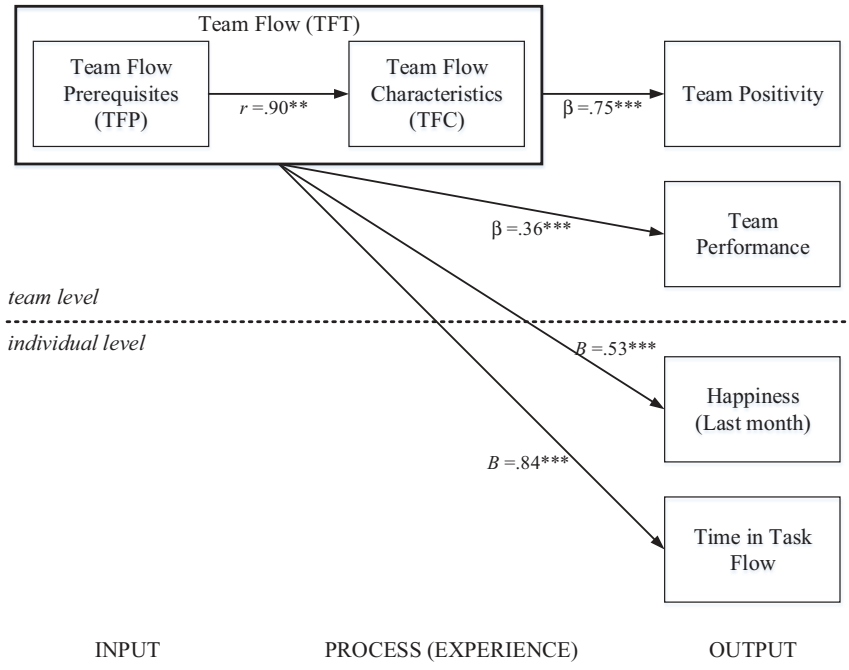

Figure 3. The relationships of the second-order construct of team flow with work-related outcomes.

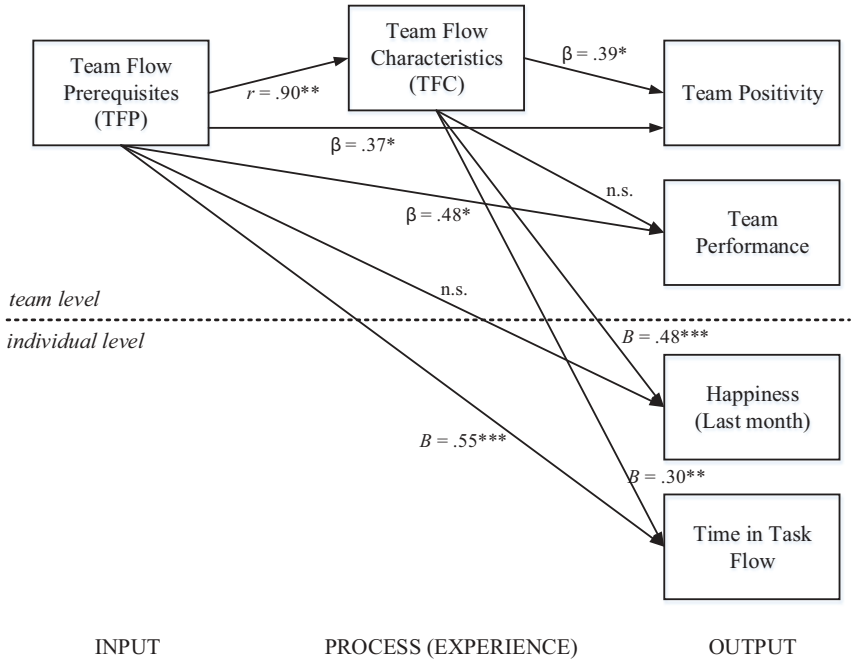

Figure 4. The relationships of the prerequisites and characteristics of team flow with work-related outcomes.

5.1. Theoretical implications

These findings have a number of important theoretical implications. First, ours is one of the earliest studies to actually verify the existence of a collective flow experience in work teams with both qualitative and quantitative analyses. The relatively nascent literature on team flow in the workplace reports on individual flow experiences in the team context rather than collective team flow experiences emerging from optimized internal team dynamics. Moreover, we were able to distinguish between team flow prerequisites and team flow characteristics. This suggests that the

constructs underlying team flow interact with one another in a complex way, which is consistent with extant research on individual flow (e.g. Ceja & Navarro, 2011) and with theoretical models that maintain that some of the factors of flow are created by the actor, while others are emergent (Hamilton & Hurford, 2007).

Though the two-factor model fit the data only slightly better than the one-factor model, we recommend the use of the two-factor model because it is more meaningful. Our findings indicate there is value in distinguishing between team flow prerequisites and team flow characteristics because they predict different outcomes, and future studies should further assess the extent to which the distinction between team flow prerequisites and team flow characteristics offers increased insight into the mechanisms underlying team flow experiences and their consequences for work-related outcomes. Then again, even if a single factor team flow measure seems preferable by virtue of being more parsimonious, maintaining the distinction between prerequisites and characteristics can still be helpful in analyzing and diagnosing team [dys]function. This is of primary importance because only the prerequisites can be directly influenced by team members.

Another important implication of the present study is that the latent construct of team flow relates positively to a team's climate and performance as well as to the happiness and optimized work experiences (flow) for its members. This is because team flow closely relates to multiple variables that have been shown in other studies to lead to improved team dynamics (i.e. team processes and emergent states). Examples include the presence of goals (Locke & Latham, 1984), psychological safety (Edmondson, 1999), and commitment (Aubé & Rousseau, 2005).

5.2. Practical implications

Strictly speaking, the statistical results do not allow causal inferences. But, theory does suggest that some causal directions are more plausible than others. Specifically, our results suggest that practitioners who are interested in improving the likelihood of team flow experiences and consequently team (member) outcomes should devote time and energy to putting in place the prerequisites for team flow. Results from the team flow monitor are an invaluable tool for determining which of the requirements of team flow is insufficiently present. The team's responses will even reveal how aware the team is of what may be lacking.

Our analysis also shows that teams have considerable influence on the way individual employees feel about work in the sense that they experience a more positive work environment and increased happiness when the elements for team flow are present. Because more and more people work in teams these days, it is important to mention effects that provably go beyond the benefits of individual experiences of flow. Teams carry within them a considerable risk of creating a negative work environment for their members; an especial risk is the loss of motivation, even unto the point of burnout (Bakker, Emmerik, & Euwema, 2006; Hackman, 1998; Lencioni, 2002). The prophylactic value of team flow, plus the improved team performance, make it important to create the conditions for team flow within teams and keep the work environment healthy and conducive to excellence.

5.3. Limitations

Our study of team flow has a few empirical limitations. Except for the team performance measure, all measurements were based on members' self-reports, which are subject to bias. But, self-report measures may not limit internal validity as much as is commonly expected (Spector, 1992, 1994; Wall et al., 2004). In addition, we recognize that the reliance on one-item measures for team outcomes has limited reliability. We compensated for these limitations by obtaining data from multiple team members who were accountable for different tasks within the team, but this retains some bias because all parties experience the same team dynamic. These limitations are offset, however, by the high level of intra-group agreement. Also, the measurements were performed using cross-sectional questionnaires, which limits the reliability of the causal findings, as does our sample size of 110 teams (though a large selection

compared to many studies, it is small relative to the number of items in our questionnaires). But, the meaning and implications of our findings despite our limited sample remains telling. Another concern is that the data collected were at times incomplete in the sense that not all members of all teams filled out the TFM, which may have introduced bias by not fully representing the experiences of all members of the team.

Limitations on generalizability that we can mention include the fact that, although we also tapped some teams operating in real-world practice, the majority of the teams in our sample were student project teams that operated in a protected (safe) learning environment where they do not face real-world business problems like the risk of not being accepted by a customer or colleague due to insufficient professional skill. Hence, future studies will need to include more real-world business teams to make the results more generalizable. Another limitation is that we collected data with both English and Dutch versions of the questionnaires, which can mean subtle differences between the versions, but this is less of a concern both because item translations were reviewed by a certified translator and because the authors comprise native speakers of English (third author) and Dutch (remaining authors, all of whom are also fluent in English). Similarly, as we noted earlier, it is important to contextualize team flow, outcomes, and dynamics because not all team contexts are alike (cf. Kozlowski & Klein, 2000; Sundstrom, de Meuse, & Futrell, 1990), though past research has shown some cross-contextual consistencies for constructs related to team flow (e.g. Sawyer, 2003, 2006, 2007).

Another issue that limits the scope of the results is that of measuring team performance. The outcome for each team was measured with a single grade that was an overarching review of the team's output by different assessors. The reality, however, is that teams produce multifaceted products that could be reviewed on any number of scales, especially by informed evaluators. One would not merely say that the performance of a symphony was "good" any more than one would consider "won" and "lost" the only possible assessments of a football team's game. As such, future studies should consider using more nuanced outcomes with multiple measures, as some may relate to team flow more than others.

Finally, one of the biggest challenges in any type of flow research is that flow is a complex construct. The linear relationships drawn between variables only approximate the actual dynamics (Ceja & Navarro, 2009, 2011). It is therefore likely that there were more complex interactions among the variables we examined that this study lacked the sample size to assess. This difficulty is also inherent in the assessment of team dynamics. Even so, research shows that the second-order approximation we used in this study is both reasonable and valid; the presence of a dynamic can be described by its overarching behavior even when more intricate and/or chaotic relationships among the variables exist (cf. Bar-Yam, 1997). Future studies should acquire sufficient data and power to run more detailed models of the behavior and dynamics of team flow.

6. Conclusion

Though Csikszentmihalyi (1990, 1996)) posited a connection between flow and performance more than 50 years ago, research is only now starting to bear out the extent to which he was correct. Our study of team flow, which is a direct offshoot of Csikszentmihalyi's paradigm and theorized conception of flow in a group, is one such contribution. The findings show that not only is there a latent factor of flow at the team level, this team-level flow experience also contributes to better team performance, higher team positivity, and more individual happiness and flow. Moreover, our study shows this connection also applies to the *ad hoc* teams more commonly found in the business world, which adds a wealth of potential applications for our findings. As the products of the business world become increasingly complex, and increasingly requiring whole teams to work on them, the research world is finding more and better ways to make those teams perform at their peaks.

In our view, team flow is the best available indicator of team function, useful long before other indicators (low performance, low motivation, etc.) reveal themselves. That makes it an invaluable tool for team monitoring and related applications. Furthermore, our conception of team flow helps to optimize multiple aspects of team functioning *simultaneously*. Team flow as a concept is a highly sensitive indicator of team functioning, which can make it a useful management tool for assessing and improving team [dys]function.

Funding
The authors received no direct funding for this research.

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Cover image
Source: Author.

Citation information
Cite this article as: Developing and Testing the Team Flow Monitor (TFM), Jef J.J. van den Hout, Josette M.P. Gevers, Orin C. Davis & Mathieu C.D.P. Weggeman, *Cogent Psychology* (2019), 6: 1643962.

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Appendix

Table A1. Final constructs from the Team Flow Monitor (TFM)

Team flow constructs	Cronbach's Alpha	Question items ("In the team in which I participate … ")
Prerequisites of team flow		
Collective ambition The extent to which the same ambition is collectively shared (CA)	0.83	… we share the same ambition.
		… we form a team from an inner drive to accomplish things together.
		… we feel that engaging in the team process is intrinsically rewarding.
Common goal A collective goal that is endorsed by everyone (CG)	0.80	… we endorse the established goals.
		… we agree on clear goals.
		… the shared goal offers a suitable challenge.
Aligned personal goals The presence of personal goals that also contribute to the common goal (APG)	0.82	… we are stimulated to determine a personal goal.
		… personal goals are derived from the common goal.
		… personal goals are important to the team.
		… personal goals are compatible with those of the team.
High skill integration The arrangement of individual merits into a collective strength (HIS)	0.84	… every team member takes up a suitable challenge.
		… we make use of each other's skills.
		… individual skills are integrated to form a coherent whole skill.
Open communication: Openness in communication with one another	0.88	… we receive feedback from one another that lets us move forward.
		… we provide each other with feedback whenever we can.
		… everyone receives clear feedback.
Safety: The level of psychological safety needed to engage in action	0.92	… we each feel that it is safe to perform our tasks.
		… there is a safe climate for learning.
		… we each feel that it is safe to take risks.
		… there is positive climate in which to perform.
Mutual commitment: The level of commitment towards one another	0.84	… we pay attention to each other's activities.
		… we know from one another who does what.
		… we concentrate on smooth collaboration.
Characteristics of team flow		
Sense of unity: The extent to which the team acts in unity	0.95	… we feel as one with the team.
		… we are fully involved with the team.
		… the team acts in unity.
Sense of joint progress: A collective feeling of accomplishment	0.88	… we collectively make progress.
		… I feel that we make joint progress.
		… together we achieve more.
		… actions naturally flow in quick succession.

(*Continued*)

Table A1. (*Continued*)

Team flow constructs	Cronbach's Alpha	Question items ("In the team in which I participate … ")
Mutual Trust: The level of mutual trust in the cooperation	0.91	… we have trust in each other to collectively complete our task.
		… there is an atmosphere of trust among us.
		… we, as a team, trust that we will be able to complete the task successfully.
		… we have trust in each other to collectively complete our task.
Holistic Focus: The extent to which everyone focuses on the common goal	0.86	… everyone is completely focused on the shared task.
		… the team as a whole is in focus.
		… everyone is fully focused on executing his/her task for the team.

NOTE. The use of (parts of) the Team Flow Monitor for any commercial purpose is expressly prohibited. The use of the Team Flow Monitor for scientific purposes is permitted if the collected data is shared with the author of this paper. The Dutch version of this survey is available from the author upon request

Table A2. Descriptives and correlations team-level variables

#	Variable	N	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Team size	110	7.28	1.64																	
2	Age (mean)	110	20.89	1.90	−.59**																
3	Team positivity	110	4.56	.92	−.04	.01															
4	Team performance	110	6.37	.78	−.12	.08	.23*														
5	Collective ambition	110	4.87	.78	.01	−.14	.64**	.19*													
6	Common goal	110	5.30	.63	−.09	−.14	.58**	.41**	.69**												
7	Aligned personal goals	110	4.62	.63	−.04	−.09	.41**	.22*	.56**	.55**											
8	High skill integration	110	4.89	.76	−.05	−.09	.64**	.38**	.77**	.79**	.61**										
9	Open communication	110	5.13	.80	−.13	−.06	.54**	.44**	.57**	.71**	.54**	.74**									
10	Safety	110	5.28	.69	−.01	−.06	.76**	.21**	.73**	.70**	.63**	.76**	.67**								
11	Mutual commitment	110	5.10	.77	−.18	−.06	.59**	.36**	.69**	.77**	.57**	.72**	.73**	.70**							
12	Sense of unity	110	4.74	.97	−.10	−.07	.70**	.31**	.84**	.71**	.49**	.83**	.67**	.74**	.77**						
13	Sense of joint progress	110	5.02	.77	−.06	−.11	.62**	.29**	.83**	.78**	.60**	.84**	.68**	.76**	.78**	.84**					
14	Mutual trust	110	5.13	.89	−.06	.-.01	.71**	.30**	.78**	.69**	.41**	.76**	.53**	.73**	.71**	.82**	.83**				
15	Shared focus	110	4.86	.73	−.12	−.04	.60**	.28**	.75**	.80**	.54**	.82**	.64**	.75**	.79**	.85**	.85**	.80**			
16	Team flow total	110	5.00	.66	−.09	−.09	.72**	.36**	.87**	.86**	.67**	.91**	.79**	.86**	.87**	.91**	.93**	.86**	.91**		
17	Team flow prerequisites	110	5.03	.61	−.08	−.10	.70**	.37**	.85**	.87**	.74**	.91**	.84**	.87**	.87**	.85**	.89**	.79**	.86**	.98**	
18	Team flow characteristics	110	4.94	.78	−.09	−.06	.71**	.32**	.86**	.79**	.54**	.87**	.67**	.80**	.81**	.94**	.93**	.93**	.93**	.96**	.90**

Note. *$p < .05$; **$p < 01$; ***$p < .001$ (two-tailed)

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Table A3. Descriptives and correlations for individual-level variables

#	Variable	N	Mean	SD	1	2	3	4	5	6	7
1	Age	561	20.70	2.66							
2	Gender	469	1.39	0.49	−0.10*						
3	Time in task flow	561	5.66	1.79	−0.01	0.03					
4	Happiness (today)	561	7.31	1.73	−0.06	0.03	0.24**				
5	Happiness (last month)	561	7.08	1.68	−0.06	−0.06	0.21**	0.54**			
6	Team Flow Total (TFT)	561	5.02	.94	−0.03	−0.04	.44**	.25**	.30**		
7	Team Flow Prerequisites (TFP)	561	5.05	.89	−0.05	−0.01	.43**	.23**	.27**	.97**	
8	Team Flow Characteristics (TFC)	561	4.96	1.11	−0.00	−0.09*	.42**	.27**	.32**	.95**	.85**

Note. *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed). Gender: 1 = male, 2 = female

Cogent Psychology **(ISSN: 2331-1908) is published by Cogent OA, part of Taylor & Francis Group.**