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GROUP FLOW: A THEORY OF GROUP MEMBER INTERACTIONS IN THE MOMENT AND OVER TIME

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Groups often struggle to live up to expectations. However, there are times when groups are said to be in flow—when interactions appear effortless as group members contribute in synchrony to reach peak levels of collaborative performance. Existing research on group effectiveness has provided limited insight into the momentary and changing pattern of group member interactions that enable such performance. We adopt a process perspective to unpack the temporal dynamics of group flow—a state characterized by full, seemingly effortless attention, shared positive emotional arousal, and additive, swift contributions—to theorize the momentary interactions through which group flow emerges. In doing so, we highlight the importance of the timing of contributions, how contributions relate to each other, and group momentum. Lastly, we specify how group flow enhances group effectiveness, including peak collaborative performance, group viability, and individual well-being.

Groups are the lifeblood of contemporary organizations. Yet, they are often ineffective, producing mediocre results that fall short of expectations. A rich body of research on group effectiveness has identified a wide range of factors—inputs, processes, and emergent states, among others—that explain when and why groups are effective (Mathieu, Gallagher, Domingo, & Klock, 2019; Mathieu, Hollenbeck, van Knippenberg, & Ilgen, 2017). Nonetheless, as several scholars have lamented, the dynamic sequences of interactions among the members of a group and the implications of these emergent and changing patterns of interactions over time for group effectiveness remain undertheorized (Cronin, Weingart, & Todorova, 2011; Lehmann-Willenbrock & Allen, 2018; Metiu & Rothbard, 2013; Waller, Okhuysen, & Saghafian, 2016).

Indeed, research on emergent states has typically focused on the cognitive, affective, and motivational aspects of groups (Marks, Mathieu, & Zaccaro, 2001; Rapp, Maynard, Domingo, & Klock, 2021), ignoring the fundamental role that the changing pattern of *interactions between members* play in giving rise to certain aspects of group life. As a result, we have limited theoretical understanding of what it is that group members *do* in the moment—that is, when they contribute and how this pattern of interaction changes over time—to give rise to certain states and to enable group effectiveness. Without this understanding, not only does the sequencing and timing of contributions remain unknown, but so does the way in which different factors affecting team effectiveness interact with one another and change over time in relation to one another (i.e., the extent to which changes in cognition, affect, and behavior condition each other). In other words, without a better understanding of how group member interaction unfolds over time and the principles that govern this process, our theoretical understanding of some of the key drivers of group effectiveness is less valuable and the practical guidance we can provide to group members and their leaders less helpful.

The state of *group flow* is uniquely positioned to help us spotlight the momentary and changing pattern of interactions in groups, along with the

We are grateful for insightful feedback and guidance from Associate Editor Abbie Shipp and our three anonymous reviewers. We are also thankful for the discussion of an earlier version of this paper at the Positive Organizational Scholarship Research Conference in Ann Arbor, Michigan.

relevant cognitive and affective processes that ultimately give rise to enhanced group effectiveness. Quinn (2005: 637) described group flow as "people experiencing themselves moving together toward shared or complementary goals, adjusting in real time to each other's expectations, needs, and contributions, and learning how others work and how to interact effectively along the way." When groups are in flow, interactions between members appear effortless and efficacious—each person is fully focused on the currently contributing group member (rather than on the self and concerns related to, for instance, portraying a positive self-image) and the unified actions of the group as a whole, all the while experiencing strong interpersonal connections (van den Hout, Davis, & Weggeman, 2018). During these moments of full and equal participation, the group seamlessly works toward its goals, as one contribution builds on the next. Thus, group flow is a unique state, sustained by momentary interactions and adjustments over time that "implies the possibility of a coordinated high-performance experience" (Quinn, 2005: 637).

Nascent theory on group flow remains underspecified and has yet to provide a comprehensive theoretical account of what group flow is, as well as the processes through which it arises and dissipates (Pels, Kleinert, & Mennigen, 2018). The goal of the present research is to provide a more detailed conceptualization of group flow as an emergent state and a theoretical account of how group flow arises and dissipates over time, thereby providing a window into the momentary and changing pattern of interactions that unfold as members come together to prepare and perform a wide range of tasks to the best of their abilities. In doing so, we highlight the importance of group momentum and the dynamic interplay between the cognitive, affective, and behavioral changes that unfold over time. In addition, we outline the wide range of benefits that group flow has for its members, as well as the group as a whole.

Our paper makes several contributions. Research on groups has focused on aggregate-level actions and processes to explain how certain states arise in groups and to explain the effects on group effectiveness. This approach limits our ability to understand the relational nature of interactions, in terms of both the content and timing of contributions. Our theory highlights how the relational nature of *momentary* group member interactions is important to understanding how certain group states emerge. Specifically, our theoretical analysis reveals that contributing additively (content that extends a prior contribution) and swiftly (quickly following a contribution) is central to creating a sense of momentum (i.e., forward progress). Increasing momentum, in turn, influences changes in affect, cognition, and behavior, ultimately resulting in group flow. Second, we show how these changes in affect, cognition, and behavior enhance group effectiveness, both at the individual (well-being) and group levels (group viability and peak collaborative performance). In doing so, our theory offers a critical, missing link between how group members interact, emergent states that enhance coordination, and group effectiveness, answering the call for research that considers "multilevel influence relationships" in groups (Cronin et al., 2011: 572). Third, our theory moves beyond descriptive accounts of group flow, by focusing on the role of momentum, to explain how and why group flow emerges and dissipates. Our theory can be applied to groups performing a wide range of tasks in various contexts, especially those characterized by reciprocal interdependence (Thompson, 1967; Victor & Blackburn, 1987), where outputs become inputs and vice versa. Thus, our theoretical analysis is critical if organizations are to fully leverage the potential of the groups they form and deploy.

In what follows, we first review existing research that has considered the role of time in groups to both motivate and position our theory of the emergent and changing patterns of momentary interactions during group flow. Second, we specify how these interactions enable group flow and delimit four phases—idling, acceleration, group flow, and afterglow. Third, we discuss how group flow leads to group effectiveness, drawing on three dimensions proposed by Hackman (1987). Lastly, we discuss theoretical implications and future research directions.

A NEED TO UNDERSTAND MOMENTARY GROUP MEMBER INTERACTION PATTERNS

To better understand momentary group member interactions and their importance to group effectiveness, we need to consider how existing research on group effectiveness, and groups more generally, has accounted for and considered the notion of time. Group effectiveness research has typically been guided by an input–process–output (IPO), or an input–mediating mechanism–output (IMO), framework (see Mathieu et al., 2019). These variance-based approaches tend to "compress [time] into variables (e.g., describing decision making as fast or slow)" (Langley et al., 2013: 4). For instance, to the extent that coordination is considered in relation to

group effectiveness, it is often treated as a matter of degree (i.e., more or less coordination, better or worse coordination) rather than as a dynamic process that unfolds over time (e.g., Marks, Sabella, Burke, & Zaccaro, 2002). When the "action" of coordination is collapsed into a single variable, it is difficult to understand *what* group members are doing *in the moment* and *over time* that gives rise to certain critical states, thereby enabling effective group work (Fyhn, Schei, & Sverdrup, 2023; Waller et al., 2016). Nevertheless, some research on groups—research on pacing and coordination, in particular—has provided a roadmap for how we might begin to think about how to "decompress" time.

Pacing in Groups

Research on pacing has explored when members contribute during the course of group work in order to fit work into the allotted time (e.g., Gersick, 1988, 1989; Metiu & Rothbard, 2013; Okhuysen & Eisenhardt, 2002; Waller, Zellmer-Bruhn, & Giambatista, 2002). Yet, in this research, the contributions of group members are often aggregated, obscuring who contributed what and in relation to whom. For instance, Gersick (1989) coded the timing and content of comments within a group. However, her work remained agnostic as to who was offering a particular comment and in response to whom. She found that groups varied in how pacing occurred, that timing of time-related comments related to this pacing, and that the midpoint was a common time to transition. Building on this work, Ford and Sullivan (2004) theorized that (novel) contributions are more beneficial earlier in the group's work, and that they are more likely to disrupt group work when they occur after the midpoint, at a time when groups tend to shift their focus toward implementation. More recently, Riedl and Woolley (2017) found that teams that were more "bursty" (i.e., had shorter wait times between team activities) performed better when crowdsourcing. Although this research on pacing has been invaluable in deepening our understanding of the role of the distribution of different types of contributions *at the group level of analysis*, it falls short in illuminating the changing pattern of momentary interactions between individual members of the group.

Momentary Adjustments in Groups

Research on coordination has highlighted that group members often need to make momentary adjustments to both the content and sequencing of their actions and contributions, particularly when dealing with unexpected or ambiguous situations (Bechky & Chung, 2018; Ben-Menahem et al., 2016; Lifshitz-Assaf, Lebovitz, & Zalmanson, 2021; Majchrzak, Jarvenpaa, & Hollingshead, 2007; Okhuysen, 2001; Valentine & Edmondson, 2015; Wolbers, Boersma, & Groenewegen, 2018).[1] Bechky and Okhuysen (2011), for instance, found that both film crews and SWAT officers had to shift roles, reorganize routines, and change the sequencing of their work in order to respond to surprises. Similarly, Lifshitz-Assaf et al. (2021) theorized how project teams working under accelerated timelines needed to quickly sense and adjust, provide updates, and create feedback to align group members' work. Groups that engaged in adaptive coordination—that is, work that started with a "minimal basis for coordination" but, "through swift sensing and adjusting interactions," gradually increased coordination (Lifshitz-Assaf et al., 2021: 702)—were able to develop fully functioning new products on accelerated timelines.

Some studies on coordination have adopted an even more granular approach, revealing how the patterns of interactions make these dynamic adjustments possible. For instance, Harrison and Rouse (2014) theorized how particular interaction patterns give rise to certain emergent states when groups engage in creative work. In describing these interaction patterns, the authors provided evidence of members building on each other's contributions and the need to sequence these contributions. Yet, like the research on pacing, the theory itself focuses on transitions at the group level, not on the interactions between members. Similarly, in describing aesthetic coordination in his study of a choir, Stephens (2021: 23) offered the following example:

> If I notice the person to my left start slipping, I'll try to, like, make note transitions more prominent to, like, exaggerate my tuning but, like, if I know he tends to be slightly low … I'll go like slightly high and just encourage him up, and you listen to the people around you but you have to make sure you're not sticking out while doing that.

[1] Given our focus on interactions during the completion of tasks that are bounded by the same conditions as group flow—that is, those that feature reciprocal interdependence (Thompson, 1967), we are not reviewing work on coordination that focuses primarily on the integration of efforts *across* different tasks over longer time periods of time or in distributed work (for a review, see Okhuysen & Bechky, 2009).

The quote illustrates how people make momentary adjustments in response to others' actions or contributions; however, the work stopped short of elucidating the timing and sequencing of particular interactions as a vehicle to drive group effectiveness.

A Need to Understand Momentary Group Member Interactions over Time

Overall, then, previous research on pacing and coordination in groups has provided important insights as to how groups and their members can and do adjust in the moment, highlighting the fact that group members cannot solely rely on predetermined patterns and routines to perform effectively. However, how groups adjust patterns and routines in the moment and over time remains largely opaque. By examining the interplay of group members' cognitions, emotions, and behaviors, we have the potential to better understand how they dynamically shape each other, either fostering or impeding the development of specific emergent states that drive group effectiveness (Fyhn et al., 2023, Mathieu et al., 2017). Understanding these changing patterns is not merely an academic exercise but is of practical significance. Indeed, without a richer theoretical account of how precisely the *process* of group work unfolds in the moment and over time, group members may find it challenging to tailor their actions and regulate their attention and affective experiences in a manner that supports the emergence of critical states. Simply advising groups, for instance, that trust and cohesion are important, fails to provide actionable guidance as to what group members should do when and how they should respond and adjust their actions to other members as they work together on a task (Lehmann-Willenbrock & Allen, 2018).

The concept of group flow offers a unique window into these dynamics. Indeed, the dynamic pattern of momentary interactions among members of a group is one of the defining features of group flow (Sawyer, 2003). Theorizing about momentary group interactions prior to, during, and after group flow, thus, provides the opportunity to develop theory that explains how groups can better leverage their full potential.

HOW GROUP FLOW ARISES AND IS SUSTAINED THROUGH GROUP MEMBER INTERACTIONS

Some research on groups has focused specifically on the role that attention, shared emotions, and interactions play in shaping group performance (Collins, 1990, 2005; Lepisto, 2022; Metiu & Rothbard, 2013). Building on this research, and guided by the characteristics typically associated with group flow (Duncan & West, 2018; Pels et al., 2018; van den Hout et al., 2018), we define group flow as *a group-level, emergent state that is characterized by (a) members paying full, yet seemingly effortless attention (to others and their contributions); (b) shared, positive emotional arousal; both of which are elicited and sustained by (c) interactions that are characterized by member contributions that add on to prior contributions in a swift manner resulting in action synchrony*. Although existing descriptive accounts of group flow have identified a set of static conditions that may give rise to group flow and specified characteristics that signify group flow, such as a loss of self-consciousness, intense concentration, and a sense of unity (Duncan & West, 2018; Quinn, 2005; Sawyer, 2007; van den Hout et al., 2018), existing theory does not explain what group members *do* in the moment and over time that gives rise to and sustains this optimal group state, which is the focus of our work.

Our theorizing is bounded by three conditions typically associated with group flow—interactions that (a) feature simultaneity, (b) entail reciprocal interdependence, and (c) occur as part of a performance episode. Regarding the first two, descriptions of group flow have commonly portrayed situations in which group members *simultaneously* and *interactively* accomplish a task (e.g., Aubé, Brunelle, & Rousseau, 2014; Hackert, Lumma, Raettig, Berger, & Weger, 2023; Salanova, Rodríguez-Sánchez, Schaufeli, & Cifre, 2014; Sawyer, 2003; van Oortmerssen, Caniëls, Stynen, & van Ritbergen, 2022). For example, in their study of intense work groups, Murnighan and Conlon (1991) described how string quartets had short, fleeting experiences of flow, where group members were completely engrossed in the activity of producing music together. Previous research has spotlighted that group flow is characterized by "people experiencing themselves *moving together toward shared or complementary goals*, adjusting in real time" (Quinn, 2005: 637; emphasis added). Our theorizing, therefore, applies to situations in which there are simultaneous interactions involving reciprocal interdependence—that is, task situations in which the contributions of one member become the input for another member, and vice versa (Thompson, 1967; Victor & Blackburn, 1987)—and mutual, real-time adjustment is required.

Third, group flow is most likely to arise as a consequence of the momentary interactions and adjustments of group members during *specific, time-delineated performance episodes* (Barker, 1963; Richard & Diefendorff, 2011). Performance episodes typically have a clear goal against which progress can be established (e.g., the goal might be to come up with ideas for a pitch or to respond to a set of questions during a question-and-answer session with potential investors) and are broadly defined as naturally segmented, relatively short units of activity that are thematically organized around certain activities or desired end states (Barker, 1963; Beal, Weiss, Barros, & MacDermid, 2005). Thus, our theorizing is most applicable to situations in which groups have to produce actual work (as opposed to deliberating without making a decision, for instance) over a specific period of time. Given that group flow is transient in nature, it is worth noting that groups can move in and out of flow multiple times throughout a performance episode.

In the following, we theorize that changes in attention, shared affect, and member contributions provide the foundation for understanding how group flow emerges, can be sustained, and eventually dissipates. Offering this more precise theoretical account of group flow, in turn, offers a window into understanding how momentary group member interactions shape and give rise to peak collaborative performance (Quinn, 2005). To describe the evolution of group flow, we delineate four phases: (0) idling, (1) acceleration, (2) group flow, and (3) afterglow, illustrated in Figure 1. Table 1 summarizes the changes in key variables such as attention, emotion, and behavior across the different phases from idling to afterglow.

Phase 0: Idling

Idling describes group interactions during the early part of a performance episode. That is, the group has started interacting, but the pattern of interaction lacks coherence. We propose that during this phase, group members are likely to experience scattered, effortful attention, a mix of high- and low-arousal emotions, and limited action synchrony. Thus, idling describes the typical pattern of interactions that groups experience, and which many groups never move beyond.

To illustrate the dynamics of idling, we begin with a hypothetical example of Alicia, Michael, and Erica as three members of a startup team who are a discussing a new product feature. At the beginning of the meeting, Alicia and Michael discuss what they would like to accomplish during the meeting. Alicia refers to the last feature she worked on that failed and explains that she is anxious about making the same mistakes. Michael is trying to ask questions to understand what went wrong, but is preoccupied with a conflict he had with the founder in the morning. Erica listens but is focused on the direction she would like to take this new feature; she is excited and wishes they would just start working. She tries to interject but Alicia and Michael keep talking about the prior feature.

FIGURE 1
The Emergence and Dissipation of Group Flow over Time and Its Outcomes

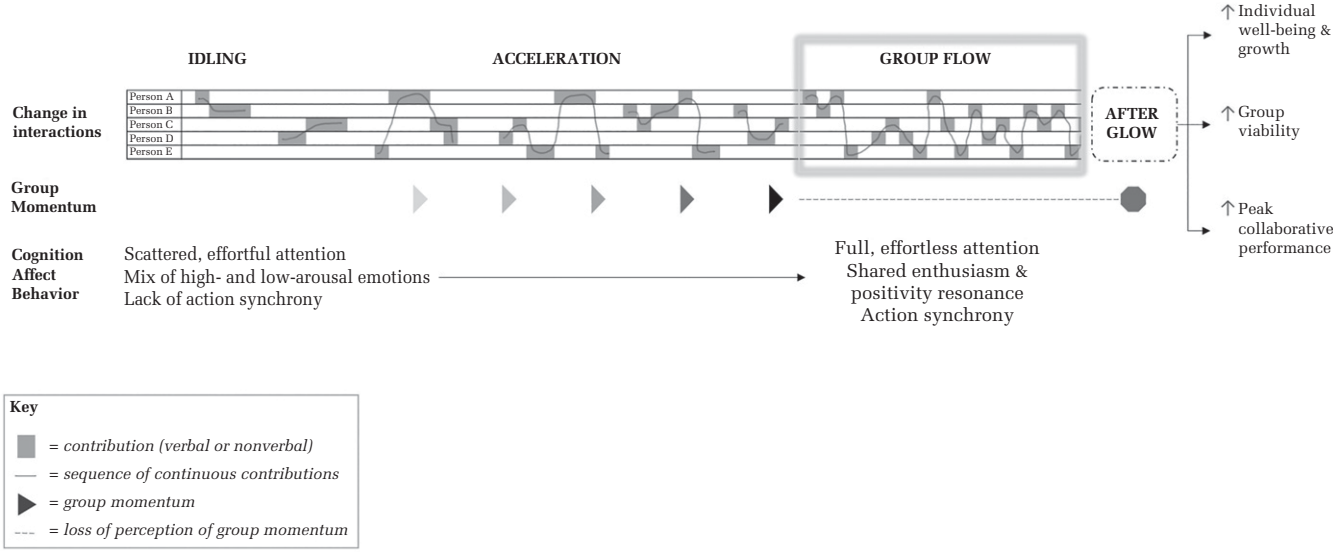


TABLE 1
Changes across the Phases of Group Flow

	Idling	Acceleration	Group Flow	Afterglow
Attention				
• Temporal focus	• Past, present, future	• Present, future	• Present	• Past
• Quality	• Scattered, effortful	• Focused, moderate ease	• Full, effortless	• Scattered, moderate ease
Affect				
• Shared	• No	• Emerging	• Yes	• Yes
• Valence	• Positive and negative	• Positive–negative ratio ↑	• Positive	• Positive
• Arousal	• High and low	• High	• Moderate-to-high	• Moderate-to-low
• Dominant emotions	• Anxiety and enjoyment	• Enjoyment	• Enthusiasm	• Pride
Member contributions				
• Temporal relation	• Delayed, infrequent	• Pace and frequency ↑	• Swift, frequent	• No contributions to task
• Quality	• Additive and subtractive	• Additive–subtractive ratio ↑	• Additive	
Synchrony perceptions				
	• Contributions appear "out of sync"	• Contributions appear to be increasing in synchrony	• Contributions appear "in sync"	• Reflection among members
Group momentum				
	• None	• Perceived as increasing[6]	• Limited perception of momentum, as attention becomes increasingly focused and exogenous	• Perceived as coming to a halt
Evaluation				
• Degree	• High	• Moderate	• None	• Moderate
• Primary targets	• Self & others, goal progress	• Goal progress	• N/A	• Effectiveness

Note: It is possible that there are moments during acceleration when momentum may decrease for brief periods of time, with little to no consequence for the *overall* perception of momentum. However, if subtractive contributions start to outweigh additive contributions or slowing/delayed contributions break attention for too long, the group may revert back to idling.

Scattered, effortful attention. As the above example begins to illustrate, while idling, members' attention is likely focused on any number of things, including different points in time, and tends to oscillate between the self, others, and the task environment more broadly. Research has suggested that in addition to focusing on their current contributions, during the early stages of a task members are likely to ruminate about the past, such as what happened just prior to the group commencing its work (Leroy, 2009), or to be focused on thoughts about the future (Shipp & Aeon, 2019), including worries of what might happen. Thus, the attention individuals devote to thinking about the past, present, and future, known as temporal focus (Shipp, Edwards, & Lambert, 2009), is likely to shift during this stage, and to vary across members. In addition, there may be varying degrees of inward focus on the "self," with members being acutely self-aware as they evaluate their roles and responsibilities vis-à-vis their abilities and desires, which results in additional heterogeneity in each member's attentional experience. For instance, attention could be shifting from external sources (e.g., task environment, other people) to internal feelings and the contemplation of next moves (Chun, Golomb, & Turk-Browne, 2011). Moreover, attention might be devoted to assessing progress, both of the self as a contributing member of the group as well as of the group as a whole. Indeed, it is likely that members will be evaluating their satisfaction with the group's overall progress and the chance of the group succeeding prior to making a contribution.

We propose that with attention shifting to different targets, individual members' attentional focus during this phase will be largely endogenous—that is, effortful in nature (Posner, Snyder, & Davidson, 1980), voluntary, and consciously initiated (Shiffrin & Schneider, 1977). Given that it is consciously controlled, endogenous attention is oriented less rapidly (Folk, Remington, & Johnston, 1992). The effort required for sustaining endogenous attention

significantly limits the duration for which it can be maintained, as it tends to consume more cognitive resources (Corbetta & Shulman, 2002). Thus, during the idling phase, members' attention will be scattered and endogenous, rather than full and effortless (the hallmarks of our definition of group flow).

Mix of high- and low-arousal emotions. We submit that the scattered and endogenous nature of attention during the idling phase will be accompanied by a variety of *high- and low-arousal emotions*. Moments of uncertainty are often accompanied by negative, high-arousal emotions (Grupe & Nitschke, 2013; Lazarus & Smith, 1988). During the early stages of group interaction there is uncertainty due to not knowing what to contribute and the potential for members to be ridiculed for taking interpersonal risks, such as offering half-baked contributions or ideas that are outside the norm (Rouse, 2020). Research has suggested that perceiving a degree of uncertainty typically gives rise to *anxiety* (Gu, Gu, Lei, & Li, 2020). In addition, individuals' emotional experience is likely to vary considerably across the members of the group during this phase, as some members have yet to contribute or have made contributions that have not been validated by the group. Others may not have been paying attention and feel bored, perceiving this to be a routine interaction, not recognizing any progress or potential novel outcomes (Fisherl, 1993), while others may have made contributions and feel a *sense of excitement* because other members approved of or extended their ideas, generating a sense of validation and acceptance by the group (Reis, Clark, & Holmes, 2004). Thus, individuals' emotional experiences are likely to be mixed in both valence (positive and negative) and arousal, depending on how involved members are and the level of validation they have experienced up to this point.

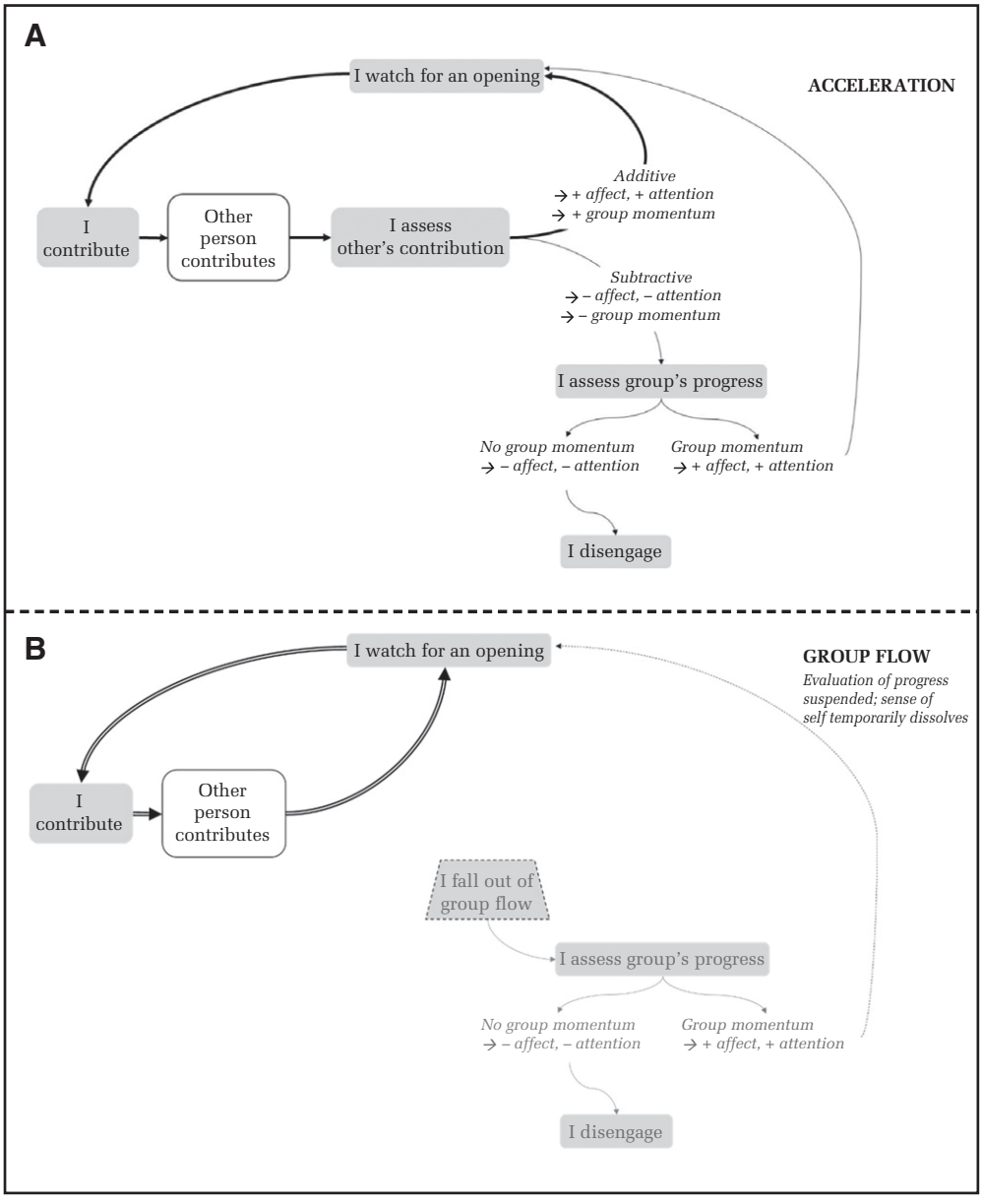
Lack of action synchrony. We suggest that the scattered, effortful nature of attention and the variety of high- and low-arousal emotions correspond to a lack of synchrony—the degree to which actions and vocalizations between members are matched (similar), both in time and semantically in their alignment toward a shared goal (Hove & Risen, 2009; Mogan, Fischer, & Bulbulia, 2017; Tickle-Degnen & Rosenthal, 1987, 1990). Task-irrelevant thoughts and their associated negative emotions reduce the ability to contribute quickly, as they limit working memory capacity (Moran, 2016). As a result, there will be varying lengths of time between contributions or changes in the pace of contributions (Hove & Risen, 2009). In addition, negative emotions may prevent people from contributing at all to avoid the risk of a potentially unfavorable result (Maner & Schmidt, 2006). Finally, anxiety decreases synchrony by changing the pace of contributions, either creating speech disturbances or speeding up speech and action in a manner that would not be commensurate with the rest of the group (Pope, Blass, Siegman, & Raher, 1970). Thus, we argue that during this early phase of group interaction, scattered, endogenous attention and the mix of high- and low-arousal emotions are likely to impede action synchrony.

Phase 1: Acceleration

The acceleration phase represents the start of a potential group flow experience. To illustrate the dynamics of acceleration, we return to our hypothetical example of Alicia, Michael, and Erica. Eventually, Alicia stops worrying about prior features and offers an idea for a new feature. No one speaks. Eventually, Michael follows up with a contribution. Alicia considers Michael's contribution. She might ask herself whether Michael's contribution built on her idea, developing it further (i.e., additive contribution), validating her idea, or whether he diminished the idea or shifted the direction of the conversation (i.e., subtractive contribution), seemingly invalidating her contribution. If she assesses the contribution as validating, she is likely to experience positive emotions and increased attention because she feels good about herself, about the member who validated her contribution, and about the task itself as she still has an active part in it (Vera & Crossan, 2005). She will also experience a sense of forward progress or momentum, which, in turn, will motivate her to watch for openings to contribute again (Vallerand, Colavecchio, & Pelletier, 1988).

If Alicia assesses the contribution as invalidating, she is likely to experience negative emotions and to withdraw her attention as a result of the perceived rejection (Watson & Nesdale, 2012). She might also look to other group members to see if someone "picked up" Michael's contribution. Did Erica, for example, jump on Michael's idea, with the group now making progress based on the seed of Michael's contribution (validating his idea and leading to his own positive emotions and increased attention)? If so, Alicia might look for an opening to contribute and build on the idea further, restarting Alicia's engagement with the group. If Erica's contribution did not build on Michael's, the group might pause and explore a new direction, starting with another contribution, decreasing the perception that the group is making progress and further decreasing, rather than increasing, Alicia's engagement with the group (see Figure 2a for a visual representation).

FIGURE 2
Individual Experience during (a) Acceleration and (b) Group Flow



As we theorize below, a group will enter the acceleration phase when additive contributions start to outweigh subtractive contributions and the time between interactions decreases, resulting in the experience of group momentum.

The building of group momentum during the acceleration phase. We theorize that acceleration to the point of reaching group flow relies on *group momentum*. Group momentum is defined as the amount of forward progress that group members *perceive* they are making over a period of time (Vallerand et al., 1988).[2] Group momentum is, thus, created by contributions that elicit the perception

[2] In the context of organizational change, momentum has been conceptualized as the energy (i.e., enthusiasm and excitement) that people feel about change (Amburgey, Kelly, & Barnett, 1993; Jansen, 2004). In the task-based context that we are examining, momentum is more appropriately conceptualized as the perception of progress, as there can be enthusiasm without momentum. However, we share the view that momentum inherently is energetic.

that the group is moving forward toward its goal. Momentum is dynamic, and fluctuates based on the contributions that are made and how these contributions influence the perceptions of group members (Jansen, Shipp, & Michael, 2016; Quinn, Spreitzer, & Lam, 2012). Amid the relatively disjointed contributions during the idling phase, there will be moments during which the group is making progress and experiences momentum as growing, and moments when progress is lacking and momentum is perceived to be slowing (see Figure 2a). Thus, we propose that momentum will ebb and flow, depending on the nature and timing of contributions—accelerating as contributions quickly follow one another and slowing when there are delays or no contribution is made (Taylor & Demick, 1994).

What contributions enable group momentum? We argue that the content and timing of contributions both shape perceptions of momentum. Specifically, we suggest that *additive contributions*, defined as "those contributions that aim at refining an individual's ideas (or actions) by building upon or extending them" (Baer & Brown, 2012: 61) enable group members to experience a sense of progress. Additive contributions focus on the strengths—something that is in the eye of the beholder—of a suggested contribution, further elaborating on the contribution, thereby allowing members to feel validated (Vera & Crossan, 2005). When someone builds additively, however, it not only validates that person's contribution (Leary, 2007) but also increases the personal relevance of the task, as some aspect of their contribution remains in place (Ryan & Deci, 2000). The degree to which the activity is personally relevant, in turn, promotes a sense of enjoyment (Pekrun, 2006), further motivating members to engage and contribute, thereby growing momentum.

This is in contrast to the common experience of members sharing a contribution, only for it to be ignored or some aspect of it rejected (Baer & Brown, 2012). Such an experience is deflating and can lead members to withdraw their efforts out of frustration (Smart Richman & Leary, 2009). Indeed, members often offer their own, unrelated contributions or make subtractive changes to a previous contribution by eliminating certain aspects of it (Baer & Brown, 2012). Evaluating and criticizing the quality of a contribution is qualitatively the opposite of momentum, as it involves slow, effortful cognitive processing (Hamilton, Vohs, Sellier, & Meyvis, 2011). We propose that such contributions will reduce group momentum, since they do not build upon the previous contribution and will thus be perceived to halt progress, at least temporarily.

We argue that additive contributions outweighing subtractive contributions is a necessary but not a sufficient condition for group momentum. This is because contributions need to happen *quickly and frequently* to sustain and build momentum. If there is too much delay in between contributions, or a particular contribution is too long-winded, it will come at the cost of perceived progress. In fact, frequent contributions or actions are required for momentum to grow (Iso-Ahola & Dotson, 2014; Mace, Lalli, Shea, & Nevin, 1992; Markman & Guenther, 2007). Thus, each contribution made during the acceleration phase can influence group momentum, increasing or decreasing it. If a contribution does not build on the last or there is a delay in time—which is perceptually too long, thereby compromising others' attention and perceived progress—momentum will be lost. Thus, the timing of contributions is critical to the emergence of group flow by shaping momentum.

Group momentum enabling group flow. Group momentum elicits an overestimation of continued success, fostering the feeling that members have the wind at their backs, and enhancing the perception of what can be accomplished and the *perceived* certainty of it occurring (Iso-Ahola & Dotson, 2016). The following quote nicely illustrates this phenomenon:

> Seeing a stream of events in which there is a clear trajectory, or progression toward a target outcome that has yet to happen … might evoke a feeling of knowing that elevates likelihood estimates even higher than when the outcome is actually known. (Roese, Fessel, Summerville, Kruger, & Dilich, 2006: 306)

Importantly, momentum does not *ensure* success; however, it strengthens members' belief in the likelihood of success. In fact, if an outcome is already *known*, this knowledge can reduce the extent to which people fully engage their attention (Loewenstein, 1994), which would be detrimental to flow. We propose that these qualities of momentum, in turn, shape the attentional, affective, and behavioral aspects of group flow in a way that allows for group flow to arise, as detailed next.

First, we suggest that the belief in a greater likelihood of success helps focus the attention of group members by removing anxiety and increasing the emotional significance of the task more generally (i.e., making it more personally relevant). Enhanced emotional value gives a task precedence over everything else from an attention allocation perspective (Compton, 2003). Since a stimulus' emotional content is suggested to be the most powerful source of influence on attentional selection, as the sense of

potential grows with momentum it becomes more likely that members devote full attention to the task and the wider task environment (Anderson, 2005). In addition, momentum and the positive emotions (i.e., enjoyment, excitement) that are associated with it will transform attention to be more exogenous (automatic), creating the seemingly effortless feeling of flow (Awh, Belopolsky, & Theeuwes, 2012). Indeed, one of the effects of positive emotional arousal is automatic cognitive processing (Bargh & Chartrand, 1999; Thayer, 1989). Moreover, we suggest that the belief in a greater likelihood of success that accompanies momentum (Iso-Ahola & Dotson, 2016) elicits a level of perceived control that will quiet the mind of worry and provide a degree of mental order that contributes to the seemingly effortless nature of group flow, since people are not processing any thoughts that are unrelated to the task and its completion.

We also propose that the energizing, positive emotions created by group momentum enhance action synchrony, creating the perception of smooth action (Thayer, 1989). This is partly due to the fact that members gain a better sense of *when* it is appropriate to contribute. Indeed, evidence suggests that synchrony in the form of timing and coordination typically occurs outside of awareness and in nonverbal channels—that is, in embodied visceral sensations and kinesthetic activity that yield a sense of attunement with another person's actions (Tickle-Degnen & Rosenthal, 1987, 1990). In addition, positive arousal is suggested to provide the cues to other people that make coordination possible (Barsade & Gibson, 2012; Kelly & Barsade, 2001; Keltner & Kring, 1998), allowing members to respond with relative automaticity to diverse cues (Droit-Volet & Berthon, 2017) and broadening their thought-action repertoires (Fredrickson, 1998, 2001).

Phase 2: Group Flow

We argue that the shift to group flow happens when momentum has increased to the point that evaluation (including both of the self and of other members of the group), as well as the negative emotions (e.g., anxiety) and the additional cognitive effort that comes with them, fully dissipate for everyone in the group.[3] Sustained attention on others and their contributions allows for members' sense of selves to temporarily fade into the background, akin to the loss of self-consciousness that occurs in individual flow (Csikszentmihalyi, 1975; Sawyer, 2007). However, for group flow to emerge, thoughts related to the abilities of other group members or the quality of their contributions, as well as the continued evaluation of progress and the likelihood of success, must also dissipate, as depicted in Figure 2b. As these are based on deliberate evaluative processes, such cognitions are likely to interfere with the attentional and affective processes that underlie the emergence of group flow (Markman & Guenther, 2007).

Launching a spacecraft provides a useful analogy for the emergence of group flow as a function of sustained group momentum. The initial launch requires substantial amounts of energy for the spacecraft to escape Earth's gravity (acceleration phase). As the spacecraft reaches a certain distance, the balance between gravity and acquired momentum keeps the spacecraft in orbit without the use of additional energy—that is, effortlessly (shift to group flow). In the same way, group flow is reached by the initial labored interactions between group members. However, as interactions happen with greater ease, speed, and frequency and group flow ultimately arises—much like a spacecraft achieving a balance between speed and gravity allowing it to remain in orbit—the cognitive and affective elements of group flow allow group members to interact effortlessly, removing friction in the form of evaluation, distractions, and negative emotions. The sequencing of the interactions perpetuates this state. We propose that in group flow attention is full and subjectively effortless, the affective experience is shared among the members of the group and characterized by positive, energizing emotions, and action synchrony is achieved.

Full, effortless attention. We theorize that in group flow, attention is fully paid to the current member contributing, to watching for an opening to supplement the member's contribution, and, more peripherally, to the other members of the group. Although full attention has been consistently mentioned as a characteristic of group flow in prior theorizing (e.g., van den Hout et al., 2018), we advance this notion by suggesting that full attention also has a subjective ease and effortless quality (Theeuwes, 1991). In fact, when in flow, we propose that attention is *exogenous*—that is, attention is allocated to task-relevant stimuli in a relatively automatic and rapid manner, *feeling* effortless (Egeth & Yantis, 1997). Indeed, if a stimulus has some particularly salient property, such as its onset (e.g., surprising

[3] While we acknowledge that people can engage in automatic, nonconscious evaluation (Bargh, Chaiken, Raymond, & Hymes, 1996), we suggest that more conscious evaluation is largely suspended during group flow, as attention is fully focused on the contributing member and the group more broadly.

contribution by another member), or if it elicits emotions (i.e., enjoyment because it builds on the previous contribution), attention is rapidly and involuntarily oriented toward it, giving it this effortless quality (Theeuwes, 1994).

Shared enthusiasm and positivity resonance. We submit that the overall affective experience in group flow is characterized by shared, positive arousal, with the level of arousal shading the line between moderate and high. This is because group flow involves highly energizing emotions (e.g., enthusiasm) but it also involves factors that are likely to reduce felt arousal, including a sense of control and being validated and supported by others (Chen, Kumsta, Von Dawans, Monakhov, Ebstein, & Heinrichs, 2011; Wolgast & Fischer, 2017). Moreover, the subjective intensity of the affective experience in group flow is likely to be subdued since the conscious awareness of emotions will dissolve into the background, given limited processing capacity and the need to fully focus on the task and the other members of the group, which can regulate the felt intensity of emotions (Sonnemans & Frijda, 1995). Thus, the affective experience during group flow is best described as members feeling calm but being on the edge of excitement (Quinn, 2003; Sawyer, 2003).

We suggest that enthusiasm is the key emotion characterizing group flow. This is consistent with existing accounts of group flow as well as its associated behavioral characteristics (e.g., control; Pels et al., 2018). Enthusiasm is a high-arousal, positive emotion reflecting the amount of excitement and pleasure that one finds in the task (Shiota, Neufeld, Yeung, Moser, & Perea, 2011). The notion that enthusiasm is a key emotion arising during group flow is consistent with our proposed mechanism that enables group flow—sustained momentum. Indeed, sustained momentum elicits the appraisal of greater certainty of an anticipated outcome (Iso-Ahola & Dotson, 2016), which, in turn, inspires enthusiasm (Shiota et al., 2011). Enthusiasm narrows attention and motivates approach tendencies (Gable & Harmon-Jones, 2008; Shiota et al., 2011) and is associated with dopamine production, fostering unwavering and pleasurable goal pursuit (Griskevicius et al., 2010; Harmon-Jones, Gable, & Peterson, 2010).

During group flow, we propose that members share their enthusiasm and feel "close" to each other—a group experience referred to as *positivity resonance*. Positivity resonance is a momentary experience that occurs when two or more people have an interpersonal connection that is built upon shared, positive emotion and mutual care and concern (Fredrickson, 2013; Major, Le Nguyen, Lundberg, & Fredrickson, 2018). Mutual care and concern are precisely what is cultivated and demonstrated by the aggregate of sustained, additive contributions. Thus, in group flow, members share their enthusiasm as they interact. When these positive feelings are shared, it creates a sense of solidarity and a sense that what the collective is doing is "right" (see Collins, 1993). The fact that affect converges is consistent with findings that the emotions that underlie group flow (e.g., enthusiasm) are contagious (Sandberg, 2007; Wang, Zhuang, Yang, & Sheng, 2014).

Action synchrony. Existing descriptions have referred to group flow as being in "sync" (Sawyer, 2003) and highlighted the importance of having alignment between contributions (van den Hout et al., 2018). However, synchrony is based not just on the content of contributions but also on their relation in time. Specifically, to experience synchrony, member contributions need to occur in close succession (Mogan et al., 2017). Indeed, when interactions happen rapidly and frequently, reducing the time between contributions, group interactions as a whole will be perceived as being in synchrony (Hove & Risen, 2009). Rapid and frequent contributions ensure that members are not cutting short each other's contributions, or trying to contribute at the same time and thus causing interruptions. We do not suggest that there needs to be a preset structure or necessary order of turn-taking; however, given the speed and fluidity of interactions, people observing a group in flow may falsely conclude that there is a governing order present. The result is that people observing typically perceive group members to be "on the same page" and having a high degree of interpersonal chemistry (Reis, Regan, & Lyubomirsky, 2022). Unlike other group emergent states (i.e., collective efficacy), sustained additive, swift contributions are necessary to sustain group flow. If interactions were to stop or become labored, attention would likely break and evaluative and self-conscious thoughts would be likely to return.

Returning to the example of Alicia, Michael, and Erica, when in group flow, members are fully immersed in the task and the sequencing of contributions. Alicia is no longer assessing the quality of Michael's or Erica's contribution or whether she is a contributing member of the group. She is exclusively focused on spotting an opening to contribute or assist, sensing when she needs to jump in to help the group and when she needs to retreat to let others shine. Michael and Erica are similarly absorbed in the action, focused on adjusting their contributions—as depicted in Figure 2b.

How does group flow dissipate? We argue that the beginning of the end of group flow is marked by a decrease in synchrony. Synchrony could be decreased by any number of external or internal factors that produce a noticeable delay or gap in the time between contributions (Hove & Risen, 2009). For instance, synchrony would not be possible if interactions were to stop, such as when the group runs out of time. Alternatively, someone might knock on the door during a meeting, someone's video could lag or freeze during a virtual meeting, or fatigue could cause members to reduce the speed and frequency of contributions. A more sporadic pattern of contributions is likely to produce scattered attention and makes it more likely that members evaluate others' contributions, as well as the group's progress toward its goal more generally, ultimately resulting in the perception of decreasing momentum. Nevertheless, if one individual member experiences a break in attention, this may not necessarily jeopardize group flow. To the extent that others continue to contribute additively with sufficient speed and frequency, we suggest that this will provide the time for the member to reenter the conversation or action and contribute (see Figure 2). Contributions that are seemingly unrelated, including those that make subtractive changes, consequently, have an outsized ability to reduce synchrony (Tickle-Degnen & Rosenthal, 1987). Given that full attention and continuous, building interactions are required to sustain group flow, it is a fragile state, making it difficult to maintain over long periods of time (i.e., hours).

Phase 3: The Afterglow

We propose that once group flow ends—that is, when attention is no longer fully focused and effortless and contributions have largely ceased—group members collectively will experience a euphoric flood of positive emotions and a strong sense of interpersonal connection, which we term "afterglow."[4] Positive emotions can have effects that last for an extended period of time, based on the intensity of the emotion (Andrade & Ariely, 2009; Wegener & Petty, 1994). Thus, we suggest that the euphoric feeling signifying afterglow is a combination of positive emotions lingering from group flow (i.e., enthusiasm) along with new emotions that emerge afterward (i.e., pride), as group members reflect on their experience and as their temporal focus shifts from present to past.

In reflecting on their experience, members are likely to perceive an enhanced sense of mastery—one catalyst that enables positive emotion during afterglow. Research has suggested that perceptions of mastery result from having been able to develop a rich body of contributions (Amabile & Kramer, 2011), satisfying the basic human need for competence (Bandura, 1977, Ryan & Deci, 2000). Following group flow, members are likely to reflect on the experience, not only in tackling aspects of the task but also in their ability to coordinate effectively with others in the moment. Perceptions of mastery result in positive emotions, most notably pride, which stems from a sense of accomplishment (Tracy & Robins, 2007).

We expect afterglow to similarly strengthen the bond between members of the group. When individuals experience pride, they are likely to savor the experience, encouraging people to reflect on and share their positive experience with each other (Stellar et al., 2017; Yih, Kirby, & Smith, 2020). Pride encourages people to talk about what happened, focusing on achievements and the moments that led to them (Williams & DeSteno, 2008). Given the central importance of additive contributions to group flow, while reflecting on the experience, members are likely to recognize the things that other members did for them and how they benefitted from their actions (Stellar et al., 2017), which enhances a sense of gratitude (Campos, Shiota, Keltner, Gonzaga, & Goetz, 2013). Recognizing the care shown for each other will bring the group closer together, resulting in members feeling a shared sense of "we" instead of "I" (Duncan & West, 2018; Rouse, 2020; Zumeta, Oriol, Telletxea, Amutio, & Basabe, 2015).

Finally, as the group collectively reflects on the group flow experience, we expect members to acknowledge the passing of time, since it will have been perceptually altered during group flow. Consistent with prior states of extreme enjoyment and absorption (Agarwal & Karahanna, 2000), we theorize that members experience a distorted perception of time looking back on the group flow experience—either feeling that time flew by or that they were moving in slow motion with time standing still. As the reflection and sharing of experiences continues and the enthusiasm associated with group flow slowly dissipates and is replaced with a collective sense of pride and gratitude, the afterglow dissipates. The afterglow is thus an experience during

[4] The afterglow is comprised of positive emotions that result both from the way the group interacted and from the mastery of the *process* of interacting. Thus, it is not necessarily dependent on goal accomplishment. However, we submit that the afterglow will be more pronounced to the extent relevant goals have been accomplished.

which the heightened cognitive and behavioral elements of group flow have subsided but members still experience the positive emotions and the strengthened interpersonal bonds created by it. While attention is not effortless, there should be a degree of ease given the emotions involved. The group might also start to reflect on the quality of the work that has been done and consider next steps, if the goals of the performance episode have not been achieved or have only been partially achieved.

GROUP FLOW, AFTERGLOW, AND GROUP EFFECTIVENESS

Despite the fact that group flow has often been associated with greater group effectiveness (Sawyer, 2003, 2007; van Oortmerssen et al., 2022), the precise nature of this relationship, as well as its underlying explanatory mechanisms, remain poorly understood (Pels et al., 2018; for an exception, see Aubé et al., 2014). Thus, it is unclear why and precisely how the components of group flow enhance group effectiveness. We suggest that group flow enhances group effectiveness along three dimensions (Hackman, 1987)—individual member well-being and growth, enhanced group viability, and peak collaborative performance.[5]

Individual Well-Being and Growth

Well-being is partly determined by the emotions that people experience from day to day, most notably the relative frequency of positive versus negative emotions (Diener et al., 2010). The experience of group flow, as well as the afterglow, are ripe with positive, energizing emotions, which may partly explain prior claims that group flow is intrinsically rewarding (e.g., van den Hout et al., 2018). The afterglow is particularly important to fully harvest the positive emotions that group flow can produce. This is because reflection and sharing will bring about some of the positive emotions and will also extend their duration and resulting impact as members savor them (Bryant, 2021; Bryant & Veroff, 2007; Fredrickson, 2001).

Personal growth, a fundamental aspect of well-being, is partly based on the realization of one's potential through purposeful engagement, which is both cultivated and demonstrated by the process of mastery (Diener, Suh, Lucas, & Smith, 1999; Ryff & Singer, 2008). Given that group flow allows members to fine-tune their abilities to jointly coordinate their activities and allows for the experience of peak collaborative performance (which we articulate next to be based in part on efficient collaborative interactions), a sense of mastery should ensue, resulting in personal growth. That is, whether the group achieves their final goal or not, the mastery of the process of interacting should lead to a sense of mastery and growth.

Group Viability

Group flow and afterglow are likely to enhance group viability. Group viability refers to members' commitment to the group, as well as the desire to remain part of the group going forward (Balkundi & Harrison, 2006, Goodman, Ravlin, & Schminke, 1987). We theorize that the positive emotions and sense of interpersonal connection associated with group flow, as well as with the afterglow, will increase the group's desire to work together in the future. Indeed, the pride emanating from the sense of accomplishment experienced during the afterglow is likely to propel members to seek out the members of the group again for future collaborations (Lazarus, 1991; Williams & DeSteno, 2008).

The interpersonal bonds that are strengthened through group flow—something that is acknowledged explicitly during the afterglow—similarly increases the group's desire to work together in the future. Specifically, strong interpersonal connections enhance rapport (Tickle-Degnen, & Rosenthal, 1990), unifying group members through a shared identity (Reis, Regan, & Lyubomirsky, 2022) as epitomized by the transcendent experience of "we" (Owen, 1985). We propose that reflecting on the experience of group flow enhances commitment to each other, since acting in synchrony and responding quickly are signals of interpersonal closeness (Templeton, Chang, Reynolds, LeBeaumont, & Wheatley, 2022), which fosters liking and social connection (Mogan et al., 2017).

Peak Collaborative Performance

We conceptualize peak collaborative performance both in terms of quantity of output per unit of

[5] If group flow does *not* emerge, we believe groups will return to or remain in the idling phase, which is likely correlated with a wider range of outcomes, including those that are neutral or negative. Since group flow is associated with increased quantity and quality of output, a lack of group flow should increase the possibility of a negative performance outcome. In addition, we believe it is possible that both group viability and well-being could be negatively impacted, given the mixed emotions associated with the idling phase.

time (efficiency) as well as in terms of quality (Hackman & Morris, 1975; Mathieu, Gallagher, Domingo, & Klock, 2019; Mathieu, Maynard, Rapp, & Gilson, 2008; McGrath, 1984). We theorize efficiency to be a proximate outcome of each group flow experience, while quality is a more distal outcome determined, to some extent, by the cumulative number of group flow experiences that a group manages to conjure during a particular performance episode. In other words, while each *single* group flow occurrence has the potential to enhance quantity, quality arises as a function of groups entering flow *multiple times* during the same performance episode.

Quantity. During group flow, member contributions are primarily additive and occur in quick succession at a high frequency—that is, member contributions are highly efficient. Therefore, we posit that group flow enables peak collaborative performance, in the sense that it optimizes the quantity of output per unit of time. When group members are unable to anticipate each other's actions and adjust their own actions accordingly, poor coordination ensues, which tends to depress efficiency (Schelling, 1960; Steiner, 1972). Evidence of coordination failures includes delays, misunderstandings, and a lack of action synchrony (Puranam & Raveendran, 2013)—experiences that are common in many groups (Van Huyck, Battalio, & Beil, 1990).

Group flow is qualitatively the opposite of these experiences. In fact, it is the epitome of efficiency, as the group moves seamlessly and in synchrony toward its goal. The quality of full attention facilitates this type of seamless coordination by optimizing each person's understanding of the contributions that are being made and by allowing them to anticipate where the contributing member is going seconds in advance (Stephens, Silbert, & Hasson, 2010). Visual and auditory attention are important in detecting the signals that help individuals understand *when* someone is finished and *when* it is time to contribute (Garrod & Pickering, 2015; Schmidt, Carello, & Turvey, 1990). Furthermore, full attention helps members discern *what* to contribute, as focusing attention on the contributions of others helps individuals understand the intentions of the member actively contributing (Huber & Lewis, 2010).

While the attentional qualities of group flow allow members to better understand *what* to do and *when* to do it, the elevated level of arousal associated with group flow allows individuals to *act* on this understanding. This is due to the energizing and approach-oriented nature of positive arousal (Gable & Harmon-Jones, 2008). Moreover, the positive emotions arising during group flow (i.e., enthusiasm) are known to enhance memory, providing access to a greater amount of information for members to draw upon and to integrate into their next contribution (Harmon-Jones, Gable, & Peterson, 2010). By increasing the amount of information accessible and propelling members to get involved quickly, the affective nature of group flow is likely to enhance the amount of progress that can be made over time.

Finally, the *nature* of contributions giving rise to group flow also enhances efficiency. For instance, in group flow subtractive contributions are largely absent, so there is no time wasted by halting progress or moving backward. The lack of subtractive change further limits the possibility for distraction in the form of ruminative or assessment-related thoughts that tend to arise when one is criticized. Distractions due to such thoughts lead to temporary disengagement from the task and make it difficult for members to reengage with it, as mental processes need to be reconfigured (Leroy, Schmidt, & Madjar, 2020), in turn decreasing efficiency.

Quality. We suggest that group flow also has the potential to enhance the quality of output of a performance episode. In contrast to quantity, which is enhanced each time a group enters flow, quality is enhanced to the extent that groups enter flow multiple times during a given performance episode. Indeed, despite group flow typically being subjectively experienced as a high-performance experience—and it being associated with higher levels of actual performance (Sawyer, 2003)—it does not *guarantee* objective quality of the output every time a group experiences flow, similar to flow at the individual level (Cseh, Phillips, & Pearson, 2015; Quinn, 2005). The reason why the relationship between group flow and quality is best characterized as stochastic is due to the inherent nature of group flow. While in flow, members suspend conscious evaluation and individuals' processing capacities are largely consumed by the need to fully focus on the contributing member and the other members of the group more peripherally. Establishing quality, however, requires members to engage in evaluation, comparing the nature of contributions and the group's progress more generally vis-à-vis the goals set for the performance episode (Hackman & Morris, 1975). Thus, establishing quality necessitates cognitive processes that likely compromise the group flow state.

A broader temporal lens is required when theorizing about the effects of group flow on quality. We submit that group flow will enhance the quality of the group's output *across* flow experiences within

the same performance episode. Indeed, the quality of a group's output is partly determined by the frequency and duration of goal-directed collaborative efforts (Kelly & McGrath, 1985; Larson, McLarnon, & O'Neill, 2020; Waller, 1999). Consequently, we suggest that quality of output is influenced by the number of times a group enters flow during a given performance episode.

We theorize that having experienced group flow, as well as afterglow, the group's *desire* and *belief in their abilities* to conjure this pleasurable state once again should increase, even in the absence of goal progress, leading to continued engagement toward the shared goal. We believe the desire to reexperience *group flow* is due to the positive emotions associated with both flow and afterglow—enthusiasm and pride—as well as the enhanced sense of interpersonal closeness, both of which should increase the group's appetite to reenter group flow within the same performance episode. This is similar to people chasing flow at the individual level by continually reengaging with a flow-inducing activity to reexperience the intense positive feelings it elicits (Partington, Partington, & Olivier, 2009).

The sense of mastery associated with both flow and afterglow is likely to enhance members' belief in their own abilities as well as the abilities of others to successfully contribute to the group effort (Campos et al., 2013; Salanova et al., 2014). This, in turn, should also allow the group to enter flow more easily going forward, by limiting evaluation apprehension and self-doubt and reducing anxiety that stands in the way of group flow arising (Casciaro, Lobo, Wilhelm, & Wittland, 2022). Furthermore, the time in between group flow experiences affords groups the opportunity to reflect on and engage in the evaluative processes that allow them to establish the quality of their work and, in the case of lack of goal progress, to make adjustments before continuing (Otte, Konradt, & Oldeweme, 2018). We suggest that experiencing flow should enhance a group's sense of their ability to evaluate and reengage without being as negatively affected by the subtractive contributions that are often part of evaluation, given the foundation of validation established through group flow (Rouse 2020). Thus, the experiences of flow and afterglow can build what we term a "group flow capacity," making it more likely for groups to enter group flow in future interactions and increasing the speed with which they do so. This reoccurrence of group flow during a performance episode in combination with the evaluation of progress between experiences enables greater quality of output in the service of accomplishing the goals set for the performance episode.

THEORETICAL IMPLICATIONS AND FUTURE RESEARCH

Groups often fail to reach their potential, performing below expectations. We develop theory to explain how group members contribute in relation to one another and over time in ways that facilitate group effectiveness via the emergence of group flow. In disaggregating the actions and contributions of group members and decompressing the notion of time, our theorizing of how group flow emerges, dissipates, and shapes outcomes helps explain how known inputs, conditions, and processes in groups work together over time to enable group effectiveness.

Implications for Research on Group Flow

Scholars have speculated about the existence of group flow and posited it to be a state that can elicit extraordinary levels of performance (Aubé et al., 2014; Duncan & West, 2018; Sawyer, 2006). However, theorizing related to group flow is still in its infancy, comprised primarily of descriptions of how it is experienced (e.g., time distortion, enjoyment) and of conditions (atheoretically derived) that may serve as potential enablers (e.g., Sawyer, 2003, 2006), without articulating its precise nature and how it operates. Our theory moves beyond the current descriptive understanding of group flow to explain how and why the state of group flow emerges and dissipates. We do so by delineating three phases—acceleration, group flow, and afterglow—that develop from idling, which may be considered the less optimal default state of many groups. Understanding the process through which group flow emerges (and dissipates) is critical for leveraging the benefits of group flow—without understanding how group flow operates, it is difficult to nurture it and to appreciate its full range of benefits. In particular, articulating the afterglow phase, which has not been considered in prior research, is an important theoretical advancement because it expands our understanding of the consequences of group flow and the benefits it can have for individuals, groups, and organizations.

In unearthing how group flow emerges, we specified its cognitive, affective, and behavioral underpinnings. Doing so advances theory by more precisely explaining what group flow *is,* so that it

can be studied more systematically in future research. We advance prior speculations about group flow's cognitive underpinning by emphasizing the role of the *quality* of attention (exogenous) rather than focusing on the role of *quantity* of attention only (full; Quinn, 2003; Walker, 2010). Our theorizing of the affective component goes beyond previous work by not only articulating the degree of emotional arousal but also specifying the emotions involved during flow (e.g., enthusiasm) and how they arise. Lastly, the behavioral dimension highlights the importance of contributions that are linked in time—not just in terms of their content, which has been the focus of prior theorizing—in building momentum (Sawyer, 2006). In addition, we suggest that only when additive contributions start to outweigh subtractive contributions and the time between interactions decreases does group flow arise. The dissolution of group flow is also tied to momentum, with anything that limits action synchrony (e.g., a delay in time, unrelated contributions) having the potential to limit perceived forward progress and, thereby, group flow. Our model, thus, reveals a potential benefit of collaborating in shorter, time-bound intervals, and highlights the importance of the timing of contributions and actions in the emergence and dissolution of group flow.

Group flow elicits a rare experience in which members not only are content to surrender control to the other members of the group but also have a more enjoyable experience doing so (Walker, 2010). Instead of asserting the self to shape how the group does its work, members let their desire to exert control temporarily fade away in order to serve the needs of the group, with no single voice dominating (Duncan & West, 2018). Group momentum enables this rare degree of openness, as members surrender to the notion that something great and potentially bigger than themselves is about to happen (Iso-Ahola & Dotson, 2014). This optimal balance between individual autonomy (over when and how to contribute) and surrendering control (over the overall trajectory of the teams' work) to the team in group flow partly addresses the need to better understand the role of autonomy in group coordination (Langfred, 2005), and offers a richer conceptual understanding of coordinating mechanisms that have sufficient flexibility (Harrison & Rouse, 2014).

Our theorizing also augments the group flow literature by explicating the conditions under which group flow is particularly relevant. Indeed, group flow has the potential to occur in a wide range of task environments and groups, but it is not relevant for *all* groups. Specifically, group flow is more likely to be conducive to collaborative performance in task environments characterized by reciprocal interdependence, requiring members to offer contributions in close succession, simultaneously, and interactively. These conditions are featured in any number of group tasks, including generating ideas, planning and strategizing, deciding on issues, and performing and executing (McGrath, 1984). In addition, although it may be inviting to assume that the emergence of group flow is predicated on contributions that are verbal in nature, nonverbal contributions can also facilitate the emergence and sustainment of group flow. Additive contributions can be physical in nature, such as spontaneously drawing a visual representation of something that someone else is explaining, or stepping out of line to finish the answer to a question on behalf of someone else who seems to be struggling to address it. Thus, group flow can occur in verbal, mostly cognitive tasks, but can also arise in tasks relying on physical interactions, such as in sports, music, and theater, as has been demonstrated in prior research (e.g., Gaggioli, Chirico, Mazzoni, Milani, & Riva, 2016; Hart & Di Blasi, 2015; Sawyer, 2003; Zumeta et al., 2015).

Implications for Research on Emergent States, Coordination, and Performance in Groups

Our theory highlights that how group members act and contribute in relation to one another, both in the moment and over time, can have powerful effects on a group's experience and how well it performs. Although research has examined a wide range of different emergent states, such as team efficacy (Salanova et al., 2014), shared mental models (Smith-Jentsch, Mathieu, & Kraiger, 2005), group affect (Barsade & Knight, 2015), and shared attention (Metiu & Rothbard, 2013), among others, the focus of this work has been on the motivational, affective, and cognitive aspects of group states (Rapp et al., 2021). Little attention has been paid to the dynamic pattern of momentary interactions that give rise to such states (Marks et al., 2001). In other words, although the concept of emergent states implies that these states "emerge" from actions within the group, we have little theory to explain the actions and interactions that constitute emergence. The literature has instead focused on aggregate-level actions and the processes they fall into (Mathieu et al., 2008, 2019; Okhuysen & Bechky, 2009). In our theorizing, we disaggregate member contributions to focus on the dynamic pattern of interactions among the individuals members of a group. In doing so, we contribute

to the literature on emergent states by spotlighting the importance of the behavioral underpinnings of group states. In addition, our theorizing offers a useful template for unpacking how certain factors known to shape group functioning can work together over time to produce certain emergent states, and how those states, in turn, shape important group outcomes.

Coordination is essential for group effectiveness. However, how members interact in the moment and over time to efficiently coordinate and, ultimately, achieve peak collaborative performance is poorly understood. We offer a new perspective that highlights the relational and temporal nature of member contributions. For group flow to emerge, contributions need to be additive (i.e., building on a prior contribution) and they need to be made swiftly (i.e., in quick succession to the prior contribution) and at a high frequency. Thus, our theory specifies some of the interpersonal parameters that not only govern the emergence of group flow but also allow for the momentary adjustments in coordination that are often required when groups perform tasks involving reciprocal interdependence. In doing so, our theory extends research on coordination generally and adaptive coordination in particular (Harrison & Rouse, 2014; Lifshitz-Assaf et al., 2021; Rouse, 2020; Stephens, 2021).

One mechanism to enhance coordination is the use of certain behavioral rules. Although establishing rules can certainly be valuable in coordinating group members' interdependent contributions, this relatively static way of coordinating has its limitations (Okhuysen & Bechky, 2009). The classic rules of brainstorming provide a useful example of some of these limitations. During brainstorming, members are encouraged to generate as many ideas as possible in a free-wheeling format, and to coordinate their efforts by building on the contributions of others without evaluating them (Osborn, 1957; Sutton & Hargadon, 1996). The reality, however, is that this set of rules is difficult to implement and follow. As a result, brainstorming has been found to be inefficient and ineffective (Gallupe, Cooper, Grisé, & Bastianutti, 1994; Litchfield, 2009; Mullen et al., 1991; Pinsonneault, Barki, Gallupe, & Hoppen, 1999).

Our theoretical analysis reveals why such rules *must* fall short in coordinating the interdependent efforts of multiple group members and in eliciting peak collaborative performance. For instance, a free-wheeling format and the desire for quantity leads people to offer whatever ideas come to mind—ideas that often are divorced from what came before. Although offering new, unrelated starting points can be valuable, it does thwart forward momentum and the critical emotional arousal that comes with it (Iso-Ahola & Dotson, 2016). More importantly, the rule to improve on others' contributions is usually based on a careful evaluative judgment (rather than spontaneous, in-the-moment action as in group flow), in turn undermining members' ability to let go of their sense of self. The potential of having one's idea scrutinized for its weaker aspects is likely to leave members feeling apprehensive to contribute going forward, undermining the potential for momentum to build and for synchrony to arise (Tickle-Degnen & Rosenthal, 1987). This is consistent with research suggesting that despite the rule to not criticize, people are still apprehensive about contributing in face-to-face group brainstorming (Cooper, Gallupe, Pollard, & Cadsby, 1998; Gallupe et al., 1994). Our analysis spotlights that fewer rules but a greater focus on the nature of contributions and their timing and frequency might be more useful in coordinating the interdependent efforts of individual group members.

Our theorizing also complements emerging research on the microlevel communicative underpinnings that allow groups to coordinate sustainably and perform effectively (Lehmann-Willenbrock, Allen, & Kauffeld, 2013). Previous research has spotlighted the role of humor and positivity, among other aspects, in strengthening the social fabric of a group, thereby enhancing performance (Lehmann-Willenbrock, Chiu, Lei, & Kauffeld, 2017). For instance, examining the behavioral patterns of humor and laughter in teams during 54 team meetings, Lehmann-Willenbrock and Allen (2014) observed that *humor patterns* (i.e., humor followed by laughter or more humor) positively related to team performance. Our work complements this research by spotlighting the importance not only of the nature and timing of contributions but also of the dynamic interplay between these behaviors and the cognitive or affective changes that unfold over time, and by theorizing the implications of this interplay for the emergence of certain states, such as group flow.

A corollary benefit of our theoretical analysis is that the insights we generated are highly *actionable*. All too often, practical recommendations based on prior research are too general to prescribe in detail what members should do in the moment to achieve peak collaborative performance. For example, while it is important for people to be "responsive to group members" (i.e., decrease the time between engagement; Riedl & Woolley, 2017), this prescription does not provide enough guidance as to what members

need to say or do in the moment. In fact, as our theory suggests, people can be responsive, but if their contributions are subtractive they are bound to limit the cognitive and affective processes that enable group flow and, as a result, peak collaborative performance. Our theory is specific enough to provide actionable guidance but broad enough that it applies to a variety of task environments (i.e., tasks featuring reciprocal interdependence).

Directions for Future Research

Our theorizing of the process through which group flow emerges and dissipates opens the door for future research to further explore how to enable and sustain group flow. Prior work on group flow has identified some of its boundary conditions, including the importance of shared goals, equal participation, and equally high ability (Duncan & West, 2018; Quinn, 2003; Sawyer, 2003). We believe that there are other important variables for future research to consider. For instance, the size of the group is likely to be a determining factor. The larger the group, the more difficult it will be to dynamically coordinate who is next to contribute in a timely enough manner to reach the point of synchrony (Van Huyck, Battalio, & Beil, 1990). Status equality (i.e., the absence of a steep status hierarchy among group members) is likely to matter as well for group flow to emerge. Status discrepancies can create performance-related anxiety for those of lower status (Harrison & Klein, 2007), making it difficult for them to fully focus on the task at hand and on the other members of the group. In contrast, members of higher status tend to make less effort to synchronize their actions with other members of the group (Gregory & Webster, 1996), thereby reducing the chances for group flow to arise. In addition, high-status members are more motivated to maintain their high status and, as such, less likely to surrender control during interactions as a means to avoid status loss (Hogan & Hogan, 1991; Troyer & Younts, 1997).

It would be meaningful for future research to explore how organizations can create conditions under which group flow is more likely to emerge. For example, fostering play, conceptualized as a behavioral orientation to performing work (Mainemelis & Ronson, 2006; Miller, 1973), may be particularly conducive to group flow. Play has several elements that likely support the cognitive and affective elements necessary for group flow. An orientation of play is free from right or wrong, true or false (Sutton-Smith, 1997), which helps clear the mind of assessment and thoughts or emotions related to worry. The behavioral manifestation of play involves surprise and unresolved possibility (Sandelands & Buckner, 1989), and might draw full attention and effortless engagement based on their intrinsically rewarding properties and positive emotional arousal (Webster & Martocchio, 1993). Play also encourages an openness to alternative solutions (Mainemelis & Ronson, 2006), which might encourage additive building and action synchrony (Sandelands, 2010). Organizations can promote play in several ways, including hiring people who are high in openness to experience and who are more risk tolerant (Glynn & Webster, 1992), limiting conditions of external threat at work (Bruner, 1972), and designing tasks that temporarily suspend organizational rules and functional or social pressures (Nemeth, 1997).

Exploring how to help group members surrender control may be particularly worthwhile, given its fundamental role in our model. The tendency for individuals to desire control is antithetical to group flow (Leotti, Iyengar, & Ochsner, 2010). However, people differ in their synchrony preferences—their willingness to adapt their pace and rhythm to others—which would directly influence their ability to surrender control and synchronize (Leroy, Shipp, Blount, & Licht, 2015). Supportive leadership behaviors (Rafferty & Griffin, 2006), as well as efforts to cultivate psychological safety (Nembhard & Edmondson, 2006), may both increase the likelihood that members surrender control to the group.

Our theorizing focused on how group flow enables a range of beneficial outcomes. Future research may explore whether there are any negatives consequences to this collective state, however. For example, while group flow is an inclusive experience and thus benefits social cohesiveness (van den Hout et al., 2018), it is possible that it could also exacerbate in-group–out-group dynamics depending on how group flow emerges. Specifically, we started from the assumption that for group flow to arise it is necessary for the entire group to be in flow. However, it is possible that some members choose not to contribute, or a subgroup breaks apart and experiences flow together, leaving others feeling excluded for not being part of the experience. Similarly, the cohesiveness that results from group flow could lead to subsequent social exclusion in the form of ignoring or rejecting other people or their contributions in future interactions (Molden et al., 2009). That is, the group may ignore or reject other people when forming a group

for a new task in an effort to maintain membership stability, thereby increasing the chances they experience flow again (Ellemers, Spears, & Doosje, 1997).

There are other temporal aspects of group flow that we did not consider explicitly as part of our theorizing. Most notably, we did not specify the maximum amount of time that group flow can be sustained for. Depending on the nature of the task and how long it takes to complete, it is possible that group flow episodes vary in length, akin to the microflow and deepflow variants of individual flow (Lavoie & Main, 2019). Future research could explore thresholds of group flow, including the minimum amount of time a group has to be in flow to boost group effectiveness, as we theorized. It is possible that sustaining group flow over extended periods of time—durations longer than we assumed possible—might produce outcomes beyond the ones we theorized. For instance, sustaining such a high level of shared performance for an extended period of time could create a transcendent experience (Eisenberg, 1990; Pratt & Ashforth, 2003). Finally, it might be interesting to explore whether the manner in which group flow ends, especially due to factors that are under a group's control (e.g., decreased synchrony) has meaningful implications for the types of outcomes that group flow produces. These and other questions provide ample fodder for future empirical research.

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