

Chapter 21

Time and Temporality in Groups

Dawna I. Ballard and Dron M. Mandhana

Abstract

The central focus of this chapter is the mutually constitutive relationship between time and group interaction. Groups shape individuals' experiences of time and individuals' experiences of time enable and constrain their group interactions. The chapter begins with a brief history of time in groups to situate early concerns which still shape many contemporary investigations, and then examines several theoretical perspectives as well as midrange frameworks and constructs which inform research on time and group communication. The chapter concludes with a summary and directions for future research in the area.

Keywords: Time; temporality; communication; social entrainment; punctuated equilibrium; constitutive role of time

Time and temporality are central to group communication. While time points *toward* an event, temporality is *in* the events themselves. In group settings, members encounter time through the friction of interacting with others. When group members notice patterns in others' behavior, human temporality gives rise to time (Bourdieu, 1977). For instance, behavior occurs at a particular frequency and temporal location, over a given duration, and with a specific periodicity and sequence (McGrath & Kelly, 1992). Group members experience these patterns and fashion unique construals and enactments that help them to anticipate their next interactions, recall their previous conversations, and proactively coordinate such encounters (Ballard & Seibold, 2003). To negotiate their relationship with each other, group interaction demands that members adopt time-based inventions (e.g., calendars, clocks, or other coordinative agreements) to smooth the flow of interaction.

The centrality of time to group membership can be emphasized by considering whether groups can exist without a shared experience of time. Individuals' group memberships and related identities pace them. For instance, the need to meet (even at irregular or infrequent intervals) requires an agreement as to time. As well, a common past and anticipated future (two time-based construals) are defining characteristics of the bona fide group (Putnam & Stohl, 1990). Thus, group memberships and identities create individuals' times and are associated with multiple temporal processes (Ballard & McVey, 2014). Individuals' temporal experiences are simultaneously limited and expanded by their group memberships. Members may face constraints around certain moments, such as family dinnertime, but that same constraint may offer access to larger traditions and rituals which precede the time of their membership and extend beyond it.

The constitutive role of time is evidenced by the common norms around membership in formal groups of varying sizes. For instance, while there is a predominantly financial aspect to annual renewals, membership lapses, and lifetime memberships, they are nonetheless bound up with time. Annual renewals require that a current member routinely reaffirm (through payment) their interest in maintaining ties to a group. In the presence of sufficient monetary resources, a membership lapse then indicates their lack of interest and loss of identity as a group member. As well, in the presence of considerable financial resources, a lifetime membership can affirm that an individual has projected into the future their desire to always associate with a given group. Rare honorary memberships also occur when the group wants to affirm the same: That the potential member has accomplished feats which are so deeply symbolic of the groups' values and membership that the honorary membership is nothing but a formal confirmation of group membership. In groups without formal membership standards or structures, the frequency, duration, and periodicity of communication with the group in organized settings (e.g., via online forums or face-to-face meetings) is often used to informally define members similarly, as current, former, or even alumni.

Consistent with these observations, the central focus of this chapter is the mutually constitutive relationship between time and group interaction. Groups shape individuals' experiences of time and individuals' experiences of time enable and constrain their group interactions. Extant reviews have offered excellent, heuristic treatments of the temporal perspective on groups and teams, including work by McGrath and Gruenfeld (1993) and Arrow and colleagues (2005). Here, the authors primarily consider time and limit discussions of temporality to the ways in which it shapes time-based practices and norms in groups and teams. Accordingly, the chapter begins with a brief history of time in groups to situate early concerns which still shape many contemporary investigations, and then examines several theoretical perspectives as well as midrange frameworks and constructs which inform research on time and group communication. The chapter concludes with a summary and directions for future research in the area.

A Brief History of Time in Groups

Given the tie between time and task accomplishment in Western, industrialized settings, the focus on time in groups and teams has historically been driven by a concern with productivity and efficiency. Two areas of investigation were exemplary of this tradition. The first was Frederick Taylor's (1911) theory of scientific management and related time-and-motion studies, a method of work analysis, design, and motivation which continues well into the twenty-first century (Lopetegui et al., 2014). This approach is designed to increase productivity, defined as output generated per unit of time. For groups whose work is subject to scientific

management, however, the traditional use of wage incentives to increase productivity often made pacing norms contentious (Dalton, 1948). If production rose too high, overall rates would be cut. Consequently, groups collectively pressured members, called rate-busters, whose production exceeded the norm. This pressure ranged in intensity from ostracism and verbal threats to physical violence. At the same time that groups may wield influence to moderate the pace of work, classic research on the bank wiring observation room also showed that informal group norms can lead members to work faster (Homans, 1951/2013). Thus, teams and time were two key constructs in early industrial research.

A second, prominent area of scholarship that emerged later focused attention on efficient group coordination. Thompson (1967) described the time-based elements of pooled, sequential, and reciprocal interdependence and the corresponding coordination required by group members. *Pooled interdependence* exists when units each produce distinct deliverables (products or services) that are not directly contingent upon another unit's performance, but each is impacted by the performance of all other units based upon their shared fate as members of the same organization. In these cases, frequent communication is unnecessary for task completion, and activity coordination can be regulated through establishing regular time-based standards for behavior. Requiring all employees to report to work at 9 a.m. to begin the workday, go to lunch at 12 p.m., and leave the office at 5 p.m. is an example of a standardized temporal policy. Unlike pooled interdependence, in *sequential interdependence*, each unit's deliverable is contingent upon another unit's deliverable. Since units complete their tasks in a sequence and rely on other units to complete tasks in a timely fashion, coordination is accomplished through planning, such as setting a projected date for completion. Finally, in *reciprocal interdependence*, the outputs of each unit become inputs for the other units, but the units also work back and forth collaboratively. Accordingly, each team needs to be regularly informed about each other's actions, often in real time. Online project management, calendaring, and inventory systems may be used to accomplish these goals. From an efficiency perspective, reciprocal interdependence is associated with the greatest costs because it relies most extensively on communication – a process that Thompson viewed as inherently inefficient.

The taken-for-granted assumptions about time in industrial groups reflected in these two early approaches (i.e., that time is a scarce resource which must be judiciously managed) continue to influence formal and informal group communication norms and practices (Blagoev & Schreyögg, 2019). This draws attention to a key relationship between time and temporality in groups and the focus of this chapter: Group members' communicative constructions of time enable and constrain fundamental temporal processes inherent to group development and task accomplishment. These temporal processes are highlighted in classic research and theory on group interaction, including literatures on group development (Bales, 1950), problem-solving phases (Tuckman, 1965), decision development (Poole, 1981), as well as McGrath's (1991) TIP (Time, Interaction, and Performance) theory.

Each of these models considers the path that groups take over time to achieve certain goals. Bales' (1950) Interaction Process Analysis (IPA) is focused on the process through which groups strive for equilibrium and the various communication acts members use to return to equilibrium. Tuckman's (1965) classic model charts the developmental sequences that members take through group development as well as task accomplishment. They depicted a sequential path from forming (i.e., testing group norms and orienting to the task), storming (i.e., resisting group influence and task demands), norming (i.e., being open to the group and the task), and performing (i.e., working diligently on the task and supporting member roles). A fifth stage, called adjourning (i.e., processing sadness about the end of the group) was later added. Poole (1981) problematizes the temporality of these (and other) unitary sequence models and offers evidence to support a multiple sequence model which allows for more complexity across groups. Rather than all groups proceeding through a given, singular path, his work shows how the unitary model offers a baseline which helps to orient the temporality of group development but may not reflect the actual path groups take.

Finally, McGrath (1991) drew from extant group models to illustrate the temporal processes in group interaction and performance. In his theory of groups, Time, Interaction, and Performance (TIP), he described four possible modes of activity. Mode I focused on goal choice (beginning a project), Mode II focused on means choice (solving the technical issues), Mode III focused on policy choice (resolving any conflicts), and Mode IV focused on goal attainment (completing the project). Consistent with Poole's (1981) multiple sequence model, McGrath (1991) theorized Modes I and II as necessary for all group work, while Modes III and IV may not occur in a given group. As well, McGrath described alternate paths that groups may take, centering temporality in his analysis and theorizing.

Taken together, this early work on group temporality – while divergent in terms of approach and claims – underscored that groups emerge *in* and *through* a range of temporally driven processes which take varying amounts of time. Additionally, it helped to shape future theorizing on groups as particularly attentive to temporality, even when time was not foregrounded. Later, as time became more foregrounded in the interdisciplinary field of group dynamics more generally, and in group communication research in particular, this sensitivity to temporal processes in work groups offered a more complex view of time than earlier, industrial-centered work that stressed productivity. It gave rise to research on group interaction which treated time as both a dependent and independent variable relative to group interaction. Much of this work occurs in organizational settings, and considers both how group communication is shaped by external time demands as well as how socially constructed time-based constraints shape team performance and interaction. These approaches are elaborated in the following section.

Overview of Major Theories and Concepts

Theoretical Perspectives

In contrast to early and mid-twentieth-century research on groups and teams focused on narrow time-based outcomes like productivity and efficiency, more recent work in the late-twentieth century and extending into the twenty-first century has focused on the underlying temporal processes associated with a range of time-based outcomes. This includes: team coupling, pace, and

rhythm associated with social entrainment processes; the structures created through everyday repeated practices and routines; team coordinative processes; and, pacing and timing norms associated with team project completion. In the first of two subsections below, the broader theoretical perspectives are described, followed by midrange theories and constructs in the second subsection.

Social Entrainment

The concept of entrainment originated in the biological sciences as a way to describe the process by which one cyclic process becomes disrupted by, and set to oscillate in tune with, another process. Group and organizational scholars then adopted this term to explain cyclical shifts in the phase and pace of members' work (Ancona & Chong, 1996; Bluedorn, 2002). McGrath and Kelly (1986) developed an extensive theoretical model of *social entrainment* centered at the team level which relies upon five assumptions. First, much of human behavior is temporal – that is, regulated by cyclical, oscillatory, and rhythmical processes. Second, these rhythms are endogenous, or intrinsic, to systems. Third, sets of internal rhythms become synchronized within each system (i.e., they adopt the same *phase* and *periodicity* of occurrence). Fourth, when persons interact, their internal rhythms can become entrained to one another. Fifth, the internal rhythms of individuals and social groups can become collectively entrained, or synchronized, to powerful external pacers, altering the phase and periodicity of their endogenous rhythms.

Applied to group communication, the social entrainment perspective highlights the ways in which group temporality shapes and is shaped by the pace and rhythm of members' interaction. This interaction is driven by the timing of their task demands, as Kelly and colleagues found in a series of experiments on short-term time trials in small groups (Kelly et al., 1990; Kelly & McGrath, 1985). Later, others applied the perspective to help understand larger time scales and larger groups, such as departments, occupational groups, and cultural groups (Ancona & Chong, 1996; Ballard & Seibold, 2003; Bluedorn, 2002).

Practice Theory

Following Kelly's laboratory experiments, *Making Time: Ethnographies of High-Technology Organizations* was one of the earliest collections of field research that explored how groups' task demands enable and constrain their experience of time (Dubinskas, 1988). Drawing on a *practice theoretical perspective* to consider time in group interaction, the essays in the edited volume illustrated how group members' everyday repeated practices and routines are recursively tied to their experience of time (Bourdieu, 1977). The ethnographies explored group differences driven by a range of practical demands tied to the social systems within which groups operated. This included differences in the experience of time for two hospital radiology teams working on equipment designed with distinct temporal features as well as conflict between scientists and managers over the temporal demands of their work. The various contexts considered the tie between teamwork practices and time, underscoring the observation of Dubinskas (1988) that, "Time is not prior to social life, but rather it is made out of social action" (p. 19). The practice perspective later gave rise to the temporal structuring approach described in the next section on midrange perspectives and theoretical constructs (Geiger et al., 2021; Orlikowski & Yates, 2002).

Activity Coordination

Consistent with Dubinskas' (1988) observation about social action, McPhee and Zaug's (2000) theoretical framework points to *activity coordination* as one of the four communication flows responsible for the communicative constitution of organizations (CCOs). Coordination methods are inherently temporal, involving a variety of time-based innovations to manage communication across groups and departments. As such, the CCO perspective proposes the ways in which time and group interaction are mutually constituted. Ballard and Seibold (2003) feature activity coordination as a pivotal communication structure that shapes and is shaped by group members' experience of time. Nonetheless, activity coordination remains an underexplored construct in CCO scholarship. Su et al.'s (2017) work on implicit coordination (i.e., when team members anticipate each other's needs and actions and adjust dynamically) provides more support for the relationship between team temporality and communication. In their study of trauma resuscitation teams at a pediatric hospital, Su and colleagues found that team members' communication during the prearrival time period (waiting in the trauma bay) established team norms that predicted implicit coordination during the simulation. Geiger et al.'s (2021) research on firefighting teams (described in the next subsection) also centers on coordination. While neither study was developed from a CCO perspective, both highlight the centrality of coordination to temporal processes in teams.

Midrange Theoretical Frameworks and Constructs

Scholars have developed a variety of midrange theoretical frameworks and domain-specific constructs used to explore the relationship between time and temporal processes in group communication. Frequently these multilevel frameworks draw from broader theoretical perspectives described in the previous subsection while others (especially models that are specific to the small group context) do not. Several are described below.

Temporal Structuring

Drawing on practice theory, Orlikowski and Yates (2002) introduce the concept of *temporal structuring* to account for the ways in which group and organizational members produce and reproduce a range of temporal structures through routine, everyday actions. These structures recursively shape their experience of time. For example, in their study of firefighting teams, Geiger et al. (2021) expand the original temporal structuring framework to develop the construct of *temporal autonomy*, defined as

...the temporal patterning of multiple routines in such a way that each single routine performance is actively shielded from temporal contingencies, while the operation as a whole remains adaptive to the unfolding situation.

(p. 32)

They argue that when faced with the high temporal uncertainty associated with unexpected and high-risk events, teams cannot

develop the type of temporal structures traditionally associated with incremental and repeated practices. Instead, they must “get ahead of time” (p. 8) by going back to previously developed temporal structures and routines developed during training. In these cases, members rely on temporal autonomy.

Geiger and colleagues depart from the strictly action-focused analysis that is characteristic of practice theoretical approaches. They show how temporal autonomy proceeds through individual actors' performance of temporal boundaries to realign team actions and achieve team coordination under fast-changing circumstances. Their findings and related work by [Blagoev and Schreyögg \(2019\)](#) on *temporal uncoupling*, used to resist extreme work hours in a top management team, both stand in contrast to social entrainment theory.

[Geiger et al. \(2021\)](#) and [Blagoev and Schreyögg \(2019\)](#) critique extant management research for framing entrainment as an avoidable and desirable state. In contrast, they stress the need for practices like temporal uncoupling and temporal autonomy to support adaptive temporal responses in groups and teams. Similarly, in communication research, [Kalman et al. \(2018\)](#) describe entrainment based on memberships in a variety of groups – including families and friendship groups – as associated with either positive or negative outcomes for individuals, groups, and communities. They theorize entrainment as an inherently neutral temporal process which wields influence in proportion to the extent a given pacer is aligned with members' values. This approach is reflected in [Ballard and Seibold's \(2003\)](#) *meso level model of organizational temporality* described next.

Meso-level Model of Organizational Temporality

[Ballard and Seibold \(2003\)](#) draw on practice theory as a meta-theoretical framework and use the four flows model and a social entrainment perspective to position the experience of time as shaped by communication processes and mediated through group interaction. They elaborate the experience of time as arising from both temporal *enactments* and *construals*. Enactments refer to the way work group members “perform” time in their day-to-day activities and routines. These include *pace*, tempo or rate of activity; *flexibility*, the degree of rigidity in time structuring and task completion plans; *linearity*, the degree to which tasks are completed one at a time; *punctuality*, the exacting nature of timing and deadlines; *delay*, working behind schedule; *scheduling*, the extent to which the sequencing and duration of plans, activities, and events are formalized; and *separation*, a measure of (spatiotemporal) connection or availability among organizational members in time and space. Construals depict the way organizational members interpret or orient to time and include: *scarcity*, a focus on time as a limited and exhaustible resource; *urgency*, a preoccupation with deadlines and task completion; and *present, past, and future temporal foci*, orthogonal dimensions characterized by intentions oriented toward immediate action, reference to previous events, or long-term planning, respectively.

Construals focus attention on the social process of deriving meaning and the temporal structures that give rise to intersubjective temporal experiences within work groups, departments, and related units. Similarly, enactments focus our attention on more than behavior; they are both outcome and medium of interaction with the environment and, as such, highlight the ways in which temporality is communicatively constituted over time through mundane practices which may (or may not) evidence processes of social entrainment. As reflected in a series of propositions, enactments and construals shape and are shaped by a variety of factors both endogenous and exogenous to a given unit, including team members, colleagues, clients, task timelines, quarterly business cycles, and a range of cultural influences. For instance, in their study of immigrant workers, [Lee and Flores \(2019\)](#) found support for the influence of cultural orientation and acculturation type on members' experience of time and related mobile technology use.

Punctuated Equilibrium

[Gersick's \(1988\)](#) theory of *punctuated equilibrium* foregrounds time in team task accomplishment and has arguably been the most heuristic of the theoretical frameworks which center time in groups ([Gersick, 1991, 2020](#); [Knight, 2015](#); [Waller et al., 2002](#)). Across multiple studies, she found that phase models were less descriptive of the temporal path that groups took toward project completion. Rather, their group development was driven by an awareness of external time constraints, alternating between inertia and revolution, until completion. Notably, she found two distinct phases. The first phase of a project is marked by roughly half of the allotted calendar time for a project. This phase is characterized by inertial movement established at the end of the first team meeting. At the midpoint between task assignment and required completion, a transition emerges in group activity that sets the pace for the second phase of their work. Members describe their concern about completion and a revised approach is accompanied by major progress toward their goal. These alternating phases of inertial change and revolution are captured by other theoretical perspectives across multiple levels of analysis ([Gersick, 1991](#)).

[Knight \(2015\)](#) explores how team mood across the two phases of the punctuated equilibrium model shapes performance. Based on a longitudinal survey with teams preparing for a military competition, he found that when members shared a positive mood, they were more likely to engage in an exploratory search in the first phase, and to limit exploration in the second phase. This time-based strategy is associated with higher team performance as it yields new information at a time when it could best inform group progress. In contrast, a negative mood shared by team members predicts a continuation of exploratory search during the second phase of the project and is associated with lower performance. Here, it is vital to note that, while the punctuated equilibrium model continues to enjoy support and has been validated across investigations ([Gersick, 2020](#); [Waller et al., 2002](#)), it has also been critiqued in favor of traditional models of group development in terms of the model's sensitivity to factors including group age and level of development ([Wheelan et al., 2003](#)). Wheelan and colleagues found that traditional models of group development were a better fit for more established groups and those whose members perceive their level of development to be more advanced.

Summary and Directions for Future Research

Not only is temporality foundational to theories of group development and processes, but time has significant implications for research designs as well ([Arrow et al., 2004](#); [Ballard et al., 2008](#); [Zaheer et al., 1999](#)). One growing area of scholarship on temporal processes that noticeably lacks attention to time is the detection, measurement, and analysis of emergent small group phenomena (e.g., team cohesion, team resilience, team learning, etc.).

Waller et al. (2016) observe the lack of attention to time-related dynamics in extant research on emergent phenomena. They argue that attention to time scale in team research is one practice to help remedy this absence. In particular, Zaheer et al. (1999) specify five types of time scales: (1) existence interval (time needed for one instance of a phenomena, process, or event to occur), (2) observation interval (researcher defined period of observation), (3) recording interval (frequency of recording instances), (4) aggregation interval (what time scale the recorded information is aggregated), and (5) validity interval (time scale over which the theory holds), and argue that to make theory-driven data collection and analysis choices, researchers must specify time scales for all the variables, relationships, and boundary conditions.

As an example, for group-level constructs to emerge, team members must interact and share experiences over time. However, current theorizing on emergent phenomena is not clear on *how much* time must pass (i.e., existence interval) before the group-level construct emerges (Allen & O'Neill, 2015). For instance, Chen et al. (2002) speculate that the low intraclass correlations associated with collective efficacy in one of their samples may have been because the group-level construct did not emerge at the time of data collection. Clarity on the existence interval can resolve these issues. It illuminated Siebold's (2006) study of military teams, which found team cohesion follows a curvilinear (U-shaped) relationship over time. Thus, researchers interested in studying emergent phenomena must pay attention to the existence interval during theory and research design.

Future research on emergent phenomena must also specify the validity interval. While the existence interval indicates the minimum period over which a theory holds, the validity interval indicates the maximum period over which a theory *may* hold. For example, the initial factors that may lead to the emergence of trust among group members may not lead to the emergence of trust over a longer period. So, specifying a validity interval when studying emergent phenomena is critical to establish both the meaning of and the relationships between phenomena.

In addition to the existence and validity intervals, researchers must consider the observation and recording intervals when studying emergent phenomena. A lack of consideration of the observation and recording intervals may lead to measurement challenges. Coultas et al. (2014) note that "emergent states may be qualitatively different later on in a team's life, even if numerical indicators remain constant" (p. 686). Thus, an emergent phenomenon measured during one stage of team development may be qualitatively different from the same phenomena measured during another stage of team development (Coultas et al., 2014). For instance, in their 15-week longitudinal study, Goncalo et al. (2010) measured collective efficacy in academic project teams during early and later stages of the project. However, only the early measurements of collective efficacy were negatively correlated to the demographic diversity of teams, and the collective efficacy measurements taken during the later stages of the project were related to group performance. This finding suggests that observations of an emergent construct taken during one stage may not be indicative of the construct measured at another stage (Allen & O'Neill, 2015).

A final issue related to time scale that must be carefully considered when studying emergent phenomena is the aggregation interval. Researchers may draw very different interpretations based on the scale at which the data are aggregated (Zaheer et al., 1999). For instance, researchers can draw different interpretations about emergent phenomena at macro-, meso-, and micro time spans. While aggregation at a macro level may provide insights into relationships between emergent phenomena and theoretically relevant outcome variables, aggregation at a meso time span may provide a more granular understanding of team members' behavioral patterns that characterize successful emergence of a group-level phenomena (Lehmann-Willenbrock, 2017). Overall, it is important that researchers studying emergent phenomena consider and clearly specify time scales for all the constructs, relationships, and boundary conditions.

Related to the deliberate attention to time scale in the study of emergent states, the authors also recommend researchers forego excessive reliance on static methods and adopt newer, more dynamic methods of data collection to capture the dynamism of temporal processes. Since dynamic interactions among group members lead to group-level emergent phenomena, data collection methods that can capture these dynamic interactions may provide a better understanding of the patterns of behaviors and conditions that enable and constrain emergent states (Kozlowski, 2012). Researchers can gain access to these data collection methods by either collaborating with data scientists and computer scientists or by using configurable tracking solutions provided by companies that develop wearable automated sensing devices, as described below.

A variety of dynamic data collection methods such as video/audio recording, communication analysis, and computational modeling are available (Kozlowski, 2015). In addition, wearable sensors that collect experience sampling, fine-grained, longitudinal data are among the most underutilized and promising methods for group communication research. Over the last decade, several researchers (e.g., Brown et al., 2014; Kim et al., 2012; Mashhadi et al., 2016; Pentland, 2012) have utilized automated sensing systems to record objective instances of face-to-face unplanned interactions in teams using Radio-frequency Identification (RFID) badges and Bluetooth Low-energy (BLE) devices to track colocation among individuals.

In addition to recording frequency of interactions, these sensing systems (when paired with corresponding mobile applications) can also record the type and quality of interactions along with a variety of environmental team-based factors. For instance, Mandhana (2018) paired BLE devices with a custom-mobile application that triggered push notifications (linked to an online, spot-sampling survey) every time participants engaged in a face-to-face unplanned conversation. This type of multimodal data can provide a nuanced understanding of team interactions across time (Kim et al., 2012).

In conclusion, group communication research will benefit from accounting for time in both its theoretical formulations and methodological considerations. The foregoing theoretical perspectives, midrange theories, and constructs illustrate the ways in which time and temporality are not only experienced in group communication but emerge in and through group interaction. The directions for future research on detecting, measuring, and analyzing emergent processes in addition to exploring more longitudinal, dynamic data collection methods foreground how greater consideration of time in inherently temporal processes can yield more precision in our scholarship. Taken together, exploring the interrelationship between time and temporality in both theory and method supports the broader study of group communication: Time and temporal processes fundamentally enable and constrain group and team interaction.

References

- Allen, N. J. , & O'Neill, T. A. (2015). The trajectory of emergence of shared group-level constructs. *Small Group Research*, 46, 352–390. <https://doi.org/10.1177/1046496415584973>
- Ancona, D. , & Chong, C. L. (1996). Entrainment: Pace, cycle, and rhythm in organizational behavior. *Research in Organizational Behavior*, 18, 251–284.
- Arrow, H. , Poole, M. S. , Henry, K. B. , Wheelan, S. , & Moreland, R. (2004). Time, change, and development: The temporal perspective on groups. *Small Group Research*, 35, 73–105. <https://doi.org/10.1177/1046496403259757>
- Bales, R. F. (1950). *Interaction process analysis*. Addison-Wesley.
- Ballard, D. I. , & McVey, T. (2014). Measure twice, cut once: The temporality of communication design. *Journal of Applied Communication Research*, 42(2), 190–207. <https://doi.org/10.1080/00909882.2013.874571>
- Ballard, D. I. , & Seibold, D. R. (2003). Communicating and organizing in time: A meso level model of organizational temporality. *Management Communication Quarterly*, 16(3), 380–415.
- Ballard, D. I. , Tschan, F. , & Waller, M. J. (2008). All in the timing: Considering time at multiple stages of group research. *Small Group Research*, 39, 328–351. <https://doi.org/10.1177/1046496408317036>
- Blagoev, B. , & Schreyögg, G. (2019). Why do extreme work hours persist? Temporal uncoupling as a new way of seeing. *Academy of Management Journal*, 62(6), 1818–1847. <https://doi.org/10.5465/amj.2017.1481>
- Bluedorn, A. C. (2002). *The human organization of time: Temporal realities and experience*. Stanford Business Books.
- Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge University Press.
- Brown, C. , Efstratiou, C. , Leontiadis, I. , Quercia, D. , Mascolo, C. , Scott, J. , & Key, P. (2014, September). The architecture of innovation: Tracking face-to-face interactions with ubicomp technologies. In Proceedings of the ACM international joint conference on pervasive and ubiquitous computing, Seattle, Washington (pp. 811–822).
- Chen, G. , Webber, S. S. , Bliese, P. D. , Mathieu, J. E. , Payne, S. C. , & Zaccaro, S. J. (2002). Simultaneous examination of the antecedents and consequences of efficacy beliefs at multiple levels of analysis. *Human Performance*, 15, 381–409. https://doi.org/10.1207/S15327043HUP1504_05
- Coultas, C. W. , Driskell, T. , Burke, C. S. , & Salas, E. (2014). A conceptual review of emergent state measurement: Current problems, future solutions. *Small Group Research*, 45(6), 671–703. <https://doi.org/10.1177/1046496414552285>
- Dalton, M. (1948). The industrial rate buster: A characterization. *Applied Anthropology*, 7(1), 5. <http://ezproxy.lib.utexas.edu/login?url=https://search-proquest-com.ezproxy.lib.utexas.edu/docview/1310290161?accountid=7118>
- Dubinskas, F. (1988). *Making time: Ethnographies of high-technology organizations*. Temple University Press.
- Geiger, D. , Danner-Schröder, A. , & Kremser, W. (2021). Getting ahead of time—performing temporal boundaries to coordinate routines under temporal uncertainty. *Administrative Science Quarterly*, 66(1), 220–264. <https://doi.org/10.1177/0001839220941010>
- Gersick, C. J. G. (1988). Time and transition in work teams: Toward a new model of group development. *Academy of Management Journal*, 31, 9–41. <https://doi.org/10.2307/256496>
- Gersick, C. J. G. (1991). Revolutionary change theories: A multilevel exploration of the punctuated equilibrium paradigm. *The Academy of Management Review*, 16(1), 10–36. <https://doi.org/10.2307/258605>
- Gersick, C. (2020). Reflections on revolutionary change. *Journal of Change Management*, 20(1), 7–23. <https://doi.org/10.1080/14697017.2019.1586362>
- Goncalo, J. A. , Polman, E. , & Maslach, C. (2010). Can confidence come too soon? Collective efficacy, conflict and group performance over time. *Organizational Behavior and Human Decision Processes*, 113, 13–24. <https://doi.org/10.1016/j.obhdp.2010.05.001>
- Homans, G. C. (1951/2013). *The human group*. Routledge.
- Kalman, Y. M. , Aguilar, A. M. , & Ballard, D. I. (2018). The role of chronemic agency in the processing of a multitude of mediated conversation threads. In 51st proceedings of HICSS (Hawaii International Conference on System Sciences).
- Kelly, J. R. , Futoran, G. C. , & McGrath, J. E. (1990). Capacity and capability: Seven studies of entrainment of task performance rates. *Small Group Research*, 21, 283–314. <https://doi.org/10.1177/1046496490213001>
- Kelly, J. R. , & McGrath, J. E. (1985). Effects of time limits and task types on task performance and interaction of four-person groups. *Journal of Personality and Social Psychology*, 49, 395–407. <https://doi.org/10.1037/0022-3514.49.2.395>
- Kim, T. , McFee, E. , Olguin, D. O. , Waber, B. , & Pentland, A. (2012). Sociometric badges: Using sensor technology to capture new forms of collaboration. *Journal of Organizational Behavior*, 33, 412–447. <https://doi.org/10.1002/job.1776>
- Knight, A. P. (2015). Mood at the midpoint: Affect and change in exploratory search over time in teams that face a deadline. *Organization Science*, 26(1), 99–118. <https://doi.org/10.1287/orsc.2013.0866>
- Kozlowski, S. W. J. (2012). Groups and teams in organizations: Studying the multilevel dynamics of emergence. In A. B. Hollingshead & M. S. Poole (Eds.), *Methods for studying small groups: A guide to approaches, tools, and technologies* (pp. 260–283). Routledge Academic.
- Kozlowski, S. W. J. (2015). Advancing research on team process dynamics: Theoretical, methodological, and measurement considerations. *Organizational Psychology Review*, 5(4), 270–299. <https://doi.org/10.1177/2041386614533586>
- Lee, S. K. , & Flores, M. L. (2019). Immigrant workers' organizational temporality: Association with cultural time orientation, acculturation, and mobile technology use. *Management Communication Quarterly*, 33(2), 189–218. <https://doi.org/10.1177/0893318918821727>
- Lehmann-Willenbrock, N. (2017). Team learning: New insights through a temporal lens. *Small Group Research*, 48(2), 123–130. <https://doi.org/10.1177/1046496416689308>
- Lopetegui, M. , Yen, P. Y. , Lai, A. , Jeffries, J. , Embi, P. , & Payne, P. (2014). Time motion studies in healthcare: What are we talking about?. *Journal of Biomedical Informatics*, 49, 292–299. <https://doi.org/10.1016/j.jbi.2014.02.017>
- Mandhana, D. M. (2018). *Unplanned conversations at work*. Doctoral dissertation. <https://repositories.lib.utexas.edu/handle/2152>

- Mashhadi, A. , Mathur, A. , Broeck, M. V. D. , Vanderhulst, G. , Godon, M. , & Kawsar, F. (2016, September). A case study on capturing and visualising face-to-face interactions in the workplace. In Proceedings of the 18th international conference on human-computer interaction with mobile devices and services adjunct, Florence, Italy, September, 2016 (pp. 575–584).
- McGrath, J. E. (1991). Time, interaction, and performance (TIP): A theory of groups. *Small Group Research*, 22, 147–174. <https://doi.org/10.1177/1046496491222001>
- McGrath, J. E. , & Gruenfeld, D. H. (1993). Toward a dynamic and systemic theory of groups: An integration of six temporally enriched perspectives. In M. M. Chemers & R. Ayman (Eds.), *Leadership theory and research: Perspectives and directions*. (pp. 217–243). Academic Press.
- McGrath, J. E. , & Kelly, J. R. (1986). *Time and human interaction: Toward a social psychology of time*. Guilford Press.
- McGrath, J. E. , & Kelly, J. R. (1992). Temporal context and temporal patterning: Toward a time-centered perspective for social psychology. *Time & Society*, 1(3), 399–420. <https://doi.org/10.1177/0961463X92001003005>
- McPhee, R. D. , & Zaug, P. (2000). The communicative constitution of organizations: A framework for explanation. *The Electronic Journal of Communication*, 10, 1–15. <http://www.cios.org/EJCPUBLIC/010/1/01017.html>
- Orlikowski, W. J. , & Yates, J. (2002). It's about time: Temporal structuring in organizations. *Organization Science*, 13(6), 684–700. <https://doi.org/10.1287/orsc.13.6.684.501>
- Pentland, A. (2012). The new science of building great teams. *Harvard Business Review*, 90(4), 60–69. <https://doi.org/citeulike-article-id:10606943>
- Poole, M. S. (1981). Decision development in small groups I: A comparison of two models. *Communication Monographs*, 48(1), 1–24. <https://doi.org/10.1080/03637758109376044>
- Putnam, L. L. , & Stohl, C. (1990). Bona fide groups: A reconceptualization of groups in context. *Communication Studies*, 41(3), 248–265. <https://doi.org/10.1080/10510979009368307>
- Siebold, G. L. (2006). Military group cohesion. In T. W. Britt , C. A. Castro , & A. B. Adler (Eds.), *Military life: The psychology of serving in peace and combat* (pp. 185–201). Praeger.
- Su, L. , Kaplan, S. , Burd, R. , Winslow, C. , Hargrove, A. , & Waller, M. (2017). Trauma resuscitation: Can team behaviors in the pre-arrival period predict resuscitation performance?. *BMJ Simulation & Technology Enhanced Learning*, 3, 106–110. <http://dx.doi.org/10.1136/bmjstel-2016-000143>
- Taylor, F. W. (1911). *Scientific management*. Harper & Row.
- Thompson, J. D. (1967). *Organizations in action*. McGraw-Hill.
- Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin*, 63(6), 384–399.
- Waller, M. J. , Okhuysen, G. A. , & Saghafian, M. (2016). Conceptualizing emergent states: A strategy to advance the study of group dynamics. *The Academy of Management Annals*, 10(1), 561–598. <https://doi.org/10.1080/19416520.2016.1120958>
- Waller, M. J. , Zellmer-Bruhn, M. E. , & Giambatista, R. C. (2002). Watching the clock: Group pacing behavior under dynamic deadlines. *Academy of Management Journal*, 45(5), 1046–1055. <https://doi.org/10.2307/3069329>
- Wheelan, S. A. , Davidson, B. , & Tilin, F. (2003). Group development across time: Reality or illusion?. *Small Group Research*, 34(2), 223–245. <https://doi.org/10.1177/1046496403251608>
- Zaheer, S. , Albert, S. , & Zaheer, A. (1999). Time scales and organizational theory. *Academy of Management Review*, 24(4), 725–741. <https://doi.org/10.5465/amr.1999.2553250>