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Research Methods and Issues

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Research Methods/Issues: Capturing and Analyzing Group Processes

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Group processes can be conceptualized as the mechanisms or intervening factors that connect properties of groups (e.g., group size, average skill level, diversity, or identity) to outcomes. Examples include the actions or communication groups engage in while making decisions, negotiating, or coordinating their activities. These behaviors are driven by the group's task and associated performance goals, creating interdependencies amongst group members that lead to coordinated and actively integrated behavior. It is this set of behaviors that researchers investigating group processes attempt to capture and analyze.

Scholars have suggested that to fully understand how people organize, we must consider an individual's behavior and how others react to that behavior before we can predict how that person will behave at a later time. Mapping this process of interaction can provide insight as to what triggers certain behavior, what patterns of behavior are likely to occur, and what patterns are likely to facilitate high-quality outcomes. Studying group processes thus enables the researcher to address "how" questions, such as *how* new ideas are introduced within groups, or *how* the process of planning influences which ideas are finally adopted.

The measurement of group processes poses challenges to the researcher that are distinct from those posed by the measurement of group properties. This entry is thus an overview of the primary issues faced by researchers in the measurement of group processes. First, we present an overview of group process research methods and their implications for theory and analysis. Second, we address specific methodological issues faced by group process researchers that pertain to capturing and analyzing data.

An Overview of Group Process Research Methods

This section provides an overview of the methods for capturing and analyzing group processes, focusing on the differences between capturing group processes via self-reports versus third-party observations and static versus dynamic approaches to data analysis. As survey methods that underlie self-report measures of group process are well-known, we pay more attention to methods of direct observation and associated data-analytic approaches.

Capturing Group Process - Direct Observation versus Self-reports

To capture group process data, the researcher typically has a choice of either obtaining the data from members' self-reports or from direct examination by third-party observers. Self-reports measure group members' subjective perception of the group's actual processes, usually via survey responses after the group has completed the task. Direct observation methods, on the other hand, rely on the (relatively) objective assessment of group processes by trained observers either in real-time or from recordings (typically audio or video). If the researcher is interested in a global measure of group processes (e.g., cooperation), likert-type scales can be used to assess the interaction by the observers. However, if the researcher is interested in dynamic processes or if more detailed differentiation of behavior is required, then the raw data from these recordings need to be coded and analyzed. The first step involves transforming the recording into meaningful units of analysis. This transformation typically occurs through a process of unitizing (i.e., identifying units of behavior) and classifying behaviors according to a coding scheme. The coding scheme is a set of rules or guidelines for coders to identify the unit to be coded (e.g., thought, sentence, speaking turn, paragraph), category labels, definitions, and rules of thumb for distinguishing between categories and using context (i.e., statements surrounding the unit of interest) to interpret meaning. Regardless of whether a coding scheme is adapted from previous

research or designed from scratch, its development is a pivotal step in the research process as the classification scheme has a profound influence on the researcher's ability to test and support hypotheses.

Analyzing Group Process - Static versus Dynamic Approaches

There are two alternative approaches to analyze group process data obtained from direct observation methods — static and dynamic. Distinctions between these approaches are discussed.

A static approach to measuring group process considers the total (or relative) amount of a given behavior collapsed over time. For example, cooperation might be measured by counting the instances of cooperative behaviors that occur during a team meeting. Using a static approach by aggregating group process data over time is appropriate when a researcher is interested in capturing the general approach used by a group or the relative usage of different task strategies (e.g., independent versus interdependent work or cooperation versus competition). Frequencies (or relative frequencies) are typically used to explain how inputs affect outcomes (e.g., group composition → *information exchange* → innovativeness).

The decision whether to analyze absolute or relative frequencies will be guided by one's theory of group behavior. If the given behavior is theorized to influence a group outcome regardless of the amount of other behaviors present, then *absolute* frequencies might be more appropriate. On the other hand, if one is interested in the relative impact of a behavior within the overall interaction, then *relative* frequencies will be more appropriate. Relative frequencies are typically calculated by dividing the absolute frequency of a given behavior by the total behavior exhibited by the group. Frequencies of behavior are subsequently related to the phenomena of interest using regression techniques. The use of frequencies, however, assumes no temporal

relationships among behaviors, no unique person to person interaction, and does not allow for the possibility that low frequency events can have profound influences on the group.

Alternatively, group process can be measured using a dynamic approach, looking at group behavior over time. Using this approach, researchers can measure sequences of behavior at a very fine-grained level, or they can measure broader phases of behavior over longer periods of time.

Dynamic approaches to measuring group process either focus on sequences or phases of behavior. Sequences capture the direct communication exchange between group members and can be used to predict group outcomes. For example, a group discussion where members reciprocate information sharing such that there is a back-and-forth exchange throughout the meeting will have different outcomes from another group where information is shared sequentially by each member followed by a vote. One can expect that outcomes in the former group to be more positive than outcomes in the latter group because members are building on one another's ideas. In this example, the differences in outcomes can best be explained by comparing the sequences of information exchange within the group. In contrast, reporting total frequencies of information exchange might result in the false conclusion that information exchange does not influence quality of group decisions.

Phases of group process are dynamic in that they capture the broader group processes that unfold over time. Phases can be predetermined via theory (e.g., phases of group development), time divisions (e.g., divided into quarters), or observation (emergent phases based on patterns within the data). Researchers who study phases are often interested in understanding the process itself, rather than using it to predict specific group outcomes. However, it is not uncommon for

prescriptive models to be developed based on observations of phase patterns in successful groups (e.g., phases of group development).

Sequential analysis techniques identify patterns of recurring behavior over time. Such techniques typically look at transitions from one type of behavior to another. Recurring patterns are then identified and tested for significance. Popular analytic techniques include lag sequential, Markov chain, log-linear analysis, and phase analysis. Lag sequential analysis (LSA) captures the effect of a given behavior on other behaviors that occur in lags (e.g., units) later. Thus, LSA can capture immediate or later (lagged) responses. Markov chains and log-linear analyses are related analytical approaches for capturing chains or series of behaviors. Phase analysis captures emergent phases in groups. The researcher first defines what constitutes a phase (e.g., clusters of similar behaviors; important events that serve as a transition in the process) and then the analysis is used to identify when phases actually begin and end within a given group.

Summary

This section presented an overview of how group process data is captured and analyzed, with special emphasis on techniques associated with acquiring data through direct observation methods. The following section addresses issues researchers should consider in research on group process.

Methodological issues

Researchers interested in adopting direct observation methods to measure group process face a distinct set of practical and theoretical considerations. These considerations are categorized according to whether they pertain to the capture or analysis of group process data.

Issues in Capturing Group Process

Research design.

Group processes are typically observed either in laboratory experimental studies or in-depth, small sample, group case analyses in the field. While experiments can be conducted in the field, these are rare due to the difficulties in gaining access to both manipulate working conditions and record group process for large numbers of groups.

Group process research that uses traditional experimental design aggregates data across groups to look for similar patterns within conditions and differences in patterns across conditions. The research goals of studies that utilize experiments are typically to link group process to inputs or outcomes, or when tests of mediation are desired. A prototypical study might manipulate the complexity of a group's task, examine how groups plan and perform in each condition, and then analyze how the task's complexity influenced planning and subsequent performance using mediation analysis.

In contrast, when the process itself is of interest to the researcher, then it may be more appropriate to examine group functioning in real-world contexts through in-depth examination of specific situations. These studies typically focus on a single or small set of groups and systematically examine their behavior over time. This approach is sometimes used out of necessity due to the difficulty in obtaining access to large numbers of naturalistic groups in organizational settings. While the generalizability across contexts may be limited, the strength of in-depth analyses in the field lies in the depth of understanding and in the avoidance of potential biases associated with averaging data across groups to reach conclusions about the processes of any one group.

The decision about which research design to adopt eventually depends on the research goals as well as the feasibility of implementing a particular design.

Direct observation versus self reports

Capturing group process from self-reports is appropriate in so far as members' perceptions guide their reactions and behaviors. However, relying on perceptual data to identify and measure group process introduces two sources of bias which lead to measurement problems. The first source of bias, inaccurate recall, is introduced as a result of the situation, intervening events, or members' inattention to the group process. Furthermore, the relevant group process might not be identifiable by group members during the interaction. Important group processes could occur at an aggregate level that is not immediately discernible. Even the most helpful participants cannot describe broad patterns of the group interaction. Alternatively, group processes could also occur subconsciously as people react to one another's behavior. In both cases, self reports of group process would not be able to capture the phenomena of interest. The second source of bias involves subjectivity of assessment. A group member's perception of the group process might be influenced by a number of factors such as past experiences, individual differences, status within the group, and knowledge of performance. If the researcher's goal is to understand reactions to group interactions, then capturing these perceptions via self-reports will be necessary. On the other hand, if the goal is to capture the fundamental nature of interaction in the group, these biases will create measurement problems and interfere with the research objective.

Data Collection

The process of collecting data on group processes can pose a unique challenge to researchers. Several decisions need to be made regarding the medium of data collection: Should

the data be recorded or collected in real time? If recorded, are audio or video recordings necessary? Should the verbal portion of the recordings be transcribed or can coding be done directly from the tapes? Data needs and accessibility will influence the answers to these questions.

Recording versus real-time. Obtaining a recording of the group's process is always preferable to collecting all the data in real time. Recording allows one to code the data at the coder's rather than the group's pace. Ideally a researcher would also observe the group interaction while recording, as observation provides an opportunity to detect nuances that may be lost in recording. However, at times it is not possible to record group interactions, especially when studying groups in field settings, due to concerns of confidentiality. In many of these situations coding in real time is the only option. Using a simple coding scheme and having multiple, highly trained coders will increase the likelihood of reliable data collection. More detailed coding schemes make real-time coding difficult as they require complex coding decisions to be made quickly. This difficulty, combined with the inability to review a past code assignment, increases the risk of unreliable coding. Use of multiple coders can reduce this concern in providing multiple assessments of the interaction.

Regardless of whether interactions are captured real-time or via recordings, researchers must consider whether group members' awareness of being observed is affecting the group processes. While basic research ethics demands that participants consent to being observed or recorded, the effect of this knowledge on group processes can be minimized in a number of ways. Recording devices should be as inconspicuous as possible, such as behind one-way mirrors in the lab or strategically placed. When this is not possible, group members can be given time to interact and adapt to the presence of the observer or recording device.

Audio versus video recording. Interest in nonverbal behavior and/or in identifying speakers will drive the decision of whether video rather than audio recordings are needed. Whereas audio recordings are less expensive and easier to obtain, they preclude the collection of nonverbal behavior and make it difficult to identify speakers. However, this speaker identification problem can be overcome by using a multiple track audio-recording device and recording each speaker on a separate track. Video recordings also allow speakers to be identified. However, camera placement is important to ensure a clear view of all group members. This might require the use of several cameras, depending on the configuration and size of the group and room. If multiple cameras are used, it is useful to link them to a common time code or use a video mixer to facilitate integration among the separate recordings. Advances in software packages have improved the interface between video recordings and coding equipment, making the use of video recordings more attractive. The use of audio versus video recording is also influenced by the research setting. It is often difficult to obtain permission to videotape group processes in organizational settings where concerns about anonymity and confidentiality are high. However, several organizations use videotapes of group decision making as sources of feedback for managers. Tapping into ongoing efforts might increase the odds of gaining video access. Alternative recording media are also available. For example, computer mediated communication is easily recorded using e-mail and internet chat systems and software programs have been developed for data collection. More recently, online communities have been used as an archival source of group interactions. Group Decision Support Systems (GDSS) software also provides opportunity to record written interaction while employing the system. Handwriting recognition systems are also available for saving handwritten coding and field notes.

Transcriptions. Prior to coding recorded data, the researcher must decide whether to transcribe the verbal interaction. With transcripts one can code from the transcripts alone or in combination with the recording. Without transcripts one must code from the recordings alone. Transcription, especially of videotapes, is time consuming and potentially expensive if professional transcription services are obtained. While direct coding of recordings is tempting for this reason, it is more difficult to reliably identify the units to be coded (i.e., obtain unitizing reliability) without transcripts.

If one chooses not to transcribe verbal interaction, but rather work directly from the recordings, the recordings need to be indexed using time codes. The use of digital technology facilitates this process, as each frame is indexed when it is saved. These time codes can be used by the coders to identify the beginning and ending of each unit to be coded. Behavioral coding assessments can then be linked to the location on the video using the time codes.

Issues in Analyzing Group Process

Unit of Analysis

An issue raised by adopting direct observation approaches to studying group process concerns determining the appropriate unit of analysis. When sequences are to be analyzed, the unit of analysis can vary from a single utterance that contains meaning, to a speaking turn, to a back and forth exchange. When phases are to be analyzed, the unit of analysis is the phases themselves, which can either be emergent or fixed.

At the lowest level of aggregation, an act refers to a single expressed idea or activity that is displayed by a group member. At the next level of aggregation, speaking turns are defined as beginning when an individual takes the floor and ending when that person stops talking or another group member begins. Hence, speaking turns can involve single or multiple acts. When

the unit of analysis is at the level of acts or speaking turns, sequential behavior can easily be examined. When acts are the unit of analysis, the focus is on the flow of messages, regardless of who is speaking. When speaking turns are the unit of analysis, the focus is often on the interactive nature of the group process.

At the opposite end of the aggregation spectrum is a conceptualization of group process as a series of fixed phases or stages, the elucidation of which can provide insight into group functioning such as group socialization and development. For example, one model of group socialization suggests that group members go through five phases: investigation, socialization, maintenance, resocialization, and remembrance. Similarly, five stages of group development have been proposed, namely: forming, storming, norming, performing, and adjourning. In these literatures, it is hypothesized that the current developmental phase influences group functioning and interaction between members.

The difference between conceptualizing group process as flexible rather than fixed phases is that flexible models account for the fact that group development does not progress in an orderly fashion, but rather advances in fits and starts with regression to prior stages being a common event. Thus, rather than positing a series of developmental stages, these models allow for more complex modeling of the group's process.

Another alternative is to capture group processes at predetermined intervals rather than throughout the group interaction. This method, known as time sampling, provides a glimpse at group activities at a particular point in time. For example, one might be interested in the exertion of effort at the beginning, middle and ending of a work session. The researcher needs to determine the window of time to sample, and an appropriate sampling interval. These issues will

depend on the theory about what phases of work are meaningful, and how long it takes to get a representative view of the processes of interest.

Decisions regarding choice of unit type must be linked to the research question being asked, with special sensitivity to the appropriate level of analysis and where in action and speech relevant meaning resides. If too small a unit is selected, meaning can be lost because the individual statements convey a different meaning to that conveyed by a speaking turn. Redundancy may also be added as a result of separating immediate restatements which simply repeat previous messages rather than add new information. In contrast, information can be lost if too large a unit is selected. In the event that multiple categories of statements are made during a speaking turn, the researcher must decide which code best represents the behavior within a given unit. To aid such decisions, dominance schemes, which identify the kinds of behavior that are expected to have the greatest impact on the interaction, can be developed to provide rules of thumb for these decisions. Alternatively, the first or the last code within the unit might be retained. Regardless of the approach that is used, the risk of losing valuable information remains.

Coding Scheme Design

General vs. task specific. In designing a coding scheme, one of the first issues the researcher has to consider is whether a general or task-specific scheme is more appropriate. General schemes are exhaustive, logically complete, classification systems that can be applied across task types, while task specific schemes index behaviors associated with performing the specific task at hand.

While the generalizability of results using a task-specific approach is more limited than using a general coding scheme, it complements the use of more domain-specific theories of

group behavior. Several researchers have pointed out that it may not be possible to generalize group process across tasks due to the large number of factors that might influence the interdependencies among group members. Hence, the task-specific approach supports the call by these researchers for mid-range theories relevant to performance effectiveness under specified circumstances.

Theory-derived vs. data-derived. What is the basis for determining how a behavior is to be classified? Should the classification system be derived theoretically, or from the data? In practice, the distinction between the two is blurred as human behavior is too complex to anticipate all relevant behaviors without some direct experience with the group interacting on the specific task at hand. Thus, a hybrid approach is typically adopted where the coding scheme is continually refined by iterating between theory, data, and application of codes to samples of the data. An appropriate first step in this strategy is to develop categories based on theoretical predictions of the types of behavior that are expected to be important. This brings us to issues about how exhaustive and detailed the coding scheme should be.

Exhaustiveness. Both theoretical and analytical concerns are relevant to answering this question. If one is interested in detailed interaction patterns, coding all verbal behaviors may be important. However, if some behaviors are not theoretically interesting, but all behavior must be classified (such as when conducting a sequential analysis), a “miscellaneous” or “other” category can be used. If the miscellaneous category turns out to contain substantial information, the researcher can always create new codes to reclassify these behaviors.

Depth of coding scheme. The more detailed the scheme, the more fine-grained the discrimination between behaviors. Hence, as the number of categories increases, the risk of combining two behaviors that potentially serve different purposes is reduced. However, the

downside of the proliferation of categories is twofold. First, coding becomes more difficult as categories become less distinct. Coding errors are more likely, lowering reliability and potentially necessitating the collapsing together of categories. Second, as the number of categories increases, the frequency of behavior in each category necessarily decreases. Low frequency within categories is problematic for most statistical methods – especially sequential data analysis techniques. The issue of how detailed the scheme should be ultimately depends on the goal of the analysis – whether global or detailed interaction patterns are of interest.

Code Application

Reliability and validity. The reliability and validity of a measure are issues all researchers should be concerned about. For group process research, the two kinds of reliability of concern are *unitizing reliability* and *interpretive reliability*. Unitizing reliability refers to the degree of agreement regarding identification of the units to be categorized, while interpretive reliability refers to the consistency in applying labels to the units. High reliability of both types suggests that raters are coding from the same set of units and applying labels consistently to these units.

To ensure high interpretive reliability, it is best to unitize and code the data in separate passes because errors in unitizing will have a strong impact on interpretive reliability. That is, when units do not align, codes will be applied differently and cannot be aligned and compared. This is especially important when coding from recordings where it is more difficult to identify the specific unit to which a code has been assigned.

Low reliability suggests that the interpretation and application of labels between coders is inconsistent. This could be due to an over-exhaustive coding scheme which may make it more difficult for coders to distinguish between behaviors. Inconsistencies between raters could also

be attributed to the imprecise definitions of labels. In the former case, reliability can be increased by collapsing categories while in the latter, more precise definitions and more practice will enable coders to better discriminate.

Interpretive validity refers to the degree to which a coding scheme taps into the information it was designed to obtain. It addresses the question of how accurately the applied labels represent what group members actually mean. Coding schemes can be validated by either using theoretically derived coding schemes, or through participants' reflections and interpretations, or some combination of the two.

Conclusion

Group processes are inherently complex and their complexity is reflected in the methods that have been developed to study them. This complexity has often scared away researchers who are interested in group process, but either are unfamiliar with the methods or daunted by the number of steps involved. Although time consuming, the method is tractable and worthwhile in that direct examination of group process can provide insights as no other method can. Findings from such research can illuminate critical interactions within groups that deepen our understanding of the relationship between group attributes and outcomes.

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