Building Better Ideas Together: Understanding the Influence of Individual and Contextual Characteristics on the Emergence of Transactivity

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Abstract

Teams are formed to achieve goals that cannot be accomplished by individuals alone. To achieve these goals, teams need to process information through communication, integrate diverse knowledge, and reason effectively together. Transactivity, or the process in which conversation partners build on each other's reasoning, is a potentially important determinant of group effectiveness that has received very little attention from group scholars. In this dissertation, I ask "How can we help conversation partners understand each other and build new knowledge?" and explore how individual differences in personality traits and features of the problem context influence the emergence of transactivity.

In Chapter 1, I review the theoretical background on transactivity, which originates in developmental psychology, and discuss parallels with related work in organizational behavior. I compare transactivity to similar constructs and discuss the similarities in how it captures the quality of interaction and communication that influence individual and group cognition and learning. I also describe the process of constructing and validating a measure of transactivity in dyadic communication, first by developing sub-dimensions of transactivity for human coding based on both written and spoken dialogue, which are used as a basis for developing natural language processing (NLP) algorithms for automatic detection of transactivity I use in the analyses presented in subsequent chapters.

In Chapter 2, I investigate the influence of personality traits in the emergence of transactivity. Drawing upon Piagetian theory of learning and research on communication, I theorize how different combinations of partners' personality traits (extraversion, agreeableness, honesty-humility, openness to experience) can facilitate transactive exchanges in dyads. I test my predictions in an archival dataset of online discussion board exchanges, employing the algorithm developed in preliminary work.

In Chapter 3, I integrate transactive goal dynamics theory, research on negotiation, and collaborative learning to theorize about contextual factors that shape the emergence of transactivity in dyadic negotiation. Specifically, I develop hypotheses about how task demonstrability and power relations jointly affect transactivity emergence between two negotiators. I test my predictions in an experiment where I manipulate task demonstrability and power balance in dyads engaging in a negotiation exercise, and analyze their effects on transactivity as measured by our algorithm

Research Overview

Organizations in every sector are increasingly using teams to perform many different functions, including to solve problems, create new products and deliver essential services. Teams are potentially valuable because they can serve as a vehicle for combining and using a wide variety of information, expertise and perspectives. However, many teams struggle to integrate their valuable but diverse inputs. Often, when considering the challenges of diversity, people often think about the issues related to race, culture, and other demographic differences, but it turns out that even individuals who seem similar in these respects can struggle to understand each other and collaborate, for reasons that may not be readily apparent to observers and thus difficult to address.

My research is motivated by the question "How can we help team members understand each other and build new knowledge?" The potential value of teams is only realized when team members are able to create synergies by bringing diverse knowledge and perspectives, and integrating them in a way that enables them to better mitigate situational risks, foster innovations, and learn and perform effectively together. A key aspect of these potential synergies lies in the conversations that take place among members (Argyris, 1993; Larson, 2010; Macmillan, Entint, & Serfaty, 2004; Zoethout, Wesselink, Runhaar, & Mulder, 2017). However, the quality of conversations in teams can vary considerably in terms of how generative or conducive to learning they are (Marlow, Lacerenza, Paoletti, Burke, & Salas, 2018), even when the people participating are very knowledgeable and well-meaning, and an important question relates to why that is.

In this dissertation, I propose that the inability of team members to reason and argue well acts as a roadblock to achieving the synergetic gains. Specifically, the problem may be in the

composition of individual characteristics (e.g.., personality traits) and the context they are in (e.g., power structure), which are two influential inputs to designing teams (Hackman, 2002). Team members' characteristics may not be compatible for engaging in constructive, knowledge-building conversations. The interplay of different individual traits can be complementary, and the specific combinations of these traits can significantly influence a team's ability to collaborate and learn from one another. Similarly, the task and interpersonal contexts may influence their perceptions of whether they have compatible goals, and the quality of exchanges that develop between them.

To study the effects of these compositional and contextual features of a team, first, we need a construct that captures the quality of the exchanges taking place between conversation partners that foster the creation of synergies. Transactivity is one such construct that has been used in the literature to conceptualize this phenomenon, referring to an emergent, dyadic process of conversation partners operating on each other's reasoning, which facilitates co-creation of knowledge (Berkowitz & Gibbs, 1983; Teasley, 1997; Weinberger & Fischer, 2006). Studying transactivity will enhance our understanding of the role of communication between team members in constructing new cognitive structures and promoting team learning.

Additionally, we also need to ensure that we have the right tools to measure collaboration effectively. Common measures that are used by team researchers involve detailed coding of conversation and behavior by trained human evaluators, self-report survey measures, and assessment of group effectiveness based on their work products or recipients' evaluations. These measures tend to be fairly coarse, as they are time and resource-intensive and thus can only capture brief snapshots at one or a few points in time. To address this challenge, I collaborated with computer scientists computer scientists to develop algorithms for automatically detecting

the quality of dyadic conversation (transactivity), based on both written and spoken dialogue in Chapter 1. The following is an overview of each chapter.

In Chapter 1, "Theory and Measurement of Transactivity," I begin by introducing the concept of transactivity, drawing upon Piagetian learning theory and comparing it to related constructs in the field of organizational behavior, such as transactive memory processes (Wegner, Giuliano, & Hertel, 1985). The chapter then explains the process of constructing and validating a measure of transactivity, detailing the development of transactivity dimensions, the results of human annotation, and the creation of algorithms for detecting transactivity in written and spoken dialogue. Specifically, two algorithms are developed for use in the context of online discussion board data (that use written communication) and a negotiation exercise (that use real-time spoken communication). Each model is applied for scoring transactivity in two empirical studies in Chapters 2 and 3, respectively.

In Chapter 2, "Personalities in Sync: Investigating Complementarity in Personality Traits and Transactivity," I first theorize the relationships between the adaptation strategies (i.e., assimilation, accommodation; Piaget, 1971), communication styles (i.e., assertiveness, responsiveness; Waldherr & Muck, 2011), and personality traits (i.e., extraversion, agreeableness, honesty-humility, openness to experience; Lee & Ashton, 2004). Specifically, I examine the associations between specific combinations of personality traits and the extent to which conversation partners are compatible for engaging in transactive, knowledge-building conversations. I test the hypotheses using three archival datasets of online discussion board exchanges, and applying the transactivity scores generated by the first algorithm developed in Chapter 1.

Finally, in Chapter 3, “Investigating Complementarity in Contextual Factors in Developing Transactivity,” I theorize on the relationship between transactivity and transactive goal dynamics (Fitzsimons, Finkel, & Vandellen, 2015) integrating negotiation research to examine situational determinants of transactivity in a negotiation setting.. Specifically, I focus on two contextual factors, including task demonstrability (problem context) and power structure (interpersonal context), positing that these two contexts can complement each other in specific combinations, and jointly affect partners’ ability to develop transactivity. I test the hypotheses in an experiment where these two factors are manipulated, and using transactivity scores measured by the second algorithm developed in Chapter 2.

Chapter 1. Theory and Measurement of Transactivity

In this chapter, I review the theoretical background of transactivity, which is an emergent, dyadic process where conversation partners build on each other's reasoning (Berkowitz & Gibbs, 1983; Teasley, 1997; Weinberger & Fischer, 2006) and discuss the development of algorithms to measure it in different contexts. In the first section, I present the theoretical foundation of transactivity, based in Piagetian learning theory, and map a nomological network of related constructs within the organizational behavior, teams, and related literatures. In the second section, I detail the process of developing algorithms to detect transactivity in dyadic exchange. I start with the development of sub-dimensions used by human coders to annotate dyadic discussions using two modes of communication: (1) written communication, based on a set of online discussion boards, and (2) spoken dialogue, based on real-time spoken communication during a negotiation exercise. I then describe the process and the experiments we conducted to develop deep learning algorithms for automatic detection of transactivity in dyads based on written and spoken communication.

Theoretical Background on Transactivity

Transactivity or transactive discussion refers to "reasoning that operates on the reason of another" (Berkowitz & Gibbs, 1983, p. 402). That is, rather than merely sharing ideas, partners challenge each other as they demonstrate their reasoning and collaborate in constructing new knowledge (Noroozi, Weinberger, Biemans, Mulder, & Chizari, 2013; Weinberger & Fischer, 2006; Gätje &Jurkowski, 2021). As conversation partners engage in each other's thoughts, critically exploring alternative arguments and process them at a deeper level, they co-construct new meaning of the problems and create breakthrough solutions (Mercer & Howe, 2012; Teasley, 1997). Studies have consistently found that transactivity promotes collaborative learning (e.g., Chi, 2009; Chi & Wylie, 2014; Vogel, Wecker, Kollar, & Fischer, 2017). In particular, transactive conversations support the emergence of team learning processes (Zoethout et al., 2017), leading transactive teams to exhibit better learning outcomes and performance (e.g., Wang, Wen, & Rosé, 2017; Wen, Maki, Wang, Dow, Herbsleb, & Rosé, 2016).

The concept of transactivity is based on Piaget's theory of cognitive functioning, particularly the notion of socio-cognitive conflict, which takes a constructivist approach to learning that views knowledge acquisition as a social activity, emphasizing discovery or problem-based learning between peers (De Lisi & Golbeck, 1999; Doise & Mugny, 1984). Piaget examined children's cognitive development and functioning in terms of subject-object relations, where "object" includes other people. That is, children get to better understand other people in a given context by performing actions with and towards others (subject-to-object), which are, in turn, influenced by the specific context (object-to-subject). In particular, according to the tenets of socio-cognitive conflict, it is predicted that more learning can occur between a subject and an object when there is a discrepancy between their respective experiences or viewpoints, leading to

a cognitive conflict that needs to be resolved through negotiating meaning (Doise & Mugny, 1984). Transactivity builds upon this concept by emphasizing the role of demonstrating reasoning in settling cognitive conflicts, creating an emergent process of knowledge co-construction (Teasley, 1997). This perspective parallels similar ideas that have emerged in teams research, where team researchers have conceptualized groups as socio-cognitive, information processing systems (Gruenfeld & Hollingshead, 1993; Hinsz, Tindale, & Vollrath, 1997), highlighting the role of communication between team members in constructing new cognitive structures and enhancing team learning (Decuyper, Dochy, & Van den Bossche, 2010; Drach-Zahavy & Somech, 2001; Van den Bossche, Gijselaers, Segers, & Kirschner, 2006; Wiese, Burke, Tang, Hernandez, & Howell, 2022; Zoethout et al., 2017).

Piaget (1966) asserted that an important influence on learning is the presence of a balance between the processes of assimilation and accommodation. Assimilation involves interpreting new experiences or information in terms of pre-existing cognitive structures or mental models, whereas accommodation involves adapting those structures to accommodate new experiences or information. In other words, assimilation occurs when different characteristics of an object are not taken into account; in cases of pronounced assimilation, this commonly occurs during play, when certain details of a situation are ignored and reality is distorted to fit with the actor's own rendering of the scene. Accommodation, by contrast, bends the actor to the constraints of the environment, with imitation serving as a prototypical example of extreme accommodation. Without assimilation, there would be no sense of continuity, but without accommodation, there would be no adaptation or change. Thus, achieving balance between these, or an equilibrium, requires what Piaget (1971) described as equilibration, or a self-regulatory process through which individuals adapt their cognitive structures over time. This involves progressing through

various stages of assimilation and accommodation as they encounter new information or experiences that do not fit with their existing understanding. Piaget placed great importance on the role of exploration and social interaction as the stimuli which drive the equilibration process, as well as cognitive development and learning (Saracho, 2023).

The Relationship of Transactivity to Similar Constructs in Organizational Behavior

Transactivity is similar to a number of constructs studied in the field of organizational behavior and teams research, such as transactive memory processes (Wegner et al., 1985), information elaboration (van Knippenberg et al., 2004), and others. Table 1 displays the similarities and differences between these constructs and transactivity. These constructs share a common ground viewing the team communication as an important team process through which novel insights that transcends individual understanding are expected to emerge (Argyris, 1993; Macmillan, Entin, & Serfaty, 2004). In comparison to these constructs, in what ways is transactivity similar and different? That is, what are some distinctive features of transactivity? In the following, I summarize how transactivity is distinct from and complementary to some of similar constructs in the field, and how it can provide added value to enhancing our understanding of learning, team cognition, and conflict management.

Based on the criteria of whether a construct theorizes and equally emphasizes the emergence of (a) collaborative integration of knowledge (i.e., an interpersonal dimension of conversation), (b) consensual elaboration of knowledge (one part of epistemic dimension; e.g., developing ideas that are compatible with existing views), and (c) critical reasoning and argumentation (which also constitutes the epistemic dimension; e.g., raising counterarguments), constructs that share all three of these elements are considered to be most similar to transactivity. These include transactive memory processes (Wegner et al., 1985), integrative capacity (Salazar,

Lant, Fiore, & Salas, 2012), and motivated information processing (De Dreu, Nijstad, & Van Knippenberg, 2008). Some constructs focus primarily on the interpersonal dimension (e.g., knowledge integration capability) or the epistemic dimension (e.g., integrative complexity), while others consider both dimensions but do not attribute much value to the role of critical discourse (e.g., information elaboration). In the following, I outline key features of transactivity and discuss how they compare to those of other related constructs.

First, transactivity highlights both *collaborative* integration and *critical* exploration of different perspectives. This dual emphasis provides a more comprehensive understanding of the underlying processes involved in effective collaboration and knowledge construction. Many similar constructs in our field focus on integration without giving much attention to the importance of sociocognitive conflict and differentiation. For example, such a tendency is observed in brainstorming and negotiation research, where criticism and argumentation are largely viewed as something to be avoided for idea generation and mutual gains (Curhan, Labuzova, & Mehta, 2021). Negotiation researchers have typically distinguished between two approaches to negotiation: integrative and distributive strategies (De Dreu, Weingart, & Kwon, 2000). Integrative strategy aims to develop win-win outcomes by identifying shared interests and balancing the concerns for both self and others, whereas distributive strategy focuses on claiming value through tactics like defending one's position or pressuring the other party to alter their viewpoint (De Dreu et al., 2000). Nevertheless, certain behaviors associated with distributive strategies (e.g., argumentation) can display a consideration for both self and others if an individual grounds their argument in logical, persuasive reasoning that acknowledges different perspectives (Baker, Hansen, Joiner, & Traum, 1999; Nussbaum, Sinatra, & Poliquin, 2008).

Compared to constructs in conflict management research, transactivity bears similarities to problem solving strategy (De Dreu et al., 2001), which involves an individual's tendency to reach an agreement that satisfies the aspirations of parties involved. Transactivity also shares similarities with conflict expression in a form of debate (Weingart et al., 2015), where the disagreements are easily identifiable, but individuals maintain an open-mindedness towards the information presented by the opposing side. A key distinction is that transactivity is focused on learning and co-creating new knowledge, making it a more "generative" process. That is, transactivity involves partners engaging in exploration and discovery of new perspectives and ideas, which may, in turn, generate more conflicts. Furthermore, transactivity is concerned with the demonstration of reasoning, which can offer a specific explanation (mechanism) for how conflicts may escalate or deescalate. That is, as transactivity entails examining the content of what partners are communicating, as well as how they express their opposing views, we can examine when and how debate leads to productive outcomes. Studying transactivity could thus complement conflict management research by explaining the process of how transactivity can narrow the representation gap (Cronin & Weingart, 2007) and shed light on the emergence process of conflict expression.

Some constructs, such as motivated information processing (De Dreu et al., 2008; Nijstad & De Dreu, 2012), integrative capacity (Salazar et al., 2012), and transactive memory processes (Wegner et al., 1985) acknowledge the importance of critical discussion for disseminating diverse information (as well as emphasize the importance of the interaction of social and cognitive dimensions of learning). Transactivity may be the ideal construct for operationalizing and conceptualizing the effective information processing these constructs describe. In particular, transactivity can complement task reflexivity (West, 1996), which is proposed to be important

for operationalizing information processing in groups according to the tenets of motivated information processing and integrative capacity. For example, Salazar et al. (2012) theorized that ideal cognitive integration processes (as part of integrative capacity) are "composed of knowledge consideration, assimilation, and accommodation" (p. 544) and suggested that reflexivity will elicit such processes. However, reflexivity, defined as "the extent to which group members overtly reflect upon the group's objectives, strategies, and processes and adapt them to current or anticipated endogenous or environmental circumstances" (West, 1996, p. 559), specifically focuses on collective reflection and adjustment of work methods (Schippers, West, & Dawson, 2012), with less emphasis on examining how members communicate their thoughts and manage conflicts if they arise. Moreover, transactivity embodies the three key components of integrative capacity (i.e., knowledge consideration, assimilation, accommodation; Salazar et al., 2012), as it emerges from an environment characterized by mutual respect (Gweon et al., 2013), where partners are considerate of processing the contributions of others and also willing to critically examine different ideas in pursuit of creating new knowledge.

Second, transactivity is a dyadic construct, focused on the structure and mechanics of how partners engage in each other's ideas and reasoning, which can offer a more detailed understanding of the emergent process of team cognition. Other similar constructs are either team-level (e.g., information elaboration; van Knippenberg et al., 2004) or individual-level (e.g., integrative complexity; Tetlock et al., 1993) constructs. In particular, information elaboration refers to "the exchange of information and perspectives, individual-level processing of the information and perspectives, the process of feeding back the results of this individual-level processing into the group, and discussion and integration of its implications" (van Knippenberg et al., 2004, p. 1011), which is focused on individual-level and group-level processing of

information (Harvey, 2015). Understanding transactivity can provide a deeper understanding of the mechanisms underlying group-level constructs, as group-level integration is likely to be influenced by the varying levels of transactivity among different possible pairs of members.

Specifically, regarding information elaboration, the way information elaboration is measured does not consider possibilities of such variance in quality, by requiring all members to acknowledge and discuss information shared by a member[1] (Hoever, van Knippenberg, van Ginkel, & Barkema, 2012; Homan, van Knippenberg, Van Kleef, & De Dreu, 2007). However, the same two people who were not engaged in discussion regarding specific information may be transactive when a different piece of information is raised by either one of them or by a third person. Additionally, even if key information is shared at the group level, people may access that information at different points in time depending on how centralized the group is. Furthermore, since transactivity requires the engagement of two individuals, a focal team member may be transactive with one member, but not the other in a team. This implies that two teams with similar levels of information elaboration could experience different scopes and levels of accuracy in their development of shared mental models.

Third, transactivity is applicable to various interaction contexts. While other similar constructs are rooted in diversity or negotiation research and are assumed to be most relevant to creative team performance, transactivity originates from research on moral reasoning, argumentation, and collaborative learning, which primarily focuses on learning domain-specific knowledge. Since transactivity involves cognitive conflicts and knowledge generation, creative tasks are likely to benefit the most from transactivity. For example, Hargadon and Bechky (2006)

[1] Similarly, the scoring of information elaboration was based on the researchers' predefined categories of information. The highest level of elaboration that a group can achieve was limited, which may not capture the possibility of different ways that members can generate and integrate diverse information.

identified reflective reframing or "mindful behaviors of all participants in an interaction, where each respectfully attends to and builds upon the comments and actions of others" (p. 489) as an important factor for collective creativity to emerge in their model of collective creativity. Reflective reframing shares similarities with transactivity, as both demonstrate how alternative, new ideas are generated by deeply engaging with, and being willing to listen to and change thoughts based on others' contributions. Moreover, besides creative tasks, there is no reason to believe that transactivity would necessarily be detrimental for other, more routine or demonstrable tasks. By engaging in transactive exchanges, team members can learn more effectively from each other regarding ways to solve problems, probe alternative and diverse ideas, and better identify each member's strengths (Ren & Argote, 2011). Similarly, as transactive groups tend to be more efficient in storing and retrieving information (Zoethout et al., 2017), they may be better able to structure and adapt their conversations according to the demands of various tasks. In other words, transactivity may explain why some groups develop specific memory system structures (i.e., differentiated, integrated; Gupta & Hollingshed, 2010). By fostering an atmosphere of collaboration and mutual respect through repeated transactive exchanges, and becoming more adaptable to dynamic changes in the environment, team members may also develop knowledge integration capability, or "a reliable pattern of team communication that generates joint contributions to the understanding of complex problems" (Gardner et al., 2012, p. 999).

Developing Models to Measure Transactivity

Measures of transactivity reflect a nuanced perspective on communication quality by focusing on the structure of the content (i.e., transacts) of conversations. The traditional process of evaluating transactivity, carried out by human coders, is time-intensive and laborious, making it impractical to use on a large scale. However, the growing capabilities of technology to automate the process of converting speech to text, along with developments in natural language processing (NLP), provide exciting opportunities to incorporate algorithmic detection of communication quality, including transactivity, in a wider variety of contexts.

In the following sections, I describe the development of dimensions of transactivity that can be processed and learned by a machine to automatically detect transactivity, first using text-based communication, and then using spoken dialogue (converted to text). Text analysis has evolved from capturing themes or sentiment based on specific words (e.g., LIWC) to groups of words for topic modeling (e.g., the bag-of-words approach), and now to a more nuanced and advanced understanding based on NLP (Banks, Woznyj, Wesslen, & Ross, 2022). Advancements in NLP techniques, such as deep learning and transformer models, have significantly improved the ability to capture contextual information and semantic relationships within text. We leverage these state-of-the-art approaches to develop efficient models for detecting transactivity.[2]

Measuring Transactivity in Asynchronous Text-Based Dialogue

Berkowitz and Gibbs (1979) developed a coding scheme for transactivity in which they identified 18 types of transacts or dialogue behaviors, which are classified as higher or lower order transacts. Higher order forms are *operational* transacts (e.g., "counter consideration") that work on Alter's reasoning through logical analysis, integration, and others. Lower order forms

[2] This portion of the research was conducted in collaboration with James Fiacco, Sireesh Gururaja, and Carolyn Rosé from the School of Computer Science, Carnegie Mellon University.

include *representational* (e.g., "paraphrase") and *elicitational* transacts (e.g., "feedback request"), which do not entail any transformations of Alter's reasoning. The transacts feature either competitive (e.g., "competitive paraphrase") or non-competitive (e.g., "paraphrase") mode, which can be focused on Ego's, Alter's, and the dyad's positions.

Asynchronous text-based communication, such as we would observe in an online discussion board, takes a different form than the spoken dialogue that formed the basis of Berkowitz and Gibbs' (1979) original model, as a "speaking turn" in this format typically encompasses multiple transacts. In order to use Berkowitz and Gibbs' (1979) concepts as a basis for training our machine learning model for application to text-based dialogue, we needed to cluster the original set of 18 transacts into a smaller number of dimensions according to their functions. Based on our qualitative analysis of a sample of exchanges, we identified three groups of functions capturing ideas related to acknowledgment, extension, and qualification, which I expand upon further below.

According to the Piagetian and constructivist views of learning, the "social construction of knowledge" (Berkowitz & Oser, 1985) resulting from transactivity emerges in a psychologically-safe environment where the partners feel their contributions are valued and respected (Azmitia & Montgomery, 1993). Accordingly, I developed *Active Listening* as one dimension of our model that represents the extent to which a focal subject (Ego) showed their acknowledgment of the partner's (Alter) ideas and thoughts. Second, in addition to mutual respect, learning is also facilitated when the dialogue is disequilibrating, which occurs when individuals experience a cognitive gap when exposed to something new from the environment. For instance, the partners can stimulate cognitive disequilibration by contributing another perspective, challenging their counterparts' ideas, or asking thought-provoking, critical

questions. I developed *Idea Extension* to evaluate the extent to which Ego was elaborative in presenting their own reasoning process. Third, considering that cognitive perturbations are stronger when there are conflicting views, we added *Challenging Views* to assess the extent to which Ego's qualification of Alter's argument was direct and extensive.

Capturing three separate dimensions of transactivity extends prior work which used a binary measure for identifying transactivity in text-based dialogue (e.g., Wen et al., 2016). Future work can examine different research questions by focusing on the dimensions individually or in combination. A composite transactivity measure using all three dimensions will represent a range of transactivity levels (modes), with the highest level characterized by partners collaboratively working with their conflicting ideas (e.g., providing alternative ideas) to construct better understanding (i.e., conflict-oriented consensus building; Weinberger & Fischer, 2006; Weinberger, Stegmann, & Fischer, 2007). The coding manual in Appendix A provides more details and specific guidelines for human annotation and examples for each dimension.

Measuring Transactivity in Spoken Dialogue

In addition to Active Listening, Idea Extension, and Challenging Views, in capturing transactivity in spoken dialogue during dyadic negotiation, we identified additional sub-dimensions to add to our framework — including one new sub-dimension of Active Listening (i.e., *Active Listening-initiating*) and three sub-dimensions of Idea Extension (i.e., *Idea Extension-initiating*, *Multi-Issue Offer*, *Suggestion of Concession*), resulting in a total of seven dimensions included in our measurement model of transactivity in spoken negotiation dialogue. The addition of two "initiating" transacts — *Active Listening (initiating)* and *Idea Extension (initiating)* are transacts where partners seek clarification before others share their thoughts, or elaborate on their ideas before being prompted. These are particularly relevant to a negotiation

dialogue context as partners enter the conversation having done some preparation, and thus already possess some level of shared understanding of the focal topics and having thought about their own priorities and preferences. Additionally, *Multi-Issue Offer* (i.e., presenting a specific proposal addressing multiple issues) and *Suggestion of Concession* (i.e., suggesting combining or trading off multiple issues, without presenting a specific offer) are two other negotiation-specific transacts (De Dreu et al., 2000; Walton & McKersie, 1965; Thompson, 1991) that involve demonstrating reasoning and integrating conflicting perspectives (see Appendix B for detailed coding guidelines and examples).

Human Coding and Training Machine Models

To develop our machine models, we began with a sample of dialogue from both the online discussion and real-time negotiation contexts to develop a coding manual for each context. We then had human coders rate a subsample of the dataset from each context to establish interrater reliability, following which a larger set of samples from each was used for training an algorithm to automatically detect transactivity using deep learning methods. Finally, each algorithm was used to score all of the data from its associated context—i.e., the text-based communication data from the online discussion board or the spoken dialogue from the negotiating dyads—which supplied the scores used in the analyses presented in Chapters 2 and 3.

Sources of Data for Human Coding

Online discussion board data. The text-based communication data was captured from online discussion board assignments included in an introductory OB course in three consecutive cohorts. As detailed in Chapter 2, students were instructed to post their reactions to a target article and respond to at least three other classmates' responses. A sample of 180 posts was used for developing the coding manual and evaluating interrater reliability, and another sample of 908 posts was annotated to provide the basis for training the machine model. The final algorithm was used to score a total of 5,568 comments across three datasets for the analyses presented in Chapter 2.

Negotiation data. The spoken dialogue data used for developing the second algorithm was based on a negotiation task involving the negotiation of an employment contract covering eight issues (e.g., salary) between a job recruiter and a candidate ("New Recruit" exercise; Neale, 1997). The dialogue of each dyad's negotiation was audio-recorded and transcribed by our research team. The unit of analysis for annotation was each speaking turn or statement. A sample

of 531 statements was used for developing the coding manual and evaluating interrater reliability, following which a sample of 1,048 comments was annotated for training the deep learning model. The final algorithm was applied to score a total of 10,593 statements as input for the analyses presented in Chapter 3.

Validating the Measures: Interrater Reliabilities

Online discussion. Two independent raters coded a sample of 180 comments. To be comprehensive, interrater reliability was assessed using three measures, including intraclass correlations (ICC), Krippendorff's alpha, and weighted Cohen's kappa. For intraclass correlations, ICC(3, *k*) was used, which measures the reliability of a fixed number of *k* raters (Shrout & Fleiss, 1979). This is also known as a two-way mixed effects model with multiple raters (McGraw & Wong, 1996). For ordinal variables, such as the transactivity dimensions, except for Active Listening (binary), ICC is recommended (Hallgren, 2012). ICC is also suitable for nominal and continuous variables. Krippendorff's alpha (Hayes & Krippendorf, 2007) was also computed, which is also used for assessing interrater reliabilities for all types of variables. Moreover, whereas Cohen's (1960) kappa is only suitable for nominal or categorical variables, weighted Cohen's (1968) kappa allows estimating the reliability for ordinal variables.

The results demonstrated excellent ICC(3,2) absolute-agreement values for all dimensions: Active Listening (.89), Challenging Views (.91), and Idea Extension (.87). Krippendorff's alpha was found to be acceptable across dimensions: Active Listening (.80), Challenging Views (.80), and Idea Extension (.76). Last, weighted Cohen's kappa showed moderate to strong levels of agreement: Active Listening (.80), Challenging Views (.77), and Idea Extension (.69). Given these values, one rater coded an additional 908 comments using a

roughly equal sample of comments from each of the topics assigned, to provide the basis for deep learning, as described in more detail below.

Negotiation data. Two independent raters coded a sample of 531 speaking turns from the spoken negotiation dialogues. Since all seven dimensions were scored on a binary basis, interrater reliabilities were evaluated based on two measures—Cohen's kappa (Cohen, 1960) and Gwet's AC1 (Gwet, 2008; 2014). Evaluating both metrics is important, particularly when there is high agreement between raters, as this can lead to kappa values that are low (i.e., "kappa's paradox"; Cicchetti & Feinstein, 1990), in which case Gwet's AC1 provides more accurate and reliable agreement statistics (Gwet, 2008; 2014; Jimenez & Zepeda, 2020). Kappa scores and AC1 for each dimension, respectively, were as follows: Active Listening (.51, .89), Active Listening-initiating (.71, 88), Challenging Views (.66, .98), Idea Extension (.71, .88), Idea Extension-initiating (.66, .99), Multi-Issue Offer (.74, .98), and Suggestion of Concession (.55, .97). The agreement levels (%) across the dimensions were consistently high: Active Listening (90.77%), Active Listening-initiating (99.25%), Challenging Views (98.31%), Idea Extension (91.53%), Idea Extension-initiating (98.68%), Multi-Issue Offer (98.12%), and Suggestion of Concession (97.36%). One rater coded an additional sample of 1,047 comments for use in training the machine model used to develop the algorithm.

Automation of Transactivity Detection

Working with my computer scientist collaborators, we used the annotated data as inputs to train deep learning models as the basis for two algorithms to reliably detect transactivity in our two dialogue contexts: text-based communication in an online discussion board setting, and spoken dialogue in a negotiation setting. In developing both algorithms, we have employed *transfer learning*, a method that applies the models developed in one domain to predictions in another domain that shares essential conceptual features. In our case, we started with models trained in prior work (Fiacco and Rosé, 2018) which we adapted to our settings. This enables us to apply deep learning techniques, which normally require tens or hundreds of thousands of datapoints, to a context where gathering data at that scale is not feasible. An overview of the experiments conducted and evaluations of each model is explained as follows.

Transactivity detection in text-based communication

We conducted a series of experiments[3] to enhance an existing model that successfully transferred the learning of entailment representations to the detection of transactivity (Transferable Attention Model; Fiacco & Rosé, 2018). Learning an entailment representation requires the algorithm to detect whether the meaning of a focal text (content) can be inferred from a premise presented in another text (context). We reasoned that detecting a conceptual connection between two texts based on inference would involve a logic that could also enable detection of transactivity, as it also involves relating to and building on previously mentioned

[3] "Experiments" in this work refer to rounds of resampling in which the machine predicts a score on each of the focal dimensions which is then compared to the human-annotated judgments to estimate reliability. For more details, see Haan, Woolley, & Rosé (2021).This work was conducted in collaboration with James Fiacco (Carnegie Mellon University) and Carolyn Rosé (Carnegie Mellon University). The work is published in the Proceedings of the International Conference on Computer-Supported Collaborative Learning, and was the winner of the *Best Paper Award*.

statements. For each experiment, the results were obtained through a 10-fold cross-validation, with each fold randomly assigned.

Initially, we trained the existing Transferable Attention Model on the sample of 908 human-annotated online discussion board contributions described above (referred to as "transactivity dataset" in short) and evaluated the model's performance based on its level of agreement (reliability) with the human coder in detecting transactivity to establish a baseline. Initial attempts yielded unacceptably low levels of reliability. In comparing the transactivity dataset with the pre-training corpus used to train the Transferable Attention Model, we noted that the transactivity dataset involved more abstract language usage (Brysbaert, Warriner, & Kuperman, 2014). This led us to transition and retrain the original model with a different entailment dataset, Multi-genre Natural Language Inference corpus (MultiNLI; Williams, Nangia, & Bowman, 2018), which is significantly more abstract than the corpus (Stanford Natural Language Inference; SNLI) used to train the Transferable Attention Model. This yielded significant improvement across all transactivity dimensions; however, average kappa scores still remained below acceptable thresholds.

In an effort to improve the model's accuracy, we reassessed whether the assumptions underlying the models trained on entailment datasets were the right choice for transfer learning to detect transactivity. As explained previously, entailment requires the algorithm to detect whether the meaning of a focal text (content) can be inferred from a premise presented in another text (context), typically immediately before. In comparing the focal messages in the transactivity dataset to those in the entailment data sets, we noted that the transactivity dataset messages tended to be more detailed and well-structured. This led us to question whether a model predicting transactivity based on the alignment of phrases between content and context (i.e.,

entailment) was the best approach. On further investigation of the transactivity dataset, we noted that the context may not always be found in the immediate prior turn, or it may only be implicit, making a model that requires content and context to be explicit and contiguous to be less appropriate than we initially believed. Thus, we redefined the previous model (which used MultiNLI as the pre-training corpus) to perform self-attention, which focuses on the evaluation of how the messages are structured, regardless of context. Once we implemented this new approach, we observed a significant increase in reliability on some dimensions, with Cohen's kappa increasing from .31 to .72 for the active listening dimension. However, despite some improvements, the kappa scores for other dimensions, such as challenging views, remained below threshold (kappa = .46).

To further improve the reliability of the model for detecting transactivity as expressed in the challenging views dimensions, we incorporated sequential information to the model in addition to self-attention. Models capturing sequential information are useful for detecting speech patterns involved in functions such as negation, where the occurrence and meaning of negation is highly dependent on the word order. We anticipated this could be important for the challenging views dimension. To incorporate this new element, we employed a transformer model, specifically RoBERTa (Liu et al., 2019), instead of the Transferable Attention Model, since transformer models are better able to perform self-attention as well as identify and classify the sequence of text (Vaswani et al., 2017). We fine-tuned RoBERTa on Recognizing Textual Entailment (Parikh et al., 2016), using the MultiNLI corpus, as a base model, and then fine-tuned it with the transactivity dataset for each of the cross-validation folds. The experiments were successful, with the average Cohen's kappa increasing from .46 to .67 for challenging views. The results showed that the idea extension dimension performed similarly to the previous model, (i.e,

Transferable Attention Model pre-trained on MultiNLI dataset and reconfigured for self-attention), but the performance on active listening dimension was worse (reliability decreased from .72 to .65). Thus, the previous model was used for detecting active listening, while the RoBERTa model pre-trained on MultiNLI was used for detecting idea extension and challenging views.

Transactivity detection in spoken dialogue

In contrast to text-based discussion, spoken dialogue is often non-linear; participants tend to shift back and forth between different topics at various points in time. This is particularly true in a negotiation context, where negotiators may refer to multiple topics or issues in tandem or circle back to issues after some time has passed as a tactic for trading off in making concessions on different points. With this in mind, we explored a few different approaches to developing a model to detect transactivity based on spoken dialogue from a dyadic negotiation context.[4]

First, we identified the topics or issues discussed in a given turn of dialogue, and then we classified transactivity by linking and comparing two turns that addressed the same issue. Instead of using the previous turn of a focal statement as context (referent) that it built on, which does not account for the content discussed in the previous turn, we matched it with a preceding turn that also addressed the same issue. We developed heuristics to identify issues in individual turns of conversation, based on the issues specified as part of the dataset (e.g., eight issues such as salary and location used for the negotiation exercise). We then compared the accuracy of a model trained using this approach to our initial model based on entailment. We found that this issue-based approach was not successful, primarily due to the distribution of issues discussed in the dialogues. We found that the majority of issue discussions occurred within localized segments of

[4] This work was conducted in collaboration with Sireesh Gururaja and Carolyn Rosé (School of Computer Science, Carnegie Mellon University).

conversation, with focal statements rarely referencing back to earlier turns that discussed particular topics. As a result, this approach provided only marginal improvements over the existing entailment approach, which considered the turn immediately preceding a focal statement as context.

Our second strategy focused on fine-tuning transformer models used for detecting transactivity in text-based communication. Specifically, we compared a standard RoBERTa baseline trained for sequence classification and a RoBERTa model fine-tuned on MultiNLI that incorporated entailment, like the model used to analyze our text-based discussion board data. We trained models on each of the seven dimensions of transactivity, as well as several combinations of those dimensions. However, some of the dimensions were represented in only a small number of observations in our training dataset,[5] leading to poor performance in the classifiers trained to predict individual dimensions. Kappa scores ranged from 0.29 in a test for the more common class (idea extension; 17.57% of the total observations) down to 0.01 for sparser classes, where one of which had as few as 11 examples (suggestion for concession).

To address the issue of label sparsity, we combined different dimensions to create fewer categories; however, even with a smaller number of categories, sparsity in some negatively impacted performance on the overall classification task[6]. Consequently, we focused on a binary classification objective that combined all of the dimensions of transactivity. We used a dyad-

[5] Specifically, out of total 1,047 observations in the training dataset, the number of cases that was labeled as '1' (indicating the presence of a specific dimension) were as follows: 87 for active listening, 184 for idea extension, 38 for multi-issue, 11 for suggestion for concession, 23 for active listening (initiating), 20 for idea extension (initiating), and 30 for challenging views.

[6] We also experimented with downsampling ratios to address the data sparsity issue by balancing our training data to contain a more evenly distributed set of points by label. We tested negative/positive ratios of 1, 2, and 10, in addition to the original dataset, and found that across combinations of labels, downsampling to a 1:1 ratio performed best. That is, for a specific combination of dimensions, the number of examples labeled as transactive and those that were not labeled as transactive were equal. The baseline RoBERTa model demonstrated greater robustness to changes in the sampling ratio compared to the entailment-based model, which only successfully learned when the ratio was set to 1:1.

level leave-one-out cross validation to estimate the model's performance on the unseen test data. The results showed that the RoBERTa baseline model significantly outperformed the entailment-based model across label combinations. Notably, for the best-performing label combination, which combined all seven dimensions into one (referred to as "single dimension transactivity" below), the average of the best kappa scores on the validation data was .66 when using the RoBERTa baseline model (with sequence reasoning), compared to .51 when using the entailment-based model. Therefore, we used the baseline model based on sequence reasoning for our subsequent experiments.

To further enhance the model's performance, we employed a "pseudo-labeling technique" to new, unlabeled data. To implement this approach, after training the model on single dimension transactivity, we used the updated model to label the new data. Next, we trained new classifiers on both the original, human-coded transactivity training dataset and the newly labeled dataset. We then evaluated the new classifiers using two types of kappa scores to better estimate the model's generalization capability: the average of the best kappa scores on the validation data, and the average of the final kappa scores when the model finished training (i.e., the average of the scores computed on the one left-out dyad in each fold). The former offers a notion of the upper bound on performance, while the latter provides an estimate of the average case performance. Before implementing pseudo-labeling, the best case kappa score of single dimension transactivity detection was .66 and the average case kappa score was .57. With pseudo-labeling, the best-case kappa score increased to .75 and average case kappa score increased to .67.

Last, given the strong performance of the pseudo-labeling-based classifiers, we attempted a hierarchical classification task to see if we could construct multidimensional transactivity. That

is, based on the result of positively classified examples of single dimension transactivity, we examined whether we can identify which previously-identified sub-dimensions of transactivity the positive labeling corresponded to. We trained a model to segment instances in the original dataset labeled as transactive into two groups: “interpersonal” (combining active listening, active listening (initiating), and challenging views) and “epistemic” (combining idea extension, idea extension (initiating), multi-issue, and suggestion of concession). We then applied the same pseudo-labeling procedure described above, resulting in classifiers with best-case kappa scores of .63 and .64, and average case kappa scores of .39 and .30, for the interpersonal and epistemic groups, respectively. Although this hierarchical classification task performs better than a naïve classification of these two groups, it still exhibits a large variance in performance, likely due to issues of data sparsity. Given the low reliability of the two-dimensional labeling, we decided to move forward with scoring data from our human experiments using the single dimension transactivity model.

Chapter 2. Personalities in Sync: Investigating Complementarity in Personality Traits and Transactivity

> Interpersonal communication theories that omit consideration of communicator traits are hopelessly incomplete and can never accurately describe, explain, or predict human interaction
>
> —Beatty (1998, p. 318)

This chapter explores how partners' personality traits may influence the development of transactivity. In developing a framework to guide our analyses, I integrate Piaget's theory of cognitive functioning (De Lisi & Golbeck, 1999; Piaget, 1971) and research on personality characteristics and their influence on communication behaviors, including communicators' assertiveness and responsiveness (Waldherr & Muck, 2011). I also consider different combinations of personality traits that we anticipate will foster transactivity in conversational exchanges based on extant research.

In the following sections, I will first discuss why studying individual differences is critical in the context of transactivity. Next, I will integrate existing work on communication and personality traits with research on transactivity to provide a foundation for my hypotheses, which I test using three different datasets. My findings contribute to the existing literature on group collaboration by shedding light on the role of individual differences in the development of transactive exchanges, and I discuss potential ways these insights can be used to foster better collaboration.

Theoretical Development

Adaptation Strategies, Communication Styles, and Transactivity

As described in Chapter 1, the concept of transactivity is based on Piaget's theory of cognitive functioning (De Lisi & Golbeck, 1999; Piaget, 1971). The theory conceptualizes

learning as a *self-regulatory*, adaptive process of reorganizing mental models (i.e., equilibration) when experiencing disequilibrating, cognitive conflicts in social interactions. That is, Piaget (1971) theorized that encountering ideas that challenge their mental model increases conversation partners' level of engagement and leads them to think more carefully about each other's ideas and arguments. This increased engagement and deeper consideration makes it more likely that they will integrate their partner's ideas into their own reasoning and learn from each other (Berkowitz & Oser, 1985).

According to Piaget, cognitive development is not a passive process of acquiring knowledge, but an active process of constructing knowledge through a continuous cycle of assimilation and accommodation, with self-regulation playing a key role in adaptation and learning. That is, his work underscored the significance of individual engagement in the process of cognitive restructuring, which is influenced by the individual's pre-existing knowledge and beliefs and their readiness to adapt to cognitive conflict (Block, 1982). Accordingly, individual characteristics (e.g., personality traits) can play an important role in self-regulation, as they can influence how individuals monitor and evaluate their own cognitive processes, as well as their ability to adapt their behavior to fit the demands of the environment (Barrick, Mount, & Li, 2013; Judge & Ilies, 2002; McCrae & Löckenhoff, 2010; Mount, Barrick, Scullen, & Rounds, 2005).

Research has shown that personality traits not only affect self-regulation processes (e.g., Barrick et al., 2013), but also how we handle conflicts (e.g., Rahim, 1983), think and reason (e.g., Haan, 1978; Zhang, 2006), and communicate our thoughts (e.g., Beatty & McCroskey, 1998). When conversing with others, as individuals are confronted with new ideas or perspectives, their personality characteristics can lead to different tendencies in terms of

responding more with assimilation- versus accommodation-based coping strategies (Block, 1982). Consequently, in some dyads, both partners might tend to use more assimilation, and ignore sources of cognitive conflict in order to retain existing cognitive schema (i.e., being overly assimilating or egocentric; Light, 1983). In contrast, in some dyads, both partners may take in others' perspectives and adjust their own mental model with little questioning (i.e., being overly accommodating). Both of these scenarios are unlikely to result in the emergence of transactivity. By contrast, extant theory and research on transactivity suggest that the highest levels of transactivity arise when there is a healthy balance of both assimilation and accommodation, particularly when both partners actively contribute to both aspects of the exchange (Block, 1982; Golbeck & DeLisi, 1999).

Integrating research on individual personality with extant work in communications, I theorize that assimilation and accommodation are related to assertiveness and responsiveness, two substantive factors of communication style (Richmond & Martin, 1998; Richmond & McCroskey, 1990; Waldherr & Much, 2011). Communications researchers have demonstrated that assertiveness involves voicing and defending oneself, and is characterized by a focus on control and status (Anderson & Martin, 1996; Infante & Gorden, 1989). Assertiveness can also manifest as a stronger focus on one's own perspective and a reluctance to adapt to others' viewpoints (Ames, Lee, & Wazlawek, 2017; McCroskey & Richmond, 1996). Based on this understanding, I theorize that assertiveness will be associated with a tendency towards assimilation, as both relate to an underlying process of fitting new information into existing mental structures or schemas. In contrast, responsiveness involves attentive listening and being receptive to others, characterized by a focus on empathy and affiliation (Rubin & Martin, 1994; Stiff, Dillard, Somera, Kim, & Sleight, 1988; Waldherr & Much, 2011). That is, responsiveness

encompasses being receptive to the perspectives of others and demonstrating a willingness to adapt one's views (McCroskey & Richmond, 1996; Myers, Martin, & Mottet, 2002; Porter, Wrench, & Hoskinson, 2007). Accordingly, I theorize that responsiveness will be associated with a tendency towards accommodation, as both relate to the process of modifying one's mental structures to adapt to new information. In short, I expect that people who tend to be assertive will also tend to respond to new information by assimilating it into their existing schemas, while those who tend to be responsive will exhibit a preference for accommodation as their adaptation strategy.

It is important to note that in addition to the influence of individual characteristics, communication behaviors are also influenced by situational factors (Giles & Street, 1994). Since the characteristics of one's partner constitutes an important situational factor, the emergence of transactivity is influenced by the *combination* of both partners' characteristics (Mercer, 2000). In other words, an individual's capacity to regulate their cognitive processes and seamlessly shift between assimilative and accommodative modes may not be fully realized if they're not paired with the "right" partner. Thus, a key approach to enhancing our understanding of the equilibration process is to consider the tendencies toward assimilation and accommodation (as manifested in communication styles) by both partners in a dyad.

In this regard, an important question is which dyads are likely to be most transactive? When examining the combinations of two partners' characteristics, there are two "layers" of combinations to consider: one is the combination of two communication styles (and adaptation strategies) at the dyad level as a whole, and the second is how they manifest in each partner, as each individual can exhibit varying levels of both assertiveness and responsiveness (Thomas, Richmond, McCroskey, 1994).

First, at the dyad level, I expect that a combination of high levels of *both* dyadic (i.e., mean) assertiveness and responsiveness is associated with higher levels of transactivity (Kozlowski & Klein, 2000). These dyads are more likely to initiate cognitive conflicts and are also better equipped to recognize and appreciate the value of the differences in their perspectives. That is, as partners are willing to provide access to their way of thinking (i.e., being assertive), while also reflective of other's thoughts and emotions (i.e., being responsive), they are more likely to develop higher levels of transactivity and learn from each other (Borgatti & Cross, 2003).

Second, when comparing two dyads with similar average levels of assertiveness and responsiveness, the dyad in which *both* individuals have similarly high levels of *both* tendencies will develop higher levels of transactivity than dyads with more varied tendencies (Emich, Lu, Ferguson, Peterson, & McCourt, 2022). In this case, each individual is better able to contribute to the assimilating and accommodating processes by both initiating and supporting them (Pruitt & Rubin, 1986). This type of dyad will benefit the most from the complementarity of assertiveness and responsiveness as both partners are able to collaboratively process information. However, given that there is variation in assertiveness and responsiveness in the population, and that these two tendencies are uncorrelated in most samples (e.g., Richmond & McCroskey, 1990), many individuals will not of their own accord exhibit high levels of both. Thus, the "right" partner for any participant is someone that complements what they themselves are lacking so that they can possess equally high levels of both assertiveness and responsiveness to support the development of high transactivity.

Combinations of Personality Traits and Transactivity

More recent research on assertive and responsive communication styles has explored connections with other widely-researched personality traits in adjacent research in psychology (Beatty, 1998; de Vries et al., 2013; Gudykunst, Matsumoto, Ting Toomey, Nishida, Kim, & Heyman, 1996; Leung & Bond, 2001; Waldherr & Muck, 2011). More specifically, the four personality traits most widely connected with assertiveness and responsiveness are extraversion, agreeableness, honest-humility, and openness to experience (see Figure 1 for an illustration of the relationships between these communication styles and personality traits).

Specifically, high extraversion and low agreeableness are consistently associated with high assertiveness (e.g., Kammrath, McCarthy, Cortes, & Friesen, 2015; Wood & Bell, 2008). Individuals with low extraversion are naturally reflective and thoughtful, enabling them to be more receptive to other's ideas and thoughts[7] (Grant, Gino, & Hofmann, 2011; Jonassen & Brabowski, 1993; Zhang, Zhou, & Kwan, 2017). Similarly, individuals who are high in honesty-humility, along with high agreeableness, tend to be cooperative and pursue goals that benefit others, while those with low honesty-humility tend to be more status-seeking and expressive and exaggerating in communication (e.g., Ashton, Lee, & de Vries, 2014; Ashton, Lee, Baer, & Shackel, 2022). Last, openness to experience has been associated with both assertive and responsive tendencies. Individuals high in openness to experience are found to be expressive and particularly inquisitive (de Vries et al., 2013), verbally engaged (Leung & Bond, 2001), initiate conversation sequences, introducing new topics to discuss (Cuperman & Ickes, 2009), use more words related to causation (Kern et al., 2013), are perceived to be verbally fluent and expressive

[7] The relationship between extraversion and receptiveness is not conclusive. Some studies found that extraversion on its own is not related to responsiveness (e.g., Pence & James, 2015; Pence & Vickery, 2012; Sims, 2017). cf. Low extraversion is typically not characterized by "responsiveness" in terms of rapid reactions to external stimuli (Bullock & Gilliland, 1993; Rammsayer, Indermühle, Troche, 2014).

(Sneed, McCrae, & Funder, 1998). They are also found to be empathetic (McCrae & Sutin, 2009; Sims, 2017) and perceived to be accommodating (Cuperman & Ickes, 2009).

Based on research that connects adaptation strategies (i.e., assimilation and accommodation) and communication styles, integrated with research on the intersection of assertive and responsive tendencies and personality traits, I theorize how different combinations of these characteristics within dyads combine to influence transactivity. The basic argument underlying all four hypotheses is that dyads with higher overall levels of assertive and responsive tendencies will be more transactive, and that these effects will be strongest when both partners have characteristics leading to strong tendencies on the same dimensions (Emich & Lu, 2017; Emich et al., 2022).

Based on the overall relationship between communication styles and personality traits summarized in Figure 1, we can expect "optimal" combinations of personality traits for transactivity. Dyads with personality trait levels that fall in both the assertiveness and responsiveness spheres are expected to exhibit the strongest emergence of transactivity. For example, for dyads with lower honest-humility (see assertiveness sphere on the right), greater transactivity is likely to emerge when they are also low in extraversion or high in agreeableness (see responsiveness sphere on the left), which ensures that their tendencies towards assimilating and accommodating strategies are well-balanced. In the following, I elaborate on the resulting hypotheses regarding specific combinations of personality traits that can complement each other.

Extraversion and honesty-humility. Individuals high in extraversion typically exhibit assertive communication behaviors in social situations (Cole & McCroskey, 2000), with an innate desire to dominate and get ahead of others (Barrick et al., 2013). This can lead to dominating conversations, hindering the development of shared understanding, and making

others feel undervalued (Ames, Lee, & Wazlawek, 2017). To balance this assertive tendency, a responsive orientation is crucial, which involves being empathic and considering others' perspectives. Honesty-humility comes into play here, as it is strongly associated with perspective taking and empathy (Brazil, Volk, & Dane, 2022; Fang, Dong, & Fang, 2019) and prosocial behaviors (de Vries et al., 2013; Johnson, Rowatt, & Petrini, 2011; LaBouff, Rowatt, Johnson, Tsang, & Willerton, 2012; Lawn, Zhao, Laham, & Smillie, 2022), which can help prevent individuals from distorting the meaning of what others say to fit their own perspective or scheme (i.e., being overly assimilating). Indeed, individuals who are high in extraversion and low in honesty-humility are found to be highly narcissistic (Oh, Lee, Ashton, & de Vries, 2011). Thus, honesty-humility is an important factor that jointly with extraversion, facilitates transactive exchanges. Likewise, dyads characterized by low levels of extraversion (i.e., representing high responsive tendencies) and low levels of honesty-humility (i.e., representing high assertive tendencies) are expected to complement each other, making them more likely to engage in transactive exchanges.

On the other hand, when there is a mismatch in these traits, particularly extraversion, within a dyad, it is less likely that transactivity will develop. For instance, if one partner in a dyad is high in extraversion and honesty-humility, while the other is low in both traits, this dyad is less likely to be transactive although each partner is high in both assertive and responsive tendencies, due to incompatibility between high and low extraversion. That is, studies suggest that extraverted and introverted individuals tend to experience difficulties communicating effectively because of their differences in social interaction styles and information processing preferences. Cuperman and Ickes (2009) found that extravert-introvert pairs tend to be less cohesive and interactive than pairs that share similar extraversion levels. Similarly, introverts

tend to hold negative impressions of extraverts and evaluate extraverts' performance less favorably than that of their introverted partners (Erez, Schilpzand, Leavitt, Woolum, & Judge, 2015). Additionally, physiologically, dyads homogenous in extraversion show higher activation of periocular muscles, suggesting the expressions of more positive valence emotions (Salminen, Henttonen, & Ravaja, 2016). Taken together, I hypothesize as follows.

Hypothesis 1: Conversation partners with matching high or low levels of extraversion and honesty-humility (i.e., similarly high or low strengths in extraversion and honesty-humility) will demonstrate more transactive exchanges than those that are mismatched.

Agreeableness and honesty-humility. Second, high dyadic honesty-humility can also complement the strong assertive tendencies associated with low dyadic agreeableness, while high dyadic agreeableness can similarly complement the assertive tendencies observed in dyads with low honesty-humility. Low agreeableness is characterized by a tendency towards competitiveness, skepticism, and a willingness to argue (Ashton et al., 2014; McCrae & Costa, 1989), whereas high honesty-humility is associated with sincerity, modesty, and a lack of self-aggrandizement (Ashton et al., 2014; Lee & Ashton, 2012). The interaction between low agreeableness and high honesty-humility in a dyad can lead to more critical but constructive conversations, as the perspective-taking and empathic tendencies associated with high honesty-humility (e.g., Brazil et al., 2022) can help mitigate the potential negative effects of low agreeableness. This composition allows partners to find alternative views and critical arguments raised by each other to be stimulating rather than offensive. Similarly, the assertiveness associated with low dyadic honesty-humility could be moderated by the responsive tendencies of high dyadic agreeableness, resulting in a more transactive interaction. That is, dyads that are composed of individuals with *unaligned* levels of these traits (i.e., low agreeableness combined

with high honesty-humility, or high agreeableness combined with low honesty-humility) will demonstrate more transactive exchanges compared to dyads with similarly aligned levels of these traits.

When dyad members share high or low levels of agreeableness and honesty-humility, the resulting level of transactivity is likely to be lower. In cases where both traits are high, partners are at risk of groupthink or conformity (DeYoung, Peterson, & Higgins, 2002; Janis, 1972; Kong, Konczak, & Bottom, 2015; Roccas, Sagiv, Schwartz, & Knafo, 2002) where their desire to maintain a positive relationship and avoid conflict outweighs their willingness to assert their own viewpoints and challenge opposing perspectives. This can limit the scope of the conversation, leaving little room for learning opportunities. In contrast, when both traits are low, partners are prone to reassert their own ideas without considering the perspectives of others, further exacerbating their competitive nature. Furthermore, in cases where matching occurs only within individuals, but not between them (i.e., one partner is high in both agreeableness and honesty-humility, while the other partner is low in both traits), the low agreeable and honest-humble partner may dominate the conversation, while the highly agreeable and honest-humble partner may be hesitant to express their own views if they perceive the other partner to be too aggressive. This situation can lead to the partner with high agreeableness and honesty-humility overly accommodating the views of the low agreeable and honest-humble partner without receiving the same level of reciprocation.

> *Hypothesis 2: Conversation partners that are low in agreeableness and high in honesty-humility (or high in agreeableness and low in honesty-humility; i.e., mismatched strengths) will demonstrate more transactive exchanges than those that are matched.*

Agreeableness and extraversion. Third, the strong assertive tendencies of low dyadic agreeableness can result in increased transactivity when paired with low levels of dyadic extraversion (i.e., representing responsive tendencies), and similarly, matching at the higher end (i.e., high agreeableness and high extraversion) is also expected to facilitate more transactive exchanges. That is, the reflective nature of low extraversion (e.g., Grant et al., 2011) can redirect the assertive tendencies of low agreeableness towards critical but thoughtful engagement in conversations, cooling down the potential for low agreeableness to turn into aggression. Moreover, along with honesty-humility, agreeableness is another innately prosocial personality (Ashton et al., 2014; Graziano & Tobin, 2017). It is expected that high levels of dyadic agreeableness can balance the tendency towards assimilation exhibited by high levels of dyadic extraversion. Considering that agreeableness is strongly related to cooperative behaviors (Habashi, Graziano, & Hoover, 2016), particularly those related to responsive communication (e.g., Cuperman & Ickes, 2009; Graziano, Jensen-Campbell, & Hair, 1996; Sims, 2017), its responsive tendencies are likely to enhance transactivity when combined with the assertive tendencies of extraversion. In contrast, dyads characterized by high extraversion and low agreeableness, or low extraversion and high agreeableness, are prone to engage in heated, emotionally charged arguments or to experience emotionally reserved interactions.

Hypothesis 3: Conversation partners with matching high or low levels of agreeableness and extraversion (i.e., similarly high or low strengths in agreeableness and extraversion) will engage in more transactive exchanges than those that are mismatched.

Openness to experience. Last, I suggest that dyads that are homogenous and high on the dimension of openness to experience will be more transactive. Open individuals, who are naturally curious and creative (McCrae & Sutin, 2009), are likely to demonstrate their reasoning

more comprehensively and show genuine interest in getting to know what others think in conversations. Openness to experience is associated with effortful thinking (Sadowski & Cogburn, 1997), divergent thinking (McCrae, 1987), a deep approach to learning (Zhang, 2003), learning proficiency (Barrick & Mount, 1991), and moral reasoning (Dollinger & LaMartina, 1998). Importantly, as described above, open individuals tend to be both assertive and responsive (e.g., Cuperman & Ickes, 2009; McCrae & Sutin, 2009). Although openness to experience is not an inherently prosocial personality, open individuals tend to exhibit prosocial behaviors particularly when these facilitate finding optimal solutions (Lawn et al., 2022). In short, driven by their innate desire for intellectual growth (Barrick et al., 2013), conversation partners who are similarly high in openness would engage in more transactive exchanges. In contrast, when openness is either mismatched or uniformly low, dyad members are less likely to be transactive due to the diametric differences in the way open and closed individuals process information and develop opinions (McCrae, 1996), which can hinder the development of a shared, new understanding.

Hypothesis 4: Conversation partners that are high in openness to experience will demonstrate more transactive exchanges.

Method

Sample and Procedure

I collected data from three cohorts of an introductory OB course delivered to first-year MBA students (in the fall of 2019, 2020, and 2022) at a university in the northeastern U.S. Each cohort completed one or more discussion board assignments, with some variation in topic and other instructions (as explained below), resulting in three separate datasets, one for each cohort. The 2019 dataset includes data from 199 students ("2019 dataset" in short), the 2020 dataset

includes data from 142 students (“2020 dataset” in short), and the 2022 dataset includes data from 107 students (“2022 dataset” in short). None of the students in one dataset were part of any of the other datasets.

The assignments in the course included discussion topics which students were asked to engage in together in an online discussion board forum.. In the 2019 dataset, there were six discussion topics based on business cases and newspaper articles, one of which was assigned prior to the start of the course. Students were instructed to respond to at least three other classmates’ posts of their choosing. Similarly, in the 2020 dataset, there was one discussion topic based on a business case that was assigned prior to the start of the course, and students were instructed to respond to at least three other posts of their choosing. Importantly, students were encouraged to actively participate in the online discussion board by a grading rubric that rewarded consistent engagement, such as providing clarification and asking follow-up questions. Finally, in the 2022 dataset, students were randomly assigned to three other students’ posts to respond. There were four different topics over four weeks, with each week's topic being a follow-up question to the course material.

The discussion data were extracted from the online platform. Observations with multiple referents, unclear referents, and postscripts to oneself were excluded. The final dataset included a total of 3,386 observations (interactions) nested in 2,806 dyads from the 2019 dataset, 757 observations nested in 443 dyads from the 2020 dataset, and 1,425 observations nested in 1,212 dyads from the 2022 dataset. In the 2019 dataset, 16.5% of dyads (30.8% of total observations) had more than one interaction, while in the 2020 dataset, 55.1% of dyads (73.7% of total observations) had more than one interaction, and in the 2022 dataset, 15.8% of dyads (28.5% of total observations) had more than one interaction.

Measures

All survey items used a Likert-scale anchored at 1 ("strongly disagree") to 5 ("strongly agree"). For exploratory purposes, participants in the 2022 course were asked to respond to an additional questionnaire on assertiveness and responsiveness.

Personality traits. *Extraversion*, *honesty-humility*, *agreeableness*, and *openness to experience* were measured using the HEXACO-60 personality inventory developed by Ashton and Lee (2009). Students were asked to complete the personality measures prior to the beginning of the course. For each personality trait, 10 items were measured. Sample items include "I rarely express my opinions in group meetings" (extraversion; reverse-coded), "I want people to know that I am an important person of high status" (honesty-humility; reverse-coded), "When people tell me that I am wrong, my first reaction is to argue with them" (agreeableness; reverse-coded), and "I like people who have unconventional views" (openness to experience).[8]

Distance* (*Alignment) between personality traits. Because our predictions involve evaluating the alignment of multiple attributes both within an individual participant (i.e. is this participant high or low on both *a* and *b*?), as well as between conversation partners (i.e. are both partners high or low on the same attributes?), I analyzed the alignment of those attributes using the attribute alignment approach demonstrated by Emich and colleagues (2022). To measure the alignment of each pair of personality attributes across each dyad, I constructed matrices representing each partner and their attributes, and calculate the 2-norm (Euclidean distance) between the vectors for each analysis, examining the alignment of extraversion and honesty-

[8] The scale reliabilities (α) for these personality traits (at the individual level), in the order of 2019, 2020, and 2022 datasets, were as follows: .81, .77, .82 for extraversion; .66, .69, .76 for honesty-humility; .73, .71, .74 for agreeableness; and .73, .71, .73 for openness to experience.

humility, extraversion and agreeableness, and agreeableness and honesty-humility. Smaller distance is indicative of greater alignment between the two attributes.

Transactivity. Transactivity was evaluated for each message posted using the natural language processing algorithm described in Chapter 1. The total transactivity score used in analyses was based on the sum of the scores for the idea extension and challenging views dimensions.[9] Due to the skewed distribution of scores on the "challenging views" dimensions, I followed current recommendations in the literature (Flora 2020; Trizano-Hermosilla & Alvarado, 2016) and calculated coefficient omega to estimate the reliability of this measure. Omega for transactivity was .80 in the 2019 dataset, .78 in the 2020 dataset, and .79 in the 2022 dataset.

Controls. I used four different types of control variables in analyzing the degree to which different combinations of personality traits were associated with transactivity scores in dyad discussions. First, *turn order* of the focal interaction was controlled by counting from the first response to the post. Second, the *word count* of each interaction was controlled for in our analyses as longer messages can increase the likelihood that transactivity will be detected. Third, the number of *total exchanges* across discussion topics was controlled to account for familiarity between two partners. For the 2022 dataset, given that participants did not have choice in selecting their partner, the total interactions variable was divided into two components, including *total pairings assigned* (i.e., the number of times two people were assigned to interact as a dyad) and *total voluntary exchanges* (i.e., the number of times they interacted beyond the required interactions). Last, dummy variables were used to control for each *discussion topic* in the 2019 and 2022 datasets as some topics demonstrated stronger main effects on transactivity than others.

[9] Given the low variability observed in active listening across datasets (e.g., 97.8% of the observations in the 2019 dataset were coded as "1" as exhibiting active listening) we found that excluding it improved the internal consistency reliability; omega was .64 in the 2019 dataset, .56 in the 2020 dataset, and .54 in the 2022 dataset when all 3 dimensions were included, compared to .80. .78, and .79 when using just two dimensions.

Results

Tables 2, 3, and 4 report the summary statistics and correlations among the study variables in 2019, 2020, and 2022 datasets, respectively.

Test of Hypotheses

To test the hypotheses, linear mixed-effects modeling was conducted to account for the non-independence of multiple interactions within a dyad. To address the idiosyncratic dyadic factor, I included a random effect for dyads in the model, allowing for the variability in the intercept of each dyad (i.e., a random intercept model). Intraclass correlation or the variance in transactivity attributed to the dyad-level factors was .18, .17, and .04, respectively for the 2019, 2020, and 2022 datasets[10]. The results are presented in Tables 5, 6, and 7, corresponding to the 2019, 2020, and 2022 datasets, respectively. To test hypotheses 1-3, I began by examining the standard interaction effects based on the dyadic mean level of each personality trait. I followed that with additional analysis using the attribute alignment approach to investigate the effects of the distance between the vector norms of personality traits. To test Hypothesis 4, I used the dyadic mean openness to experience to assess the relationship between dyadic openness and transactivity.

First, Hypothesis 1 predicted that high or low levels of strength and similarity in extraversion and honesty-humility would be positively associated with transactivity. As shown in

[10] Although the intraclass correlation was low for the 2022 dataset, it's important to consider the hierarchical structure of the observations and the potential for underestimating standard errors by not accounting for this structure. Therefore, scholars recommend using multilevel analysis (Bliese, 1998; Nezleck, 2008). Additionally, there were many singletons or one observation within a dyad, where 84.2% were singletons for the 2022 dataset. However, previous research suggests that the biases due to singletons and low intraclass correlation can be mitigated by increasing the number of dyads (Austin & Leckie, 2018; Bell et al., 2008; Du & Wang, 2016; Maas & Hox, 2005). For example, Du and Wang (2016) found that their simulation required a minimum of 100 dyads when the intraclass correlation was as low as .10 and the proportion of singletons was as high as 50%. Similarly, Bell et al. (2008) found that even when 70% of clusters were made up of singletons, the impact on Type 1 error and biases was negligible as long as the number of clusters was large (n = 500). Given that there were 1,425 dyads in the 2022 dataset, I proceeded with using multilevel analysis.

Table 6, the interaction between mean dyadic levels of extraversion and honesty-humility are significantly related to transactivity in the 2020 dataset ($\beta = .23$, $p < .001$; Model 2 in Table 6). The interaction between dyadic extraversion and honesty-humility in the 2019 dataset was marginally significant in the initial model (Model 2, Table 5), and reached standard significance thresholds when including all variables (Model 4, Table 5). Using Preacher, Curran, and Bauer's (2006) computation tools, the interaction is depicted in Figure 3a. Simple slopes test revealed that dyadic extraversion was positively associated with transactivity when dyadic honesty-humility was high (mean +1SD) ($b = .24$, $SE = .08$, $p < .01$), while dyadic extraversion was negatively associated with transactivity when dyadic honesty-humility was low (mean –1SD) ($b = –.22$, $SE = .09$, $p < .05$).

Furthermore, when using the vector norm distance to examine alignment in more detail, both within and between partners concerning extraversion and honesty-humility, the results indicated a negative association with transactivity ($\beta = –.18$, $p < .01$; Model 3 in Table 6, 2020 dataset). This finding suggests that the more these two traits are aligned within and between two partners (e.g., both partners being high in extraversion and honesty-humility), the more transactive their interactions become. Last, when incorporating all variables into the model, the mean interaction was found to be significant ($\beta = .18$, $p < .05$; Model 4 in Table 6, 2020 dataset).

Second, Hypothesis 2 proposed that a mismatch in honesty-humility and agreeableness would be associated with higher transactivity. The interaction between dyadic mean agreeableness and mean honesty-humility was found to be significant in the 2020 dataset ($\beta = –.13$, $p < .05$; Model 2 in Table 6) and also in the 2019 dataset when including all variables ($\beta = –.06$, $p < .05$; Model 4 in Table 5). Employing the same method as used for testing Hypothesis 1 (Preacher et al., 2006), the interactions are depicted in Figures 3b and 2b, based on 2020 and

2019 datasets, respectively. Simple slope tests showed that, for the 2020 dataset, the negative relationship between dyadic agreeableness and transactivity was significant when dyadic honesty-humility was high (mean –1SD) (b = –.28, SE = .09, p < .01), but the slope for low dyadic honesty-humility (mean –1SD) did not differ from zero (b = –.01, SE = .08, *ns*). Regarding the 2019 dataset, the simple slopes test revealed that dyadic agreeableness was more negatively associated with transactivity when dyadic honesty-humility was high (mean +1SD) (b = –.19, SE = .04, p < .001) than when it was low (mean –1SD) (b = –.08, SE = .04, p = .08).

Moreover, the vector norm distance between agreeableness and honesty-humility was found to be positively significant in the 2020 dataset (β = .12, p < .05; Model 3 in Table 6), which implies that the more unaligned these two traits are within and between partners in a dyad, the more transactive exchanges they engage in. Comparing this finding to the interaction result (Figure 3b), it is evident that the effect of unalignment is mostly driven by the composition of partners who are low in agreeableness and high in honesty-humility, while the high agreeableness and low honesty-humility composition does not exhibit much difference from other compositions. In contrast, when including all variables into the model, the 2022 dataset showed an opposing result regarding the vector norm distance. The alignment of agreeableness and honesty-humility increased transactivity (β = –.13, p < .01; Model 4 in Table 7). As elaborated in the discussion section, it is conjectured that this finding may primarily result from participants not having the option to choose their interaction partners, which may have led them to engage in more emotionally stimulating interactions.

Third, Hypothesis 3 postulated that matching extraversion and agreeableness would be beneficial for transactivity, theorizing that high extraversion can complement the low assertive tendencies of high agreeableness, while high agreeableness can complement the low reflective

tendencies of high extraversion. The same logic applies to the low extraversion and low agreeableness combination. Specifically, the interaction between dyadic extraversion and agreeableness was found to be significant in the 2019 dataset ($\beta = .05$, $p < .05$; Model 2 in Table 5). The interaction is depicted in Figure 2a, and the simple slopes test showed that dyadic agreeableness was more negatively associated with transactivity when dyadic extraversion was low (mean –1SD) ($b = –.17$, $SE = .03$, $p < .001$) than when dyadic extraversion was high (mean +1SD) ($b = –.07$, $SE = .04$, $p = .07$) (Preacher et al., 2006). Although the vector norm distance was not found to be significant, its direction (negative), when compared with the interaction results, suggests that the composition of high agreeableness and high extraversion may not be significantly more transactive than low agreeableness and high extraversion composition. It can be inferred that a matching combination of low agreeableness and low extraversion is optimal for a dyad's transactivity. Since complementarity did not occur for all optimal combinations, Hypothesis 3 receives a partial support.

Last, Hypothesis 4 posited that conversations partners with high levels of openness to experience would likely engage in more transactive interactions. This prediction is supported by the 2022 dataset, as demonstrated across all models in Table 7 (e.g., $\beta = .09$, $p < .05$; Model 2).

Additional analysis

For exploratory purposes, in the 2022 dataset, I collected measures of assertiveness and responsiveness (Thomas, Richmond, & McCroskey, 1994) to directly examine the patterns associated with these tendencies in relation to transactivity. Assertiveness and responsiveness was measured using the 20-item scale from Thomas et al. (1994), which presents twenty personality characteristics and asks participants to rate the extent to which they agree that these characteristics apply to themselves (1 = strongly disagree, 5 = strongly agree). Sample

characteristics for assertiveness include “defends own beliefs” and “willing to take a stand” (α = .81), and sample characteristics for responsiveness feature “responsive to others” and “sensitive to the needs of others” (α = .86).

Table 8 reports the descriptive statistics and intercorrelations, updating Table 4 to include assertiveness and responsiveness. The results of linear mixed-effects models are presented in Table 9. As shown in Model 2, the interaction of dyadic mean levels of assertiveness and responsiveness is significant ($\beta = .06$, $p < .05$). The interaction is depicted in Figure 4, and the simple slopes test reveals that the relationship between dyadic responsiveness and transactivity is more negative when assertiveness is also low (mean –1SD) ($b = –.12$, $SE = .04$, $p < .01$) than when assertiveness is high (mean +1SD) ($b = –.01$, $SE = .04$, $p = ns$) (Preacher et al., 2006). The results indicate that the composition of low dyadic assertiveness and dyadic responsiveness is most transactive. One possible explanation for this finding might be related to the context in which participants were not given the option to choose their conversation partners. This constraint may increase the importance of cognitive motivation over affective or relational motivations to collaborate, making it more likely for dyads who are analytical and task-focused to possess the necessary resources and motivation to engage in discussion. Indeed, individuals who are low in both assertiveness and responsiveness are often described as analytical and intellectually curious, focusing on “why” questions (e.g., Alessandra & Hunsaker, 1993; Merrill & Reid, 1999). In such a setting, their intellectual motives could outweigh relational cues when participants were required to interact with three other people for a discussion topic. Further research is needed to explore these dynamics and understand the underlying mechanisms for these observed patterns.

General Discussion

Piaget's theory of learning has been influential in shaping the way we think about how individuals learn and adapt to new and different situational factors they encounter or interact with (De Lisi & Golbeck, 1999; Piaget, 1971). The theory emphasizes the importance of self-regulation, involving the process of equilibration that requires learners to be capable of and willing to switch between and find a balance between assimilation and accommodation strategies in relation to disequilibrating elements of the environment. This balanced state is crucial for successful adaptation or equilibrium to occur. Researchers in learning sciences have applied the process of equilibration to collaborative learning between peers, introducing transactivity as a construct that encapsulates the effective equilibration process. The current study builds on this by suggesting that personality traits are particularly relevant for transactivity, as they play a significant role in how individuals set goals and regulate themselves (Barrick et al., 2013; Mount et al., 2005).

Some prior research on collaborative learning has examined participants' attributes, primarily focusing on their argumentation skills, in determining the effectiveness of their learning experiences. Although not all studies explicitly measured transactivity as a process, the concept is often implied when assessing the impact of participant attributes on learning outcomes. Notably, research has found that partners with different levels of initial cognition or competence in a particular concept are more likely to benefit from collaboration (e.g., Schwarz, Beuman, & Biezuner, 2000). Other studies have investigated openness to argue (e.g., Jeong, 2007), willingness to argue (e.g., Nussbaum, Sinatra, & Poliquin, 2008), and other characteristics (see review by Noroozi et al., 2012). Researchers have pointed out that there is a need for more investigation into the role of dyadic composition in enhancing collaboration and learning, as there has been limited research in this area (Asterhan, Schwarz, & Cohen-Eliyahu, 2014).

This paper extends this line of research by renewing focus on self-regulation of assimilation and accommodation strategies and the influence of multiple personality traits. Importantly, by investigating the effects of various compositions of personality traits in a dyad, this study sheds light on the interplay between personality traits, offering practical insights into optimal dyad compositions for promoting effective collaboration and learning. This study theorizes that it is essential to consider not only the focal person's characteristics but also the environment or context, including the person they interact with. For example, even if an individual is high in agreeableness and high in honesty-humility (i.e., having a stable balance between assertive and responsive tendencies), their level of contribution to the discussion depends on who their partner is. Transactive exchange would be most active when they are paired with a partner who has a similarly mismatched combination of agreeableness and honesty-humility.

The findings show that dyads with matching high or low levels of extraversion and honesty-humility engaged in more transactive exchanges, which was supported when using both traditional (i.e., interacting mean levels) and the attribute alignment approach (Hypothesis 1). For agreeableness and honest-humility combinations (Hypothesis 2) and agreeableness and extraversion combinations (Hypothesis 3), partial support was found when comparing the results of mean interactions and vector norm distance. The mismatch of agreeableness and honest-humility and its effects on transactivity was mainly driven by a composition of partners who are low in agreeableness but high in honesty-humility, while the mismatch in a form of high agreeableness coupled with low honesty-humility was not significantly more transactive than a matching low agreeableness and low honesty-humility composition.

Regarding the composition of agreeableness and extraversion, the vector norm distance between these two traits was not significant. One possible explanation for this is that the

unalignment of agreeableness and extraversion might be as transactive as the aligned composition within and between partners. While I hypothesized, based on the framework of assertiveness and responsiveness, that alignment of agreeableness and extraversion would be better for transactivity, the interpersonal theory (Barford, Zhao, & Smillie, 2015; Kiesler, 1983) suggests that unaligned dyads may also be compatible. For example, a highly agreeable (but not extraverted) partner may extend the ideas of a highly extraverted (but not agreeable) partner, while the extraverted person provides critical perspectives (e.g., Grant et al., 2011). Similarly, highly agreeable individuals, being socially accommodating by nature (Graziano & Tobin, 2013), may adjust their communication styles to match that of their more assertive and dominant partner (Muir, Joinson, Cotterill, & Dewdney, 2016), enabling them to "act" assertively while maintaining their naturally responsive tendencies. It would be fruitful for future research to examine this effect in detail by grouping dyads accordingly based on personality surveys (cf. Weingart, Brett, Olekalns, & Smith, 2007), using a confederate as a partner, or experimentally manipulating a fictitious partner's personality traits (e.g., Erez et al., 2015).

An interesting mixed finding emerged regarding the vector norm distance between agreeableness and honesty-humility. When including all variables into the model, in the 2022 dataset, it was found that alignment of these two traits, rather than unalignment (as theorized), facilitated more transactive exchanges. Comparing this result against the strong negative effect of dyadic agreeableness on transactivity, it can be inferred that the composition of alignment that is driving this effect is partners who are both low in agreeableness and honesty-humility. However, in the 2019 and 2020 datasets (although not being statistically significant in the 2019 dataset), the pattern of interactions and the direction of vector norm distance with respect to agreeableness and honesty-humility were consistent with the theory developed.

Another notable finding in the 2022 dataset, which was not present in the 2019 and 2020 datasets was the positive effect of dyadic openness to experience on transactivity. One possible explanation for these differences is the fact that participants in the 2022 dataset were not allowed to choose their interaction partners, whereas those in the 2019 and 2020 datasets could. This difference likely influenced participants' attitude and motivation towards the discussion task. In the 2019 and 2020 datasets, it is possible that participants chose to interact with people whose writings piqued their interest, satisfying their intellectual curiosity, and as a result, potentially diminishing the effects of openness to experience between dyads. On the other hand, in the 2022 dataset, the effects of openness to experience likely became more prominent, as open individuals possess an innate drive for discovering intriguing aspects in each other's ideas. Moreover, due to the lack of partner choice, being highly assertive, even at the cost of low responsiveness (i.e., alignment of agreeableness and honesty-humility), may have been a key driver for participants to maintain engagement in discussions with "strangers." That is, without a choice, they were more likely to seek emotionally stimulating interactions. These speculations warrant future research, which could investigate the changes in the level and types of motivation people exhibit when interacting in situations where they can choose their group members versus when they are assigned to a group by managers or others.

In addition to several ideas suggested above for promising avenues of future research, another worthwhile path, considering the practical implication for composing dyads and groups, is to study the effects of task structure, training, and other situational factors that can influence the relationship between personality composition and transactivity. The first recommendation for managers when composing dyads is to recognize that personality traits are complex and multidimensional, and to consider both matching and mismatching of various combinations of

personality traits to enhance the potential for transactivity. However, there may be cases when an individual intrapersonally does not possess much potential for transactivity. For example, if a person is highly agreeable and highly honest-humble at the same time, it would be ideal to avoid pairing this person with someone who is also highly agreeable and highly honest-humble. Alternatively, considering that personality traits can be amplified or suppressed depending on contexts (Barrick & Mount, 1993; Fleeson, 2001), interventions such as assertiveness training or constructive feedback and mentoring sessions (e.g., Korsgaard, Roberson, & Rymph, 1998) may be effective in enhancing transactivity, even for dyads that initially lack some of the desired traits. In addition, it may be possible that personality traits interact with partners' roles and status. While the work on transactivity has been focused on, and takes root in, peer to peer collaboration, it is possible for a dyad at work to be composed of individuals with different status and power. When there is a status differential between two partners, the effects of personality traits could vary depending on their expectations of lower and higher status individuals, as well as the quality of the relationship they have with each other.

Conclusion

Extant research has demonstrated that transactivity serves as an important building block for team cognition. This chapter focused on transactivity as a function of dyadic personality composition, examining how conversation partners may or may not be compatible in ways that enable transactive, knowledge-building conversations. The findings reveal that the personality compositions of a dyad, involving extraversion, honesty-humility, agreeableness, and openness to experience, are important predictors of transactivity. By uncovering the nuanced interplay between personality traits, this work contributes to a deeper understanding of effective strategies

for enhancing collaboration and provides insights for managers and educators in forming optimal dyads for improved learning outcomes and performance.

Chapter 3. Investigating Complementarity in Contextual Factors in Developing Transactivity

In the previous chapter, I focused on how individuals in a dyad can engage in transactive interactions by examining their personality composition—how different personality traits complement each other in terms of assertive and responsive tendencies in facilitating transactive exchanges. In the current chapter, I explore situational factors that influence the emergence of transactivity. Transactivity develops when conversation partners challenge one another and constructively build on each other's ideas and reasoning (Fischer et al., 2002; Weinberger et al., 2005); however, little is known about how the structure of a problem and the situation lead problem-solvers to be more transactive. Contiguously, transactive goal dynamics theory (Fitzsimons, Finkel, & Vandellen, 2015; Fitzsimons, Sackett, & Finkel, 2016; Fitzsimons & Finkel, 2018) has extensively examined the situational features that lead individuals to adopt a shared goal system, and in a third, adjacent literature, research in negotiations has examined how the structure of a problem influences the strategies—or the ways that problem-solvers should interact to find the best solution—that lead to the best outcomes. Therefore, in the research presented in this chapter, I join these three research streams to develop and test a framework addressing the features of the problem and context that influence the emergence of transactivity, and its effects on the quality of conversational outcomes.

I explore the contextual factors in developing transactivity within the context of negotiation tasks. Negotiation is an everyday activity in which people with different interests engage in discussions to reach agreements (Pruitt, 1981). Research consistently shows that mutually beneficial negotiation outcomes arise when negotiation partners recognize the integrative potential within the problem space (De Dreu, Koole, & Steinel, 2000; Prietula &

Weingart, 1994) and engage in integrative behaviors that consider both parties' interests simultaneously (De Dreu, Weingart, & Kwon, 2000; Walton & McKersie, 1965). Active discussions, sometimes in the form of heated debates and information sharing, enable negotiation parties to detect the existence of integrative potential (Fairfield & Allred, 2007; Harink & De Dreu, 2004). Indeed, as negotiation requires significant cognitive and emotional effort (De Dreu & Van Kleef, 2004), it is crucial that the parties commit to the relationship and negotiation, willingly cooperating to integrate differences and reap joint gains from the interactions (De Dreu, Nijstad, & Van Knippenberg, 2008; Nijstad & De Dreu, 2012). Thus, the key is to balance critical and constructive engagement, and this is where transactivity can help better conceptualize the recent propositions in negotiation research. Negotiation research has begun to illuminate the positive role of critical engagement and debate in clarifying differences between parties, while emphasizing the importance of prosocial motivation and cooperativeness for integrating these differences for mutual gains (Cronin & Weingart, 2019; Curhan, Labuzova, & Mehta, 2021; De Dreu, 2007). For instance, Curhan et al. (2021) point out how criticism has gained a negative reputation in the negotiation literature, where it is often deemed ineffective for generating creative solutions for dispute resolution (e.g., Mnookin, Peppett, & Tulemello, 2000). However, they argue that criticism can be essential for sharing new, unrevealed information and enabling parties to engage in divergent thinking, as long as it occurs within cooperative contexts.

Based on this understanding, in this chapter, I focus on how (a) features of the *problem context*— specifically task demonstrability—and (b) features of the *interpersonal context*, specifically power balance, together influence the emergence of transactivity, and its effects on the results of the interaction. I argue that specific combinations of problem and interpersonal contexts affect partners' ability to develop transactivity in the course of finding a solution.

I manipulate the structure of the negotiation problem by varying the arrangements of negotiation issues to create less demonstrable problem space (via increasing the ratio of integrative issues) or more demonstrable problem space (via decreasing the ratio of integrative issues), where the former makes it more difficult for partners to recognize each other's goals (Laughlin & Ellis, 1986; Steinel, Abele, & De Dreu, 2007). Regarding interpersonal context, I manipulate power balance, by varying arrangements of the best alternative to a negotiated outcome (BATNA; Fischer & Ury, 1981) between parties, which can influence the extent to which parties feel more or less dependent on each other's resources and contributions (Kim, Pinkley, & Fragale, 2005; Pinkley, Neale, & Bennett, 1994; Pinkley, 1995; Wong & Howard, 2017). These two contextual features are expected to complement each other in shaping partners' perceptions of opportunities for cooperative or positive outcome interdependence (Tjosvold, 1998), and influence the level of transactivity that develops as well as its effect on resulting outcomes. In the following sections, I outline a theoretical framework based on the transactive goal dynamics (TGD) theory (Fitzsimons et al., 2015) and propose specific hypotheses within the negotiation context.

Theory Development

Transactive Goal Dynamics and Transactivity

Partners who engage in transactive exchanges do so by building on each other's reasoning, to better understand their partner’s ideas, and to co-construct a new understanding of tasks and problems (Berkowitz & Gibbs, 1983; Teasley, 1997). In order to achieve a high level of transactivity, I theorize that the two partners need to function as a single self-regulating unit or a "transactive goal system," according to the TGD theory (Fitzsimons et al., 2015).

According to TGD theory, individuals do not pursue goals in isolation but instead do so via their interdependent ties with others. The degree to which partners perceive the opportunity and are motivated to act interdependently to achieve their goals will influence "transactive density" or the number and strength of the links among their goals, pursuits, and outcomes (Fitzsimons et al., 2015). Furthermore, if partners' perceive that their goals are compatible and that joining efforts will enable them to achieve all of their goals—which TGD theory refers to as "goal coordination"—then they are more likely to contribute effort to working together to achieve transactive gains (Fitzsimons et al., 2015).

Linking TGD theory to extant research on transactivity, I argue that the level of transactivity partners develop is an important mechanism for translating the features of the problem and interpersonal context into outcomes. Transactivity encapsulates the process in which partners exert effort to learn more about each other's goals and help each other pursue their goals by actively seeking (e.g., raising questions to get a more accurate understanding of each other's needs), sharing (e.g., contributing additional, critical perspectives), and synthesizing (e.g., integrating diverse ideas and thoughts to come up with creative solutions) information. In doing so, transactivity enhances the effectiveness of the collaboration.

TGD theory suggests that partners will perceive that their goals are more compatible when they both desire the same outcome, agree on the relative value of goals within the system of goals, and share similar strategies for pursuing goals. Discerning and developing a shared understanding of all of these features of a situation results in what is referred to as a "shared goal representation" within TGD theory. Achieving a shared goal representation can be challenging, particularly when there are more complex forms of goal interdependence involved such that achieving one goal depends on aligning on one or more other goals or subgoals. Achieving goal

coordination under such conditions will require that partners are highly relationally-motivated and willing to engage with one another (referred to as "relationship orientation" within TGD theory), which I theorize leads to higher levels of transactivity in their collaboration. In short, TGD theory identifies the two factors influencing goal coordination as shared goal representation and relationship orientation.

I extend TGD theory and theorize that these two factors complement one another not only in influencing the transactivity of the partners' collaboration, in the process of building effective mechanisms for goal coordination. Specifically, I theorize that features of the interpersonal context that encourage higher levels of relational orientation, such as power balance, will help partners develop a shared goal representation, especially when the problem context makes this complex, such as when there is complex goal interdependence (i.e., low task demonstrability). In other words, I theorize that partners with more complex goal interdependencies will develop higher levels of transactivity if they are also higher in relational orientation (such as by having equal power). I posit that this will occur as the more complex goal interdependencies require deeper inquiry between partners as the potential compatibilities among goals are less readily demonstrable; uncovering where preferences are aligned can only occur in a context where partners are on equal enough footing (or common ground) to express their preferences and elicit input. Conversely, when a shared goal representation is easier to develop in a more demonstrable problem context, relational orientation will be less essential to developing transactive exchange, as partners do not need to challenge each other's reasoning to develop greater understanding of goal compatibilities.

Goal Dynamics and Transactivity in Negotiation

The aforementioned framework, which links the tenets of the TGD theory to transactivity, is applicable to a variable-sum (as opposed to zero-sum) negotiation task where integrative potential can exist. That is, a variable-sum task allows for win-win, transactive gains (Fitzsimons et al., 2015) from interactions. In such negotiations, partners can engage in behaviors reflecting both self-concern and concern for others while searching for mutually beneficial outcomes (i.e., integrative strategy; De Dreu et al., 2000). In variable-sum negotiations, the total value available to the parties can be expanded or contracted depending on the specific issues being negotiated. There are three types of issues that can arise in this context: integrative, compatible, and distributive issues. Integrative issues are those where the parties have different preferences, but there is potential to create value through trading off or logrolling issues that are of lesser importance to each other. Compatible issues are those where the parties have the same preferences. Distributive issues are those where there is a fixed amount of resources or value to be divided between the parties. Integrative potential is conceptually based on integrative and compatible issues, but in practice, some negotiation partners may assume that integrative potential exists even when the task only involves distributive issues by design (e.g., Mumpower, Sheffield, Darling, & Milter, 2004).

I suggest that transactivity is relevant and important in the context of negotiation as the emergence of transactivity entails negotiators developing a clearer understanding of how their goals and interests are interrelated by thoroughly exploring the problem space, which may lead to the achievement of integrative potential (or transactive gains). Negotiation scholars studied negotiators' behavioral strategies that are conducive or detrimental for achieving integrative potential: integrative and distributive strategies (De Dreu et al., 2000; Weingart et al., 2007).

While integrative strategy is focused on improving one's understanding of the counterpart's goals (and using that to create joint value), distributive strategy serves value-claiming functions, such as arguing to support one's position or pressuring a partner to change their stance (De Dreu et al., 2000). However, as described in Chapter 1, I argue that some behavioral indicators of distributive strategies (e.g., argumentation) may manifest in ways that reflect concern for both self and others. That is, argumentation, when done in a collaborative manner (i.e., transactivity), can also promote value creation in negotiations. Specifically, partners substantiating their position or engaging in argumentation may positively impact the development of goal coordination mechanisms if they base their argument on sound, persuasive reasoning that acknowledges and respects differences (Sinnott-Armstrong, 2018), while helping their counterpart better understand their goals, and thus refining the goal system (Fitzsimons et al., 2015) and potentially fostering more creative thoughts on ways to reduce the problem space. Indeed, competitive outcome interdependence has been associated with more creative generation of ideas (e.g., Munkes & Diehl, 2003), as criticism can help prevent groupthink, conformity, and the overlooking of critical, unshared information in cooperative groups (e.g., Nemeth Personnaz, Personnaz, & Goncalo, 2004).

One of the antecedents to negotiation strategies and behaviors examined in negotiation research is structural, contextual factors (e.g., Beersma & De Dreu, 2002; Hyder et al., 2000; Mumpower, 1991; Mumpower et al., 2004). Structural elements of negotiation involve the arrangement of preferences and values of the negotiation partners (based on the objective information provided to them). For example, scholars have examined the effects of structural power of negotiators derived from their best alternatives, and how the existence and similarity

(dissimilarity) of power between counterparts influence individual negotiators' behaviors and negotiation outcomes (e.g., Wong & Howard, 2017).

In particular, to examine how structural elements of a negotiation task influence the goal representation and interpersonal commitment for negotiators, this study focuses on two contextual factors structured into a negotiation task, including task demonstrability (problem context) and power relations (interpersonal context), and their interactive effects on transactivity.

Problem Context: Task Demonstrability and Goal Representation

Detecting integrative potential in a variable-sum negotiation task is often considered a disjunctive task (e.g., Thompson, 1991), where an optimal, "correct" solution exists that negotiation partners can identify, such as by using log-rolling to exchange issues of low and high value. In other words, the correctness of these negotiations is demonstrable (Laughlin, 1980; Laughlin & Ellis, 1986). However, in practice, due to private information among negotiators, the correct solution may not be fully demonstrable to realize the integrative potential (Hüffmeier, Zerres, Freund, Backhaus, Trötschel, & Hertel, 2019). Specifically, considering that negotiators tend to be more accurate in predicting the relationship between values and payoffs for their counterparts in a problem space with linear functional forms (Mumpower et al., 2004), I expect that increasing the number of compatible and/or distributive issues (or decreasing that of integrative issues) will make the task more demonstrable. Conversely, while keeping the total number of issues constant and maintaining similar integrative potential, increasing the number of integrative issues will make the task less demonstrable, requiring more effort from negotiators to explore the possibility of reconciling their interests in a mutually beneficial way.

According to the TGD theory (Fitzsimons et al., 2015), when the negotiation task is more demonstrable, it suggests that partners are likely to find themselves in an environment where the

development of shared goal representation or comprehension of each other's goals and pursuits becomes more efficient. In other words, it becomes easier for partners to recognize how their goals are interdependent. This is due to the existence of a greater number of compatible issues (where both partners desire the same outcome) and distributive issues (which require a low-effort, split-the-difference strategy for local optimization), collectively offering a more straightforward path towards agreement. Consequently, a task or problem with a highly demonstrable structure is expected to promote more efficient coordination and reduce disagreements over the best course of action. On the other hand, in a less demonstrable task environment, the degree of interdependence among goals is higher, which makes the task more complex (Rivkin, 2000; Simon, 1962). Accordingly, more complex information is required to solve the problem (Bystrom & Jarvelin, 1995), rendering the task less clear and predictable (Withey, Daft, & Cooper, 1983). As integrative issues are highly interdependent and subject to logrolling in pairs, a problem space with more integrative issues would be more challenging to resolve, requiring partners to be more collaborative when navigating uncharted areas of the dialogical problem space.

However, negotiation tasks are only "sufficiently" demonstrable (Hüffmeier et al., 2019), implying that critical information might not be fully disclosed. Depending on other situational factors, some dyads may perceive the level of demonstrability to be higher or lower than what is structurally embedded in the problem. Some dyads may excel in a less demonstrable, complex environment, while others may become more competitive. In the latter case, partners may prioritize their individual goals over a potentially viable solution, resulting in transactive losses from the interaction. Therefore, while maintaining similar integrative potential across conditions, assessing the effects of varied task demonstrability necessitates considering an additional layer of

task structure (Mumpower et al., 2004) to better understand when dyads are more likely to engage in transactive exchanges, striving to build a more comprehensive and accurate goal system.

Interpersonal Context: Power Structure and Relational Commitment

Another structural element of negotiations, in light of the TGD theory (Fitzsimons et al., 2015), that is relevant for developing efficient coordination mechanisms and providing insight into how dyads handle the complexity of the problem space, is the role of power relations and dynamics. One way of studying power as structural potential is examining negotiators' options beyond (external to) the negotiation that they can take if they choose to leave the negotiation, which can largely be symmetric (i.e., the value or attractiveness of partners' alternative option is equal) or asymmetric (i.e., the value or attractiveness of partners' alternative option is unequal) between partners. A large body of research has examined how power asymmetry influences negotiators behaviors and outcome (e.g., Coleman, Kugler, Mitchinson, Chung, & Musallam, 2010; Dannals, Zlatev, Halevy, & Neale, 2021; Gino & Moore, 2008; Wong & Howard, 2017).

A consistent pattern of findings from research on asymmetric power (comparing high- vs low-power individuals) is that people with power (e.g., with strong alternative) tend to feel agentic, set higher goals, and behave more assertively (De Dreu, 1995; Galinsky, Gruenfeld, 2003; Magee & Galinsky, 2008). However, considering that power is a relational property (Bacharach & Lawler, 1981), recent studies take a view that how the effects of power for the individual transpire may be dependent on situation and context (e.g., Lammers & Galinsky, 2009; Lammers, Galinsky, Gordijin, & Otten, 2008; Tost, Gino, & Larrick, 2012). Notably, in the domain of advice taking, Tost et al. (2012) found that although high-power individuals are generally competitive, discounting advice from others, when they are induced to feel cooperative

with their advisors, they also behave cooperatively and take in the advice, particularly when the advice is from experts. This hints at the possibility of high-power negotiators behaving more cooperatively even when the potential power is asymmetric. Likewise, some studies show that people with greater access to power tend to be both competing and collaborating in their conflict management styles (e.g., Thomas, Thomas, & Schaubhut, 2008).

When it comes to comparing dyads with symmetric and asymmetric power structures, the findings are mixed. While some studies have found that dyads with equal power are more likely to achieve more efficient joint outcomes as partners become more cooperative (e.g., Lawler & Yoon, 1993), some have found that dyads with unequal power are more likely to achieve better outcomes as the low-power partner feels a greater need to devise creative, integrative solutions (e.g., Pinkley et al., 1994). Given such mixed findings, a few research looked into moderators (e.g., Giebels, De Dreu, & Van de Vliert, 2000; Kim & Fragale, 2005; Wong & Howard, 2017). For example, Wong and Howard (2017) argued that the reason for inconsistent findings lies in whether or not negotiation partners were aware of each other's BATNA, theorizing that the knowledge of BATNA makes the link between potential structural power (i.e., the existence of BATNA) and perceived power stronger (Kim et al., 2005), and found that high-power negotiators tend to take advantage of the situation by focusing on value claiming, distributive behaviors. However, the negotiation task they designed was characterized by low task demonstrability, where four out of a total of six issues were integrative, which makes it limited in scope to draw conclusions that information about each other's power would have detrimental effects on dyads with unequal power.

Similar to task demonstrability, the effects of power structure (equal vs. unequal) are not expected to be simply positive or negative. First, for dyads with equal power structure, (a) they

may be more committed to each other and strive to find a common goal (e.g., De Dreu, 1995; Mannix, 1993; Lawler & Yoon, 1993; 1996), engaging in more non-coercive, integrative behaviors, particularly when they also have prosocial motivation (Giebels et al., 2000) and/or (b) settle quickly on what appears to be mutually acceptable and fair (e.g., Pinkley et al., 1994)[11]. To elaborate on the second point about satisficing, because neither partner is more dependent on each other, in the process of appraising others, they may rely on stereotypes (e.g., assuming that their counterpart has a similar level of concern for particular issues), rather than on individual attributes (De Dreu & Van Kleef, 2004; Neuberg & Fiske, 1987). Moreover, another reason for equal-power dyads to satisfice may be concerned with their fairness perception. That is, in situations where the power differential is low, dyads are more likely to prioritize equality in dividing the resources, a tendency that is similar to that of low-power negotiators, while high-power negotiators tend to be more focused on equity considerations (Kabanoff, 1991; Lois & Riedl, 2022; Wong & Howard, 2017). Thus, partners may think that it is beneficial and fair for both to satisfice on what is readily available.

On the other hand, for dyads with unequal power structure, there is an inherent tension between high- and low-power negotiators. High-power negotiators tend to push for agreements that allocate payoffs proportional to their power advantage, which they perceive as fair, while low-power negotiators view such allocations as unfair unless the power positions are deemed

[11] Furthermore, because they are equally dependent, although not empirically supported (Giebels et al., 2000), they may be more assertive and possibly tempted to take advantage of each other (Kabanoff, 1991; Rubin & Brown, 1975). The degree to which these behaviors occur is likely influenced by the strength of alternatives available to the parties. Such competitive behaviors are more likely to arise when both parties possess equally strong alternatives. When operationalizing equal power, prior research has generally assumed that the strength of the alternative option is weak (e.g., an alternative option that is worth approximately half of what can be obtained through a split-the-difference strategy for all issues). In the current study, to ensure that the combined value of BATNAs remained consistent across conditions, the strength of the alternative option for the equal power condition was set at a moderate level. Further discussion of limitations and suggestions for future research are found in the General Discussion section.

legitimate, resisting giving in to terms that reflect the power differences (Bacharach & Lawler, 1981; Giebels et al., 2000; Lawler & Yoon, 1993; 1996; Lois & Riedl, 2022; Pinkley et al., 1994). In particular, low-power negotiators' efforts to counter high-power counterparts' power plays may drive them to develop a more accurate understanding of their counterpart due to increased outcome dependency, and also attempt to enhance the perceived value of their resources and devise creative, flexible solutions to compensate for power disparities (De Dreu & Van Kleef, 2004; Kim et al., 2005; Pinkley et al., 1994). However, this effort might backfire when dealing with competitive (as opposed to cooperative) high-power negotiators, as low-power negotiators also tend to be sociable (De Dreu & Van Kleef, 2004; Giebels et al., 2000).

These observations suggest that in order for negotiation partners to fully develop their goal systems and improve the goal coordination mechanisms, and thereby be more transactive in the process, equal and unequal power dyads need additional structural enablers that can complement their naturally cooperative and competitive tendencies, respectively, and induce them to perceive more opportunities to gain from exploring the problem space. Specifically, for equal power dyads, if they are situated in a space that allows for establishing goal representations efficiently by design (i.e., high task demonstrability), they are likely to disregard critical but unshared information. That is, they need to feel the need for putting in the effort to stretch their seemingly fixed boundaries of goals and interest. In contrast, for unequal power dyads, they need to recognize common ground to perceive opportunities for realizing integrative potential. That is, they need to feel interdependent for their individual goal pursuits, so partners do not overly emphasize information favoring their own interests. In such a context, low-power negotiators will feel more empowered, and high-power negotiators will be motivated to use their power in a more conciliatory manner.

Interaction of Task Demonstrability and Power Structure

In summary, while maintaining constant information about each other's BATNA across different power conditions (Kim & Fragale, 2005b; Wong & Howard, 2017), I propose that when task demonstrability is low (i.e., the interdependence between goals is more complex), which offers more opportunities for negotiation partners to extensively and broadly explore the problem space, equal power dyads will be more transactive than unequal power dyads. First, this is because the complex and ambiguous problem space mitigates equal power dyads' tendency to satisfice. Second, as task complexity demands greater effort to establish common ground (Bystrom & Jarvelin, 1995; Noroozi et al., 2012), equal power dyads, rather than unequal ones, will be better equipped to navigate the unpredictable problem space, as they are more cooperatively oriented and cohesive. As a result, low demonstrability and equal power structures complement each other in fostering transactivity development.

On the other hand, unequal power dyads tend to concentrate more on their individual interests and goals (e.g., Giebels et al., 2000) and are less likely to be cooperative unless prompted otherwise. Importantly, their tendency to make biased decisions favoring themselves is exacerbated in ambiguous contexts (Thompson & Loewenstein, 1992; Wade-Benzoni, Tenbrunsel, & Bazerman, 1996). As a result, unequal power dyads situated in a low demonstrable task environment may struggle to find common ground and develop shared goal representation. Partners will perceive themselves as mostly competitively interdependent, which makes it challenging for them to integrate their differences in a collaborative way.Thus, I hypothesize:

Hypothesis 1: When task demonstrability is low, dyads with equal power will engage in more transactive exchanges as compared to dyads with unequal power.

In line with this thought, when task demonstrability is high (i.e., the interdependence between goals is less complex), which allows for a more efficient emergence of shared goal representation, unequal power dyads will be more transactive than equal power dyads. This is because there are more compatible issues and fewer opportunities for partners to disagree on efficient problem-solving methods, which can transform the power struggle and tension in unequal dyads into collaborative argumentation. As unequal power dyads tend to concentrate more on individual goals (e.g., Giebels et al., 2000), they are likely to be strongly biased by a fixed-pie mindset (Bazerman & Neale, 1983), making it more challenging for them to spontaneously develop common ground. A less ambiguous task environment, particularly one in which partners share the same goals (i.e., compatible issues), however, could provide this common ground, potentially encouraging partners to perceive cooperative engagement as beneficial for increasing their gains. In such a situation, low-power negotiators may feel more "empowered" to assertively use power-change tactics, perceiving the value of their contribution as clearer (Kim et al., 2005). At the same time, high-power negotiators may invest more effort in understanding their counterparts and interacting more cooperatively, as they realize the problem space may be broader than anticipated. Indeed, some negotiators tend to believe that more integrative potential exists than what is objectively present (e.g., Mumpower et al., 2004), especially when they perceive the value of cooperative effort (e.g., Tost et al., 2012). Consequently, high task demonstrability and unequal power structures complement each other in motivating negotiation partners to expand their search.

On the other hand, partners in equal power dyads are neither more outcome-dependent on each other, making them more likely to rely on heuristics (Neuberg & Fiske, 1987) and assume similarities in the values they ascribe to negotiation issues. High task demonstrability is likely to

confirm these beliefs, reducing their motivation to further explore the problem space, even though the values or importance of some issues may differ between them. Therefore, a high task demonstrability paired with an equal power structure could give negotiators the impression that the goal system is already well developed (efficient), leading them to find it less meaningful to engage in thorough processing of each other's goals and interests, which often entails challenging each other. Therefore, I hypothesize:

Hypothesis 2: When task demonstrability is high, dyads with unequal power will engage in more transactive exchanges as compared to dyads with equal power.

Method

Participants and Design

Participants were recruited through Prolific, an online crowdsourcing platform (https://www.prolific.com). The study took the form of a live online experiment in which participants were paired in dyads for a negotiation task. Upon joining the study, participants were automatically assigned to a dyad. Participants could only partake in the task once. Using Prolific identifiers and IP addresses, I confirmed that there were no duplicate entries in the final sample. A total of 116 dyads participated in the negotiation task, though data from 8 dyads could not be used, whose audio was not fully transcribed for transactivity scoring, because of multiple attempts to join the platform, poor audio quality, muted audio, or participants sharing private information (e.g., payoff sheets). Thus, the final sample comprised 108 dyads. The average age was 38.39 (SD = 11.70) with 36.11% of participants being female, and 57.87% residing in the U.K. (40.27% from the U.S., and 2 from Australia). Participants received $13 upon completion of the study.

Participants were randomly assigned to one of four experimental conditions in a 2 (high vs. low task demonstrability) × 2 (equal vs unequal power structure) design. They were also randomly assigned one of two roles: job recruiter or candidate. The task involved negotiating an employment contract between a job recruiter and a candidate, using the "New Recruit" simulation exercise (Neale, 1997; Pinkley et al., 1994). With a job offer already in place, the purpose of the negotiation was to finalize the terms of eight issues: bonus, job assignment, vacation, start date, moving expense coverage, insurance plan, salary, and location (see Appendix C for sample material). Each issue offered five possible options for agreement. Participants could also choose not to reach an agreement on any issue, resulting in an impasse[12]. For all conditions, the maximum possible joint outcome was 12,800 points, while splitting the difference on all issues would yield 4,800 points.

Procedures

Participants joined the study through Prolific and were redirected to Qualtrics to sign the consent form. Afterward, they were redirected to the negotiation platform, Platform for Online Group Studies (POGS; Engel, Woolley, Jing, Chabris, & Malone, 2014), which had been customized for the negotiation study. Once there, they tested their audio and microphone, as voice communication with their partner was required. Participants had the option to wait for up to seven minutes to be assigned to a dyad. If they were not assigned after seven minutes, due to the number of participants present, they received compensation and were asked to leave the platform. Next, participants viewed a 3-minute instructional video explaining the task and how to navigate the platform. Following the video, they were automatically assigned to different

[12] There were five dyads (2%) that did not agree on at least one issue, and thus reached an impasse. The breakdown across conditions is: 1 dyad from high task complexity and equal power condition, 2 dyads from high task complexity and unequal power condition, 2 dyads from low task complexity and equal power condition.

conditions and roles at random. The platform provided negotiation material according to their assigned condition and role, with an external link available for those who preferred to reference the material in a separate window. The payoff sheet was accessible at every stage of the task. After studying the material for 10 minutes, participants proceeded to answer questions about the material they reviewed. Participants then engaged in a virtual negotiation with their counterpart. They had 30 minutes in total, but were allowed to leave earlier if they completed the negotiation (average time spent was 13.37 minutes, *SD* = 7.53 minutes). In the shared workspace displayed on the screen (see Figure 5 for a screenshot of the negotiation page), partners could synchronously choose the outcome on the final sign-off sheet. Lastly, participants completed a survey about their negotiation experience. They were debriefed about the study on the final page of the survey.

Manipulation of Task Structures

Task demonstrability was manipulated by altering the arrangement of integrative, compatible, and distributive issues (see Table 10 for detailed point sheet). The standard New Recruit exercise (Neale, 1997) consists of four integrative issues, two compatible issues, and two distributive issues. For the low demonstrability condition, the arrangement was adjusted to include six integrative issues, one compatible issue, and one distributive issue. In contrast, the high demonstrability condition featured two integrative issues, three compatible issues, and three distributive issues. To maintain similarity between the conditions in terms of total gains and losses, several measures were taken when adjusting the issues and points. First, for both conditions, integrative issues offered the highest possible positive points to be gained, while salary (a distributive issue) had the lowest possible negative points to be lost. Second, the maximum possible joint outcome was kept consistent at 12,800 points, and the points that

partners could obtain through a low-effort, split-the-difference strategy for all issues remained consistent at 4,800 points. Third, for integrative issues, the difference in value between potential pairs of issues for logrolling was held consistent at 2,400 points for both conditions, as in the standard exercise point system[13]. For example, in the high task demonstrability condition, bonus was worth 1,600 points (maximum possible gain) for the recruiter (4,000 points for the candidate), while another integrative issue, vacation time was worth 4,000 points for the recruiter (1,600 points for the candidate).

Power structure was manipulated by adding a message at the end of the point sheet as "important new information."[14] For both equal and unequal conditions, the information about the counterpart's BATNA was provided. This approach was taken for two reasons: first, it is more realistic in certain industries as advancements in technology and increased availability of information make it easier for negotiators to research their counterpart's BATNA (Wong & Howard, 2017); second, and more importantly, by knowing both their own and their counterpart's BATNAs, potential effects of uncertainty regarding power valuations (e.g., valuing one's BATNA very high or low) can be controlled (Kim & Fragale, 2005). Specifically, for the equal power condition, both recruiter and candidate read a message stating that they have an alternative party (with all things equal) willing to settle for an agreement worth 4,000 points, and that their counterpart also has an alternative party with whom the agreement is worth 4,000

[13] Additionally, I conducted an analysis to determine whether the proportion of agreements that were Pareto efficient out of a total of 390,750 possible agreements was similar between the two conditions (Kern et al., 2020; Tripp & Sondak, 1992). The results showed that the number of Pareto efficient agreements was similar for both the low task demonstrability condition (123 agreements) and the high task demonstrability condition (133 agreements). Furthermore, the means and standard deviations of the distributions of possible agreements in the two conditions were also similar, with means of 500 (SD = 357.38) and 499.98 (SD = 351.79) for the high and low task demonstrability conditions, respectively.

[14] Although the standard exercise material (Neale, 1997) uses the heading "urgent message," since the message was not distributed separately to make it seem urgent and there was a concern that participants might not notice it, the section containing the power manipulation message was labeled as "important new information" in the present study (see Appendix C for an example).

points to them. Consistent with prior research, point values were described qualitatively (e.g., Kray Reb, Galinsky, & Thompson, 2004). This point value for equal power condition was described as “somewhat favorable” to indicate a moderate BATNA level. On the other hand, for the unequal power condition, recruiters were assigned the high-power role for simplicity, as prior research found no difference between roles (e.g., Pinkley, 1995). The recruiter had another equally qualified candidate who was willing to accept a final offer worth 5,600 points (described as "quite favorable"), while the candidate had an alternative final offer from an equally prestigious company worth 2,400 points to the candidate (described as “not favorable”). Across two conditions, the combined value of BATNAs was kept consistent at 8,000 points.

Measures

Transactivity. After the audio data were transcribed and each speaking turn labeled by roles, the transcriptions were scored for each dyad using the algorithm (trained on negotiation data) described in Chapter 1. The unit of analysis was an uninterrupted speech turn made by a participant. To measure dyadic transactivity, the algorithm-produced scores (1 = transactive, 0 = non-transactive) were summed and divided by the total number of speech turns to make them comparable across dyads.

Control: Communication amount. The total length of time (in seconds) that each participant in a dyad spoke during the entire negotiation was controlled, as speaking time can indicate the level of engagement and the amount of information shared.[15]. Communication amount for each role was measured, considering that recruiter and candidate had different power levels in unequal power structure conditions.

[15] Controlling for the total number of words used instead did not change the results. Measuring communication amount in terms of actual speech time is more comprehensive, as it also accounts for nonverbal communication style, such as pace of speech.

In addition, the following were used for exploratory analysis regarding the effects of transactivity on negotiation experience and outcome.

Problem-solving strategy. As transactivity is conceptualized to involve conversation partners striving to co-construct new understanding of problems that they are facing collaboratively, I examined the association between transactivity and problem-solving strategy. Problem-solving strategy refers to an individual's way of managing conflict that incorporates both one's own and other's goals as much as possible (De Dreu, Evers, Beersma, Kluwer, & Nauta, 2001). Using a 4-item scale from De Dreu et al. (2001), participants rated the extent to which they engaged in problem-solving behaviors during the negotiation (1 = not at all, 5 = very much). Sample items include "I examined issues until I found a solution that really satisfies me and the other party" and "I examined ideas from both sides to find a mutually optimal solution." (α =.79). A strong agreement, indicated by $r_{wg(j)}$ values of .76 (mean) and .90 (median), justified using a dyadic mean (Bliese, 2000; LeBrenton & Senter, 2008).

Negotiation performance. Three objective performance measures and one subjective performance measure were used. For the objective ones, *joint sum* (i.e., sum of individual points earned), *Pareto efficiency* (Tripp & Sondak, 1992), and *integrative quotient* (Lax & Sebenius, 1987) were calculated. Specifically, Pareto efficiency is computed as 1 – S / (S + I) for a given agreement, where S indicates the number of agreements that would be better for both partners, and I is the agreements that would be worse. Integrative quotient is computed as 1 – S/P, where S is the number of agreements that are more favorable for both partners for a given agreement, and P represents the total number of possible agreements under the Pareto frontier. Additionally, for the subjective measure of performance, a shortened, 9-item measure of *subjective value outcome* from Becker and Curhan (2018) was used to assess the extent to which participants found the

negotiation with their partner to have been beneficial, fair, and satisfactory (1 = not at all, 5 = a great deal). Sample items include "How satisfied are you with your own outcome—i.e., the extent to which the terms of your agreement (or lack of agreement) benefit you?" and "How satisfied are you with the ease (or difficulty) of reaching an agreement?" The value of $r_{wg(j)}$ (mean = .79, median = .92) supported using a dyadic mean of subjective value (Bliese, 2000; LeBrenton & Senter, 2008).

Results

Descriptive statistics and correlations of the study variables are reported in Table 11.

Manipulation Check[16]

Participants rated the extent to which they agreed with their alternative option being strong and attractive (1 = strongly disagree, 5 = strongly agree; Kray et al., 2004). Within the unequal power condition, recruiters (high-power negotiators) viewed their alternative option as stronger and more attractive (M = 3.96, SD = .81) than did low-power candidates (M = 2.37, SD = 1.27), $t(86) = 7.67$, $p < .001$. On the other hand, in the equal power condition, recruiters (M = 3.51, SD = .92) did not regard their alternative option to be stronger and more attractive than low-power candidates (M = 3.53, SD = 1.03), $t(108) = -.10$, $p > .10$. Furthermore, when comparing the absolute difference between recruiters and candidates in how much they found their alternative option to be strong and attractive across equal and unequal power conditions, the absolute difference was larger in the unequal power condition (M = 1.91, SD = 1.14) than in equal power condition (M = 1.15, SD = .95), $t(107) = 3.80$, $p < .001$.

[16] Consistent with previous research that altered the number and/or types of issues (e.g., Murnighan et al., 1999; Naquin, 2003), a manipulation check for task demonstrability was not conducted in this study because participants were not informed which issues were integrative, compatible, or distributive, as doing so would undermine the purpose of negotiation, which is to discover each other's goals and interests through interactions.

Test of Hypotheses

For hypothesis testing, I conducted a series of ordinary least square regression analyses. Hypothesis 1 predicted that dyads with equal power would exhibit more transactive interactions than those with unequal power when faced with a low demonstrable task. Conversely, Hypothesis 2 predicted that dyads with unequal power would have more transactive interactions than those with equal power when the task demonstrability is high. As shown in Table 12, the interaction effect of equal power and task demonstrability conditions was significant on transactivity ($b = .02$, $SE = .01$, $p < .05$). To facilitate the interpretation of the results, I conducted a simple slopes analysis (Aiken & West, 1991). The simple slopes are plotted in Figure 6. Specifically, the slope for low task demonstrability (coded as 1) was not significantly different from zero ($b = .00$, $t = .07$, $p > .10$), but the slope for high task demonstrability (coded as –1) was significantly different from zero ($b = –.04$, $t = –2.89$, $p < .01$), thus providing support for Hypothesis 2 only. That is, when the goal interdependence is more complex, dyads with unequal power are found to be more transactive with each other than those with equal power.

Additional Analyses

For additional analyses, I investigated whether transactivity is associated with problem solving strategies, or individuals' way of managing conflict in a manner that considers the interests of all parties involved (De Dreu et al., 2001), as transactivity involves collaborative argumentation that is also founded on both concern for self and concern for others. Moreover, I examined whether transactivity has positive effects on reducing (optimizing) the problem space so that negotiation partners are better able to find solutions that are mutually beneficial solutions (in terms of joint sum, Pareto efficiency, integrative quotient, and subject value; see measures above), both directly and indirectly through problem solving.

To test these relationships, I conducted structural equation modeling (SEM) using Mplus 8.3 (Muthén & Muthén, 2017). The model demonstrated a good fit with the data ($\chi 2(18) = 24.42$, $p = .14$; CFI = .98; TLI = .95; RMSEA = .06; SRMR = .05). The detailed results of the paths are shown in Figure 7. First, the results indicate that transactivity is positively associated with problem solving strategy ($b = .22$, $SE = .10$, $p < .05$). Problem solving strategy was found to be positively related to subjective value outcome ($b = .48$, $SE = .09$, $p < .001$). To test moderated mediation, the bootstrapping procedure of Preacher and Hayes (2008) was used (with 10,000 resamples) to construct bias-corrected confidence intervals (MacKinnon, Lockwood, & Williams, 2004). The conditional indirect effect of power structure condition on subjective value outcome via transactivity and problem solving strategy, given high task demonstrability, was found to be negatively significant (effect = –.04, 95% CI = [–.130, –.004]). The moderated mediation index was also significant (index = .02, 95% CI = [.001, .074]).

Furthermore, I examined whether transactivity is related to objective outcomes (i.e., joint sum, Pareto efficiency, integrative quotient), contingent on task demonstrability conditions, as payoff schemes are not comparable between the two conditions. The results showed that conditional indirect effect of power structure condition on integrative quotient via transactivity, given high task demonstrability, was negatively significant (effect = –.06, 95% CI = [–.191, –.008). The moderated mediation index for high task demonstrability was also significant (index = .07, 95% CI = [.008, .193]). This means that under high task demonstrability, equal (unequal) power condition has negative (positive) effect on integrative quotient via lower (higher) transactivity. That is, transactivity helped unequal partners realize more integrative potential when the problem space was more demonstrable.

General Discussion

Transactivity emerges from interpersonal interactions: it is the product of a social construction process where new understanding (knowledge) is developed through collaborative argumentation (Berkowitz & Gibbs, 1983; Lisi & Golbeck, 1999). Thus, the emergence of transactivity in a given relationship is likely to be influenced by the relationship and situational factors two individuals experience. Drawing upon the tenets of transactive goal dynamics (Fitzsimons et al., 2015) and research on negotiation, this study illuminates how situational factors, including task demonstrability and power structure, can impact the development of transactivity. I proposed that transactivity represents the underlying process of making goal coordination mechanisms more efficient and is more likely to emerge when the problem space and power relations *align* in a manner that encourages conversation partners to feel safe and find it beneficial to share diverse, often conflicting, ideas and perspectives. By integrating three distinct research streams, including goal dynamics, transactivity (learning science), and negotiation, this study advances our understanding of when transactivity emerges in interpersonal interactions and how the process of transactivity can be applied to the context of learning about each other's goals and interests. It highlights the importance of considering the interplay between situational factors in fostering transactive exchanges, which can have significant implications for the effectiveness and outcomes of various collaborative endeavors, including negotiations.

The findings indicate that unequal power dyads are more transactive than equal power dyads when task demonstrability is high. This suggests that the inherent tension in unequal power dyads can be mitigated and used more constructively when they can more easily find common ground due to less ambiguous problem spaces. Moreover, in the exploratory analysis,

the results demonstrate that when an unequal power structure and high task demonstrability are aligned, transactivity is positively associated with increasing the chances of realizing greater integrative potential. However, the theorized effect of an alignment between equal power structure and low task demonstrability was not supported. It was found that equal power dyads were not significantly more transactive in their interactions than unequal power dyads when the interdependence of goals was complex.

One possible explanation for this is that the low task demonstrability, as manipulated in the study, might not have been as complex as theorized. If the goal interdependence was not sufficiently complex, it could have allowed both equal and unequal power dyads to engage in transactivity at similarly moderate levels, making it difficult to capture the differences in how these two types of dyads navigate the problem space. Conversely, another reason could be that the problem space was too complex for higher levels of transactivity to emerge. In such a situation, with too many interconnected issues, negotiation partners might have "hit the ceiling," feeling lost and losing motivation to explore further. For instance, unequal power dyads, which tend to be more conflict-prone in ambiguous environments (Thompson & Loewenstein, 1992; Wade-Benzoni et al., 1996), might have engaged in more argumentation (compared to less ambiguous environments) without effectively integrating their differences. This would allow them to be transactive to a certain degree, which calls for future research to improve the algorithm for detecting sub-dimensions of transactivity. Lastly, it could have also been the case that, due to the unclear means-to-end association in a complex, ill-structured environment (Fitzsimons et al., 2015), dyads could have treated some of the issues as compatible or distributive in order to establish some common ground. Even for equal power dyads, who tend to be more cohesive, the environment could have been too complex for them to maintain

cooperativeness without obtaining more tangible compatible agreements. These reasons highlight the importance of examining a wide range of demonstrability levels in future research, which is important for developing a more nuanced understanding of the impact of task environment on transactivity.

Regarding the power structure, there are some limitations that can pave the way for future research. First, power differences in negotiation have been studied in various ways, such as by manipulating the presence of an option to negotiate with an alternative negotiator (e.g., Giebels et al., 2000) and hierarchy (e.g., De Dreu & Van Kleef, 2004), and different operationalization of power structure may lead to varying effects on transactivity. Second, it would be worthwhile for future research to examine different strengths of BATNA and negotiators' perceptions of structural, potential power. Specifically, in the equal power condition of the current study, some negotiators may have perceived their alternative to be stronger than the objective value. That is, even if two people have similar levels of BATNAs, their perceptions of BATNAs could be strong or weak, which could alter the dynamics (Kim et al., 2005). For example, if the BATNAs are objectively strong and negotiators also perceive them as strong, they might be more competitive. Therefore, it would be important to examine the role of negotiators' perceptions of their alternatives. Similarly, considering that negotiators might have different assumptions about their contributions, even if they perceive the strength of their BATNAs commensurate to the objective value, their perceptions of the bargaining zone may vary, which can strengthen or weaken the effects of BATNA on their behaviors (Kim & Fragale, 2005). Future research should consider manipulating contributions alongside BATNAs to obtain a more accurate analysis of the relative power each negotiator possesses.

One intriguing finding from this study is that the recruiter's amount of speech (speaking time) had a strong and positive effect on transactivity, while the candidate's speaking time did not. It is possible that negotiators expected recruiters to have more knowledge about the issues discussed since they would have extensive data on which candidates typically receive specific employment packages. Recruiters might have shared more thoughts and reasoning on why certain options were better or worse for the candidate, and the candidate could have deferred to the recruiter's "insider" knowledge. This dynamic could have intensified as speaking time is associated with leader emergence (MacLaren et al., 2020). In other words, recruiters talking more could have driven the conversation to be more grounded in sound reasoning. For instance, when discussing location, recruiters can present a counter-argument based on "hard" evidence, such as proposing that their office in a particular location has recently opened with opportunities for the desired job assignment and career advancement for the candidate. By doing so, the scope of the discussion could have been expanded while remaining based on solid reasoning. Although previous research has found that knowledge about a counterpart's BATNA does not have different effects on behaviors between recruiters and candidates (e.g., Pinkley, 1995), it may be worthwhile to further investigate this issue and examine the role of possessing company knowledge, and how it, alone or in combination with higher power, influences transactivity.

Conclusion

This chapter sought to uncover situational determinants of transactivity in a negotiation setting. The guiding theory proposed that transactivity is more likely to emerge in task environments where partners perceive opportunities to gain more by broadening their search in the problem space while feeling secure enough to do so. Specifically, I posited that such contexts can help partners who are naturally in tension transform their conflict constructively (i.e.,

alignment of unequal power structure with high task demonstrability), and those who are naturally cohesive to push their boundaries (i.e., alignment of equal power structure with low task demonstrability). In light of these findings, practitioners (managers, instructors) should consider the interplay between task complexity and power dynamics when designing collaborative environments, where diverse perspectives are welcomed and tensions are channeled productively.

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Table 1: Summary of Comparison of Transactivity and Related Constructs

	Construct	Definition	Similarity to Transactivity	Difference/Contribution
Team-level process to create specific cognitive structure	Transactive memory process	Encoding, storing/modifying, and retrieval of information through interpersonal communication (Wegner et al., 1985).	Active and effortful dyadic communication (e.g., argument) are expected to strengthen the transactive processes. The concept of "interactive cueing," where one partner uses the information retrieved by another partner as a cue for recalling additional information (Hollingshead, 1998), bears resemblance to the sequential building-on process of transactivity. Both share similar outcomes of interest in the domain of learning.	Transactive memory processes represent a more comprehensive construct, with an emphasis on organizing and managing knowledge within a dyad or group. Transactivity may offer insights into why some groups develop specific memory system structures (e.g., differentiated, integrated), and when given a memory system, how even an integrated memory system can facilitate creation of new knowledge.
Capability for creating knowledge	Integrative complexity	An individual's tendency to process information in differentiated and integrative ways (Suedfeld & Tetlock, 2001; Tetlock, Peterson, & Berry, 1993)	Integrative complexity and transactivity both are focused on the epistemic (cognitive) aspect of information processing and learning.	Integrative complexity involves individuals' cognitive styles. Two people who score high in integrative complexity may not necessarily be capable of and/or willing to engage in collaborative efforts.
	Integrative capacity	"The social and cognitive processes, along with emergent states, that shape a team's ability to combine diverse knowledge" (Salazar et al., 2012, p. 527)	Both constructs highlight the importance of the interplay between social and cognitive dimensions, embracing a social constructivist perspective towards learning and knowledge creation.	Integrative capacity has not been specifically operationalized or tested. Some aspects of it can be captured using transactivity as a measure. Transactivity can provide a detailed understanding of the underlying communication processes that contribute to integrative capacity.

	Knowledge integration capability	"A reliable pattern of team communication that generates joint contributions to the understanding of complex problems" (Gardner et al., 2012, p. 999)	Emphasis on collaboration (social dimension) in communication.	Knowledge integration capability comprises a range of general communication behaviors (both in terms of frequency and quality) that primarily focus on interpersonal relationships, without giving much attention to deep, cognitive processing of information. It is not as focused on knowledge creation as it is on efficiently and reliably combining members' contributions. Similarly, it views confrontations and conflicts as counterproductive.
General emergent process of integration	Team reflexivity	"The extent to which group members overtly reflect upon the group's objectives, strategies, and processes and adapt them to current or anticipated endogenous or environmental circumstances" (West, 1996, p. 559)	Emphasis on epistemic (cognitive) processing of information.	Team reflexivity does not theorize about or measure the characteristics of an effective reflection process, nor does it examine how this process is necessarily linked to implementing the reflection/discussion results for ultimately adjusting work processes. Similarly, it does not place much emphasis on the role of collaboration and mutual respect in the course of reflection/discussion. The range of discussion topics is limited to work methods and processes.
	Information elaboration	"The exchange of information and perspectives, individual-level processing of the information and perspectives, the process of feeding back the results of this individual-level processing into the group, and discussion and integration of its implications" (van Knippenberg et al., 2004, p. 1011)	Emphasis on epistemic (cognitive) processing of information.	Transactivity can complement information elaboration by providing a more detailed understanding of the process, by taking into account variations in the quality of communication among different dyads within a group. Whereas information elaboration is focused on cognitive dimension of information processing and integration, transactivity places equal emphasis on relational

			dimensions and cognitive dimensions. Information elaboration also does not explore the role of critical reasoning and argumentation in the discussion and integration process.
Motivated information processing	Information processing in groups is determined by epistemic (low-high) and social (pro-self, prosocial) motivations, where high quality group outcomes are expected when high epistemic motivation is aligned with prosocial motivation (De Dreu et al., 2008).	Both constructs highlight the importance of the interplay between social and cognitive dimensions, as well as the role of motivation and effort in developing information processing systems.	Motivated information processing does not provide a specific operationalization of a variable that can capture both social (prosocial) and high epistemic motivations, where group members "try to build on" each other's ideas (De Dreu et al., 2008, p. 39).
Debate (conflict expression)	"Verbal and nonverbal communication of opposition between people" (Weingart et al., 2015, p. 235)	Both constructs acknowledge the potential positive function of conflicts and propose theories on how conflicts can be used constructively. Debate is similar to a sub-dimension of transactivity focused on the way challenges (e.g., rebuttable, counterarguments) are structured (i.e., Challenging Views).	By definition, the construct of debate (and the conflict process that emerges) involves how partners express their opposing views, not on the content of what they are communicating. Thus, we cannot fully examine how well partners are building on each other's ideas using the concept of debate alone. Furthermore, at a low-to-moderate level of transactivity, partners may build on each other's ideas without engaging in much critical discourse. However, conflict expression is a construct that is used to explain group dynamics where conflict is present.

	Reflective reframing	"Mindful behaviors of all participants in an interaction, where each respectfully attends to and builds upon the comments and actions of others" (Hargadon & Bechky, 2006, p. 489)	Both consider new knowledge to be socially constructed. Reflective reframing emphasizes how other people's ideas can serve as cues for individuals to reevaluate the problem. Active listening (which is also a sub-dimension of transactivity) plays a crucial role for reflective reframing.	Reflective reframing is focused on self-reflection; iterative and effortful verbal communication may be less important than introspecting on what the other partner said and how it can help reframe one's thoughts. Additionally, the theory does not delve into critical discourse and tends to view it as detrimental to the reflective reframing process. While reflective reframing is primarily concerned with creative performance, transactivity is a communication process that can improve collaboration for a range of tasks.
Individual behavior for managing conflict	Integrative strategy (negotiation behavior)	"Behaviors that lead to the creation of joint value typically focus on improving one's understanding of the other parties' needs and desires and using that information to craft mutually beneficial agreements" (Weingart et al., 2007, p. 995)	Both constructs are associated with cooperative intentions that facilitate collaboration between partners.	Integrative behavior is focused on consensual processing of information. Criticism and argumentation are not part of integrative behaviors.
	Problem-solving strategy (conflict management strategy)	An individual's preference for conflict management that is "oriented towards an agreement that satisfies both own and others' aspirations as much as possible" (De Dreu et al., 2001, p. 646)	Both constructs emphasize the importance of balancing self-interest (concern for self) with the interests of others (concern for others).	Transactivity can explain the communication process by which a problem-solving strategy is implemented. Transactivity is more broadly concerned with learning outcomes and knowledge co-creation, and placing a greater emphasis on critical argumentation. Transactivity is an emergent dyadic construct, capturing the interactive nature of communication between partners, while problem-solving strategy refers to an individual's tendency in managing conflicts.

Table 2: Descriptive Statistics and Intercorrelations (2019 dataset)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
Within-dyad (message) level											
1. Turn order	.04	.20	—								
2. Word count	224.88	96.31	–.12***	—							
3. Discussion topic 1[a]	.18	.38	.07***	.19***	—						
4. Discussion topic 2	.17	.37	–.07***	–.07***	–.21***	—					
5. Discussion topic 3	.17	.38	.04*	–.04*	–.21***	–.20***	—				
6. Discussion topic 4	.17	.38	.04*	–.06***	–.21***	–.20***	–.21***	—			
7. Discussion topic 5	.15	.36	–.04*	.02	–.20***	–.19***	–.20***	–.19***	—		
8. Discussion topic 6	.16	.37	–.05**	–.04*	–.20***	–.20***	–.20***	–.20***	–.19***	—	
9. Transactivity	1.45	1.39	–.01	.19***	.05**	–.11***	–.03*	.04*	–.03†	.08***	—
Between-dyad level											
1. Total exchanges	1.21	.53	—								
2. Extraversion	3.64	.40	–.01	—							
3. Agreeableness	3.37	.39	–.01	.32***	—						
4. Honesty-humility	3.43	.36	–.02	.14***	.32***	—					
5. Openness to experience	3.65	.41	–.02	.33***	.18***	.19***	—				
6. Agreeableness–HH distance	.39	.19	.02	–.05**	–.27***	–.06**	–.08***	—			
7. Extraversion–HH distance	.45	.26	.02	.11***	–.02	–.28***	.10***	.27***	—		
8. A–E distance[b]	.43	.26	–.03	.17***	–.31***	–.07***	.08***	.25***	.37***	—	

N = 3,386 interactions nested in 2,806 dyads (from 199 individuals). [a] Topic 1 (business case on teamwork), Topic 2 (extraverted leaders), Topic 3 (strategic plans), Topic 4 (aging workforce), Topic 5 (5 hour workday), Topic 6 (bias in hiring). [b] Agreeableness–extraversion distance. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3: Descriptive Statistics and Intercorrelations (2020 dataset)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
Within-dyad (message) level										
1. Turn order	.50	.71	—							
2. Word count	302.01	177.05	–.46***	—						
3. Transactivity	1.90	1.44	–.08*	.20***	—					
Between-dyad level										
1. Total exchanges	1.71	.79	—							
2. Extraversion	3.65	.36	.10*	—						
3. Agreeableness	3.34	.39	.04	.09†	—					
4. Honesty-humility	3.56	.40	.11*	.06	.44***	—				
5. Openness to experience	3.56	.40	–.12*	.14**	.19***	.06	—			
6. Agreeableness–HH distance	.40	.19	.06	–.02	–.29***	.17***	–.10*	—		
7. Extraversion–HH distance	.46	.25	.00	.04	–.18***	–.23***	.06	.15***	—	
8. Agreeableness–extraversion distance	.47	.29	.12*	.31***	–.49***	–.25***	–.03	.16***	.44***	—

N = 757 interactions nested in 443 dyads (from 142 individuals). * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4: Descriptive Statistics and Intercorrelations (2022 dataset)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
Within-dyad (message) level											
1. Turn order	.06	.26	—								
2. Word count	297.59	114.46	–.14***	—							
3. Discussion topic 1[a]	.25	.43	–.02	.18***	—						
4. Discussion topic 2	.24	.43	.03	–.02	–.32***	—					
5. Discussion topic 3	.25	.43	–.05†	.05†	–.33***	–.32***	—				
6. Discussion topic 4	.27	.44	.04*	–.20***	–.35***	–.34***	–.35***	—			
7. Transactivity	1.60	1.23	–.07*	.20***	.07**	–.04†	.09***	–.12***	—		
Between-dyad level											
1. Total pairings assigned	1.11	.32	—								
2. Total voluntary exchanges	.07	.28	.05†	—							
3. Extraversion	3.65	.42	–.01	–.08*	—						
4. Agreeableness	3.41	.37	.01	–.03	.46***	—					
5. Honesty-humility	3.51	.44	–.02	.00	–.11***	.11***	—				
6. Openness to experience	3.61	.41	–.01	.01	.34***	.31***	.02	—			
7. Agreeableness–HH distance	.49	.25	–.00	–.04	–.01	–.12***	–.12***	–.06*	—		
8. Extraversion–HH distance	.57	.32	–.01	–.02	.02	.05†	–.35***	.05†	.58***	—	
9. Agreeableness–extraversion distance	.40	.21	.02	–.00	.01	–.40***	–.11***	–.03	–.03	.21***	—

N = 1,425 interactions nested in 1,212 dyads (from 107 individuals). [a] Topic 1 (hiring), Topic 2 (group decision-making), Topic 3 (performance management), Topic 4 (giving/receiving feedback). † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5: Effects of Personality Traits Composition on Transactivity (2019 dataset)

Variable	Model 1	Model 2	Model 3	Model 4
Controls				
Turn order	–.01 (.02)	–.01 (.02)	–.01 (.02)	–.01 (.02)
Word count	.26*** (.02)	.26*** (.02)	.26*** (.02)	.26*** (.02)
Total exchanges	.00 (.03)	–.00 (.03)	–.00 (.03)	–.01 (.03)
Discussion topic 2[a]	–.13*** (.03)	–.13*** (.03)	–.13*** (.03)	–.13*** (.03)
Discussion topic 3	–.04 (.03)	–.05 (.03)	–.04 (.03)	–.05 (.03)
Discussion topic 4	.05† (.03)	.05 (.03)	.05 (.03)	.05 (.03)
Discussion topic 5	–.06† (.03)	–.06* (.03)	–.06* (.03)	–.06* (.03)
Discussion topic 6	.08** (.03)	.08** (.03)	.08** (.03)	.08** (.03)
Personality traits and interactions				
Dyadic extraversion		.00 (.03)	.02 (.03)	.00 (.03)
Dyadic agreeableness		–.12*** (.03)	–.15*** (.03)	–.14*** (.03)
Dyadic honesty-humility (HH)		.01 (.03)	.01 (.03)	.02 (.03)
Dyadic openness to experience		.01 (.03)	.00 (.03)	.01 (.03)
Dyadic agreeableness × HH		–.04† (.03)		–.06* (.03)
Dyadic extraversion × HH		.05† (.03)		.06* (.03)
Dyadic agreeableness × extraversion		.05* (.02)		.05† (.03)
Vector norm distance of personality traits				
Agreeableness–HH distance			–.01 (.03)	–.03 (.03)
Extraversion–HH distance			.01 (.03)	.04 (.03)
Agreeableness–extraversion distance			–.05 (.03)	–.01 (.03)
Pseudo R^2	.05	.06	.06	.07
Model deviance	11,623	11,586	11,595	11,584
$\Delta\chi^2(df)$ compared to Model 1		37.16(7)***	28.10(7)***	39.21(10)***
$\Delta\chi^2(df)$ of Model 4 compared to Model 2				2.04(3)

N = 3,386 interactions nested in 2,806 dyads (from 199 individuals). All predictors are standardized (Mean = 0, SD = 1). [a] Discussion topic 1 is the reference category. Topic 1 (business case on teamwork), Topic 2 (extraverted leaders), Topic 3 (strategic plans), Topic 4 (aging workforce), Topic 5 (5 hour workday), Topic 6 (bias in hiring).
† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 6: Effects of Personality Traits Composition on Transactivity (2020 dataset)

Variable	Model 1	Model 2	Model 3	Model 4
Controls				
Turn order	–.20** (.07)	–.22** (.07)	–.22** (.07)	–.22** (.07)
Word count	.22*** (.06)	.20*** (.06)	.20*** (.06)	.19** (.06)
Total exchanges	.29*** (.07)	.29*** (.07)	.29*** (.07)	.30*** (.07)
Personality traits and interactions				
Dyadic extraversion		.02 (.06)	.04 (.06)	.04 (.06)
Dyadic agreeableness		–.13* (.07)	–.10 (.08)	–.13 (.08)
Dyadic honesty-humility (HH)		.09 (.06)	–.00 (.07)	.03 (.07)
Dyadic openness to experience		–.01 (.06)	.01 (.06)	.00 (.06)
Dyadic agreeableness × HH		–.13* (.06)		–.09 (.06)
Dyadic extraversion × HH		.23*** (.07)		.18* (.07)
Dyadic agreeableness × extraversion		–.09 (.07)		–.10 (.07)
Vector norm distance of personality traits				
Agreeableness–HH distance			.13* (.06)	.08 (.07)
Extraversion–HH distance			–.18** (.06)	–.11 (.07)
Agreeableness–extraversion distance			–.05 (.08)	–.06 (.08)
Pseudo R^2	.06	.09	.09	.10
Model deviance	2,631	2,612	2,615	2,607
$\Delta\chi^2(df)$ compared to Model 1		19.10(7)**	16.56(7)*	24.08(10)**
$\Delta\chi^2(df)$ of Model 4 compared to Model 2				4.98(3)

N = 757 interactions nested in 443 dyads (from 142 individuals). All predictors are standardized (Mean = 0, SD = 1). † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 7: Effects of Personality Traits Composition on Transactivity (2022 dataset)

Variable	Model 1	Model 2	Model 3	Model 4
Controls				
Turn order	–.11* (.04)	–.11* (.04)	–.11* (.04)	–.11* (.04)
Word count	.21*** (.03)	.21*** (.03)	.20*** (.03)	.20*** (.03)
Total pairings assigned	–.06† (.03)	–.05 (.03)	–.05 (.03)	–.05 (.03)
Total voluntary exchanges	.09† (.05)	.08† (.05)	.08 (.05)	.08† (.05)
Discussion topic 2[a]	–.08* (.04)	–.08* (.04)	–.08* (.04)	–.08* (.04)
Discussion topic 3	.04 (.04)	.04 (.04)	.04 (.04)	.04 (.04)
Discussion topic 4	–.12** (.04)	–.12** (.04)	–.12** (.04)	–.12** (.04)
Personality traits and interactions				
Dyadic extraversion		–.05 (.04)	–.04 (.04)	–.03 (.04)
Dyadic agreeableness		–.05 (.04)	–.09* (.05)	–.10* (.05)
Dyadic honesty-humility (HH)		.02 (.03)	.03 (.04)	.03 (.04)
Dyadic openness to experience		.09* (.04)	.09** (.03)	.08* (.04)
Dyadic agreeableness × HH		–.02 (.04)		–.06 (.04)
Dyadic extraversion × HH		–.05 (.04)		–.06 (.05)
Dyadic agreeableness × extraversion		.02 (.03)		.03 (.03)
Vector norm distance of personality traits				
Agreeableness–HH distance			–.08† (.04)	–.13** (.05)
Extraversion–HH distance			.08† (.05)	.05 (.05)
Agreeableness–extraversion distance			–.05 (.04)	–.04 (.04)
Pseudo R^2	.06	.07	.07	.07
Model deviance	4,547	4,532	4,532	4,525
$\Delta\chi^2(df)$ compared to Model 1		14.72(7)*	15.03(7)*	22.68(10)*
$\Delta\chi^2(df)$ of Model 4 compared to Model 2				7.96(3)*

N = 1,425 interactions nested in 1,212 dyads (from 107 individuals). All predictors are standardized (Mean = 0, SD = 1). [a] Discussion topic 1 is the reference category. Topic 1 (hiring), Topic 2 (group decision-making), Topic 3 (performance management), Topic 4 (giving/receiving feedback).

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 8: Descriptive Statistics and Intercorrelations Incl. Additional Personality Traits (2022 dataset)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
Within-dyad (message) level													
1. Turn order	.06	.26	—										
2. Word count	297.59	114.46	–.14***	—									
3. Discussion topic 1[a]	.25	.43	–.02	.18***	—								
4. Discussion topic 2	.24	.43	.03	–.02	–.32***	—							
5. Discussion topic 3	.25	.43	–.05†	.05†	–.33***	–.32***	—						
6. Discussion topic 4	.27	.44	.04*	–.20***	–.35***	–.34***	–.35***	—					
7. Transactivity	1.60	1.23	–.07*	.20***	.07**	–.04†	.09***	–.12***	—				
Between-dyad level													
1. Total pairings assigned	1.11	.32	—										
2. Total voluntary exchanges	.07	.28	.05†	—									
3. Extraversion	3.65	.42	–.01	–.08*	—								
4. Agreeableness	3.41	.37	.01	–.03	.46***	—							
5. Honesty-humility	3.51	.44	–.02	.00	–.11***	.11***	—						
6. Openness to experience	3.61	.41	–.01	.01	.34***	.31***	.02	—					
7. Assertiveness	3.47	.40	–.01	–.07*	.28***	–.20***	–.13***	.13***	—				
8. Responsiveness	4.09	.38	.03	.02	.43***	.43***	–.01	.27***	–.06†	—			
9. Agreeableness–HH distance	.49	.25	–.00	–.04	–.01	–.12***	–.12***	–.06*	.09**	–.03	—		
10. Extraversion–HH distance	.57	.32	–.01	–.02	.02	.05†	–.35***	.05†	–.09**	–.09**	.58***	—	
11. A–E distance[b]	.40	.21	.02	–.00	.01	–.40***	–.11***	–.03	.04	–.15***	–.03	.21***	—

N = 1,425 interactions nested in 1,212 dyads (from 107 individuals). [a] Topic 1 (hiring), Topic 2 (group decision-making), Topic 3 (performance management), Topic 4 (giving/receiving feedback). [b] Agreeableness–extraversion distance. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 9: Effects of Additional Personality Traits Composition on Transactivity (2022 dataset)

Variable	Model 1	Model 2	Model 3	Model 4
Controls				
Turn order	–.11* (.04)	–.11* (.04)	–.11* (.04)	–.11* (.04)
Word count	.21*** (.03)	.21*** (.03)	.20*** (.03)	.20*** (.03)
Total pairings assigned	–.06† (.03)	–.05 (.03)	–.05† (.03)	–.05 (.03)
Total voluntary exchanges	.09† (.05)	.09* (.05)	.09* (.05)	.09* (.05)
Discussion topic 2[a]	–.08* (.04)	–.08* (.04)	–.08* (.04)	–.08* (.04)
Discussion topic 3	.04 (.04)	.04 (.04)	.03 (.04)	.03 (.04)
Discussion topic 4	–.12** (.04)	–.12** (.04)	–.12** (.04)	–.12** (.04)
Personality traits and interactions				
Dyadic assertiveness		.01 (.03)	–.06 (.04)	–.04 (.04)
Dyadic responsiveness		–.07* (.03)	–.03 (.04)	–.04 (.04)
Dyadic assertiveness × responsiveness		.06* (.03)		.04 (.03)
Vector norm distance of personality traits				
Assertiveness–responsiveness distance			–.10* (.04)	–.08† (.05)
Pseudo R^2	.06	.06	.06	.06
Model deviance	4,547	4,539	4,538	4,536
$\Delta\chi^2(df)$ compared to Model 1		8.24(3)*	9.74(3)*	11.02(4)**
$\Delta\chi^2(df)$ of Model 4 compared to Model 2				2.77(1)†

N = 1,425 interactions nested in 1,212 dyads (from 107 individuals). All predictors are standardized (Mean = 0, SD = 1). [a] Discussion topic 1 is the reference category. Topic 1 (hiring), Topic 2 (group decision-making), Topic 3 (performance management), Topic 4 (giving/receiving feedback)

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 10: Combined Point Sheets

Issue	Options	High Task Complexity (pts)		Low Task Complexity (pts)	
		Recruiter	Candidate	Recruiter	Candidate
Bonus	10%	0	3600	0	4000
	8%	300	2700	400	3000
	6%	600	1800	800	2000
	4%	900	900	1200	1000
	2%	1200	0	1600	0
Job Assignment	Division A	0	0	0	0
	Division B	–300	–300	–800	–800
	Division C	–600	–600	–1600	–1600
	Division D	–900	–900	–2400	–2400
	Division E	–1200	–1200	–3200	–3200
Vacation Time	18 days	0	1200	0	1600
	16 days	900	900	1000	1200
	14 days	1800	600	2000	800
	12 days	2700	300	3000	400
	10 days	3600	0	4000	0
Starting Date	June 1	0	800	1600	1600
	June 15	800	600	1200	1200
	July 1	1600	400	800	800
	July 15	2400	200	400	400
	August 1	3200	0	0	0
Moving Expense Coverage	100%	0	2800	0	3200
	90%	100	2100	800	2400
	80%	200	1400	1600	1600
	70%	300	700	2400	800
	60%	400	0	3200	0
Insurance Coverage	Plan 1	0	400	0	2400
	Plan 2	700	300	600	1800
	Plan 3	1400	200	1200	1200
	Plan 4	2100	100	1800	600
	Plan 5	2800	0	2400	0
Salary	$120,000	–6000	0	–6000	0
	$115,000	–4500	–1500	–4500	–1500
	$110,000	–3000	–3000	–3000	–3000
	$105,000	–1500	–4500	–1500	–4500
	$100,000	0	–6000	0	–6000
Location	New York	800	3200	0	0
	Boston	600	2400	300	300
	Chicago	400	1600	600	600
	Atlanta	200	800	900	900
	San Francisco	0	0	1200	1200

Table 11: Descriptive Statistics and Intercorrelations

Variable	*M*	*SD*	1	2	3	4	5
1. Power balance	—	—	—				
2. Task demonstrability	—	—	—	—			
3. Recruiter speech amount	446.30	277.87	–.02	.07	—		
4. Candidate speech amount	356.06	254.87	–.12	–.02	.44***	—	
5. Transactivity	.39	.10	–.18†	.05	.39***	.17†	—

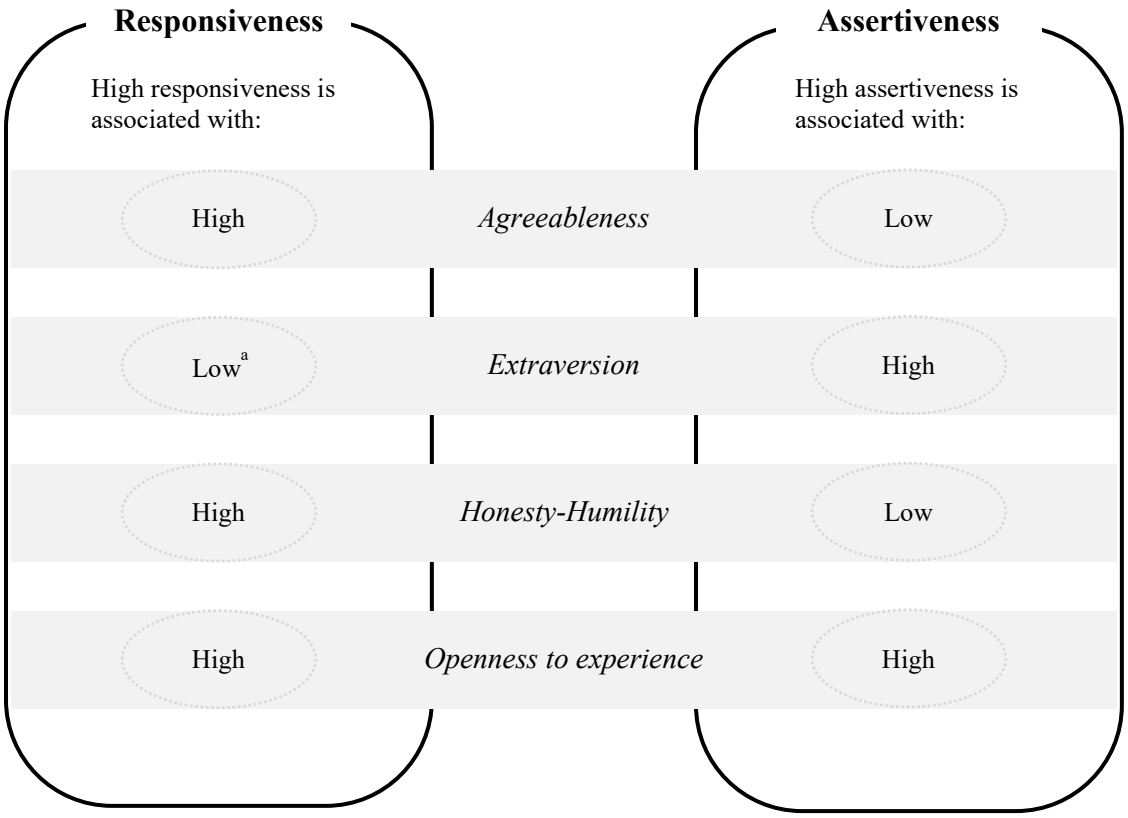
Note. $N = 108$ dyads. For power balance conditions, equal power was coded 1 and unequal power was coded –1. For task demonstrability conditions, low task demonstrability was coded 1 and high task demonstrability was coded –1. Recruiter and candidate speech amounts are in seconds. † $p < .10$, *** $p < .001$.

Table 12: Impact of Task Structures on Transactivity

Variable	Model 1	Model 2	Model 3
Recruiter speech amount	.04*** (.01)	.04 (.01)	.04 (.01)
Candidate speech amount	.00 (.01)	–.00 (.01)	–.00 (.01)
Power balance		–.02† (.01)	–.02* (.01)
Task demonstrability		.00 (.01)	.00 (.01)
Power balance × Task demonstrability			.02* (.01)
R^2	.15***	.18***	.22***
ΔR^2		.03	.03*

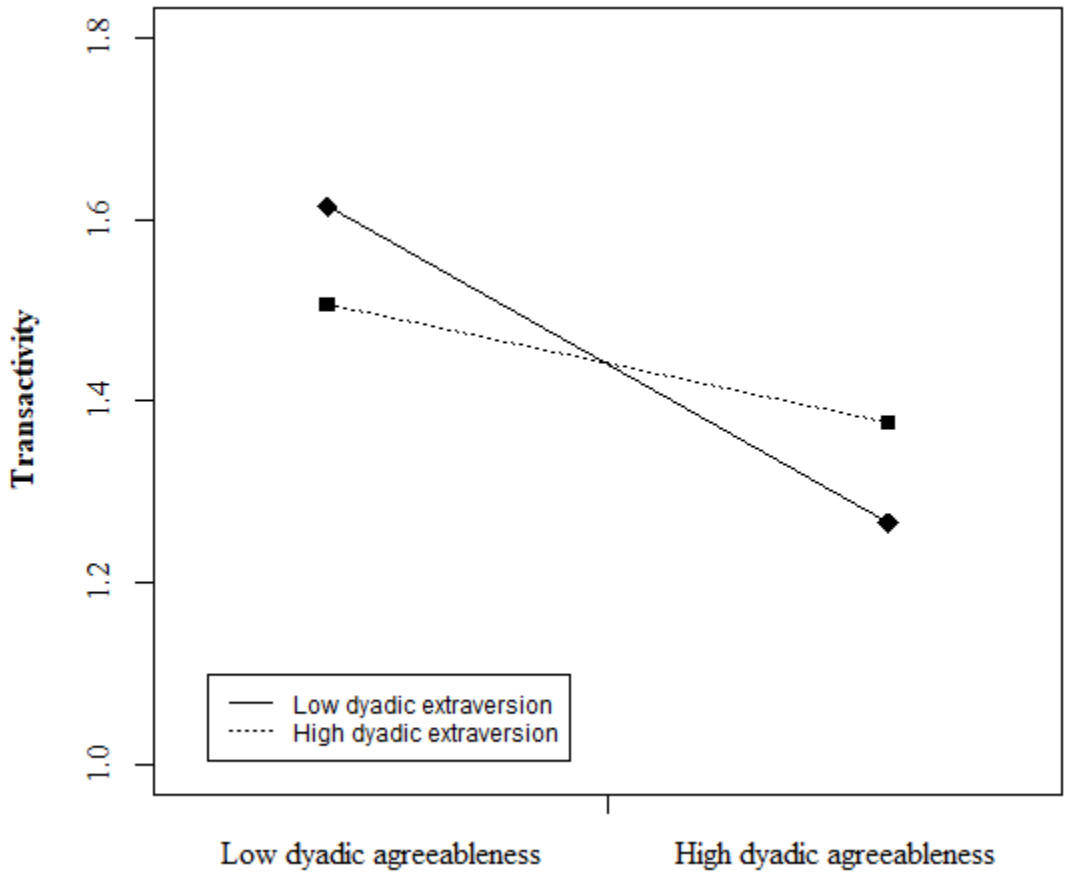
Note. $N = 108$ dyads. Entries are unstandardized regression coefficients (standard errors in parentheses). For power balance conditions, equal power was coded 1 and unequal power was coded –1. For task demonstrability conditions, low task demonstrability was coded 1 and high task demonstrability was coded –1. Recruiter and candidate speech amounts are in seconds and standardized. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 1: Correspondence between Assertiveness and Responsiveness and Commonly Associated Personality Traits



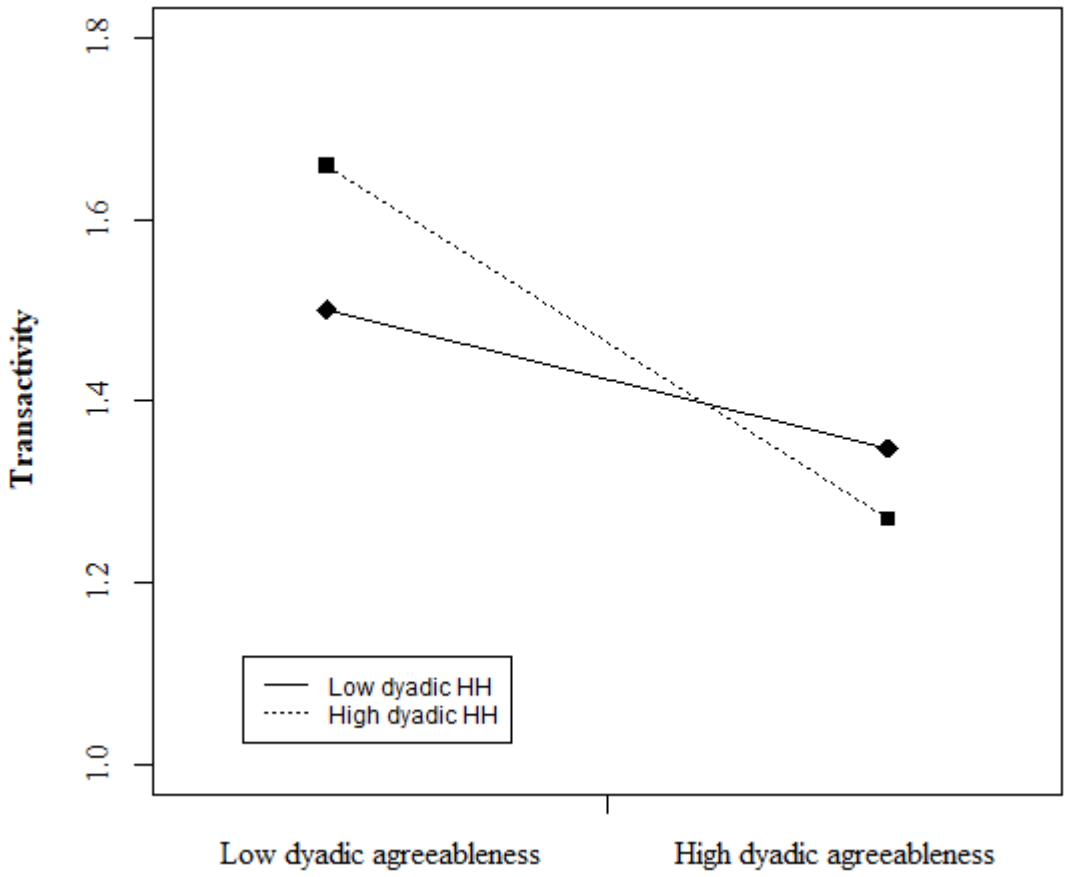
Note. Each grey bar represents the continuous range of values for each personality trait. For example, lower agreeableness is related to higher assertiveness, and higher agreeableness is related to higher responsiveness.
[a] While some studies have not found a conclusive link between extraversion and responsiveness, I suggest that lower extraversion is more relevant for responsiveness as it is characterized by seeking introspection of ideas and thoughts, while higher extraversion is strongly associated with seeking dominance and control.

Figure 2a: Interaction of Dyadic Personality Traits on Transactivity (2019 dataset)



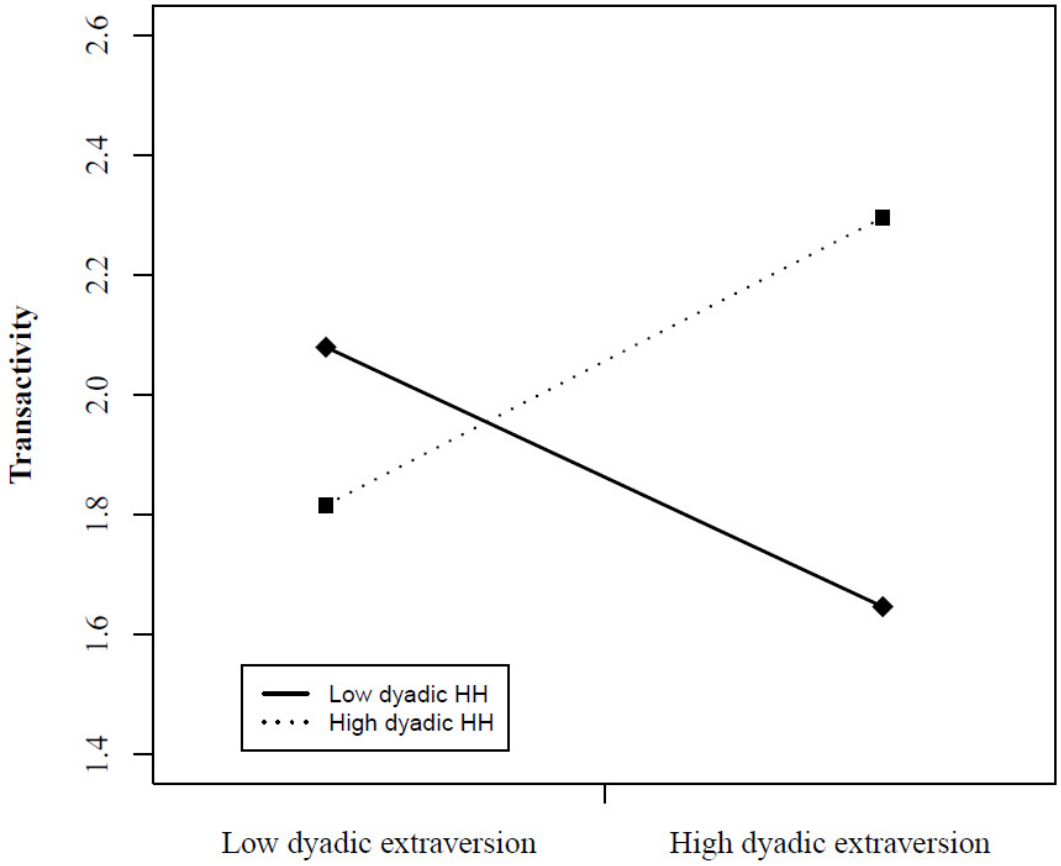
Note. Slope for low dyadic extraversion (–1 s.d.) was significantly different from zero (effect = –.17, z = –5.10, p < .001); the slope for high dyadic extraversion (+1 s.d.) was marginally significant (effect = –.06, z = –1.78, p = .07).

Figure 2b: Interaction of Dyadic Personality Traits on Transactivity (2019 dataset)



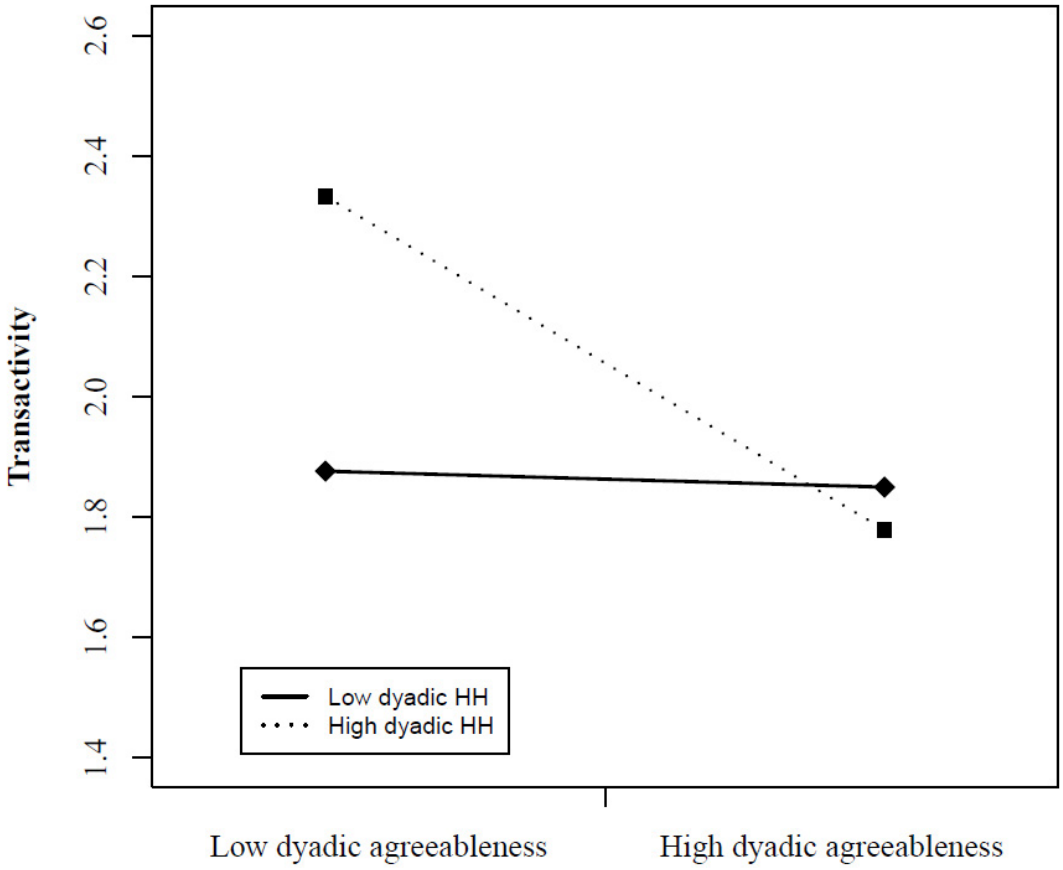
Note. HH = Honesty-humility. Slope for low dyadic honesty-humility (–1 s.d.) was marginally significant (effect = –.08, z = –1.74, p = .08); the slope for high honesty-humility (+1 s.d.) was significantly different from zero (effect = –.19, z = –4.84, p < .001).

Figure 3a: Interaction of Dyadic Personality Traits on Transactivity (2020 dataset)



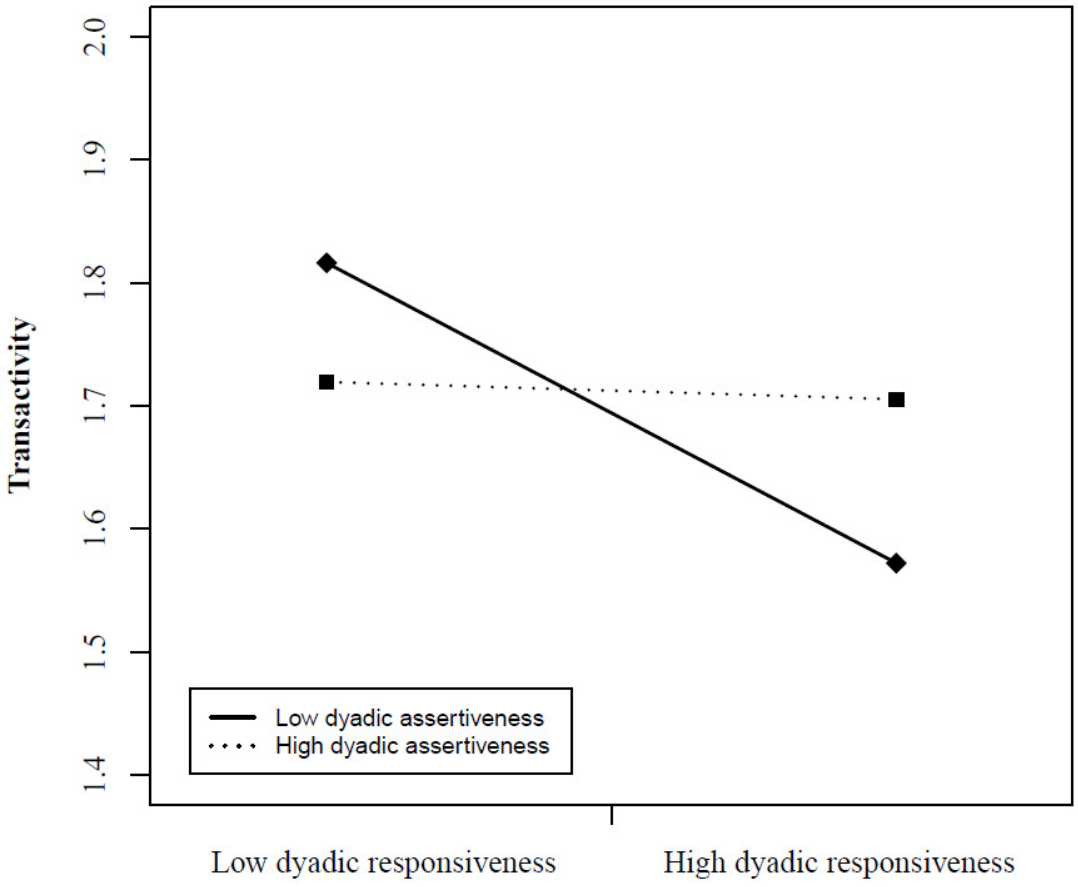
Note. HH = Honesty-humility. Slope for low dyadic honesty-humility (–1 s.d.) was significantly different from zero (effect = –.22, z = –2.43, p < .05); the slope for high honesty-humility (+1 s.d.) was significantly different from zero (effect = .24, z = 2.82, p < .01).

Figure 3b: Interaction of Dyadic Personality Traits on Transactivity (2020 dataset)



Note. HH = Honesty-humility. Slope for low dyadic honesty-humility (–1 s.d.) was not significant (effect = –.01, $z = -.17$, *ns*); the slope for high honesty-humility (+1 s.d.) was significantly different from zero (effect = –.28, $z = -3.04$, $p < .01$).

Figure 4: Interaction of Dyadic Assertiveness and Responsiveness on Transactivity (2022 dataset)



Note. Slope for low dyadic assertiveness (–1 s.d.) was significantly different from zero (effect = –.12, z = –2.82, p < .01); the slope for high dyadic assertiveness (+1 s.d.) was not significant (effect = –.01, z = –.15, *ns*).

Figure 5: A screenshot of the negotiation platform

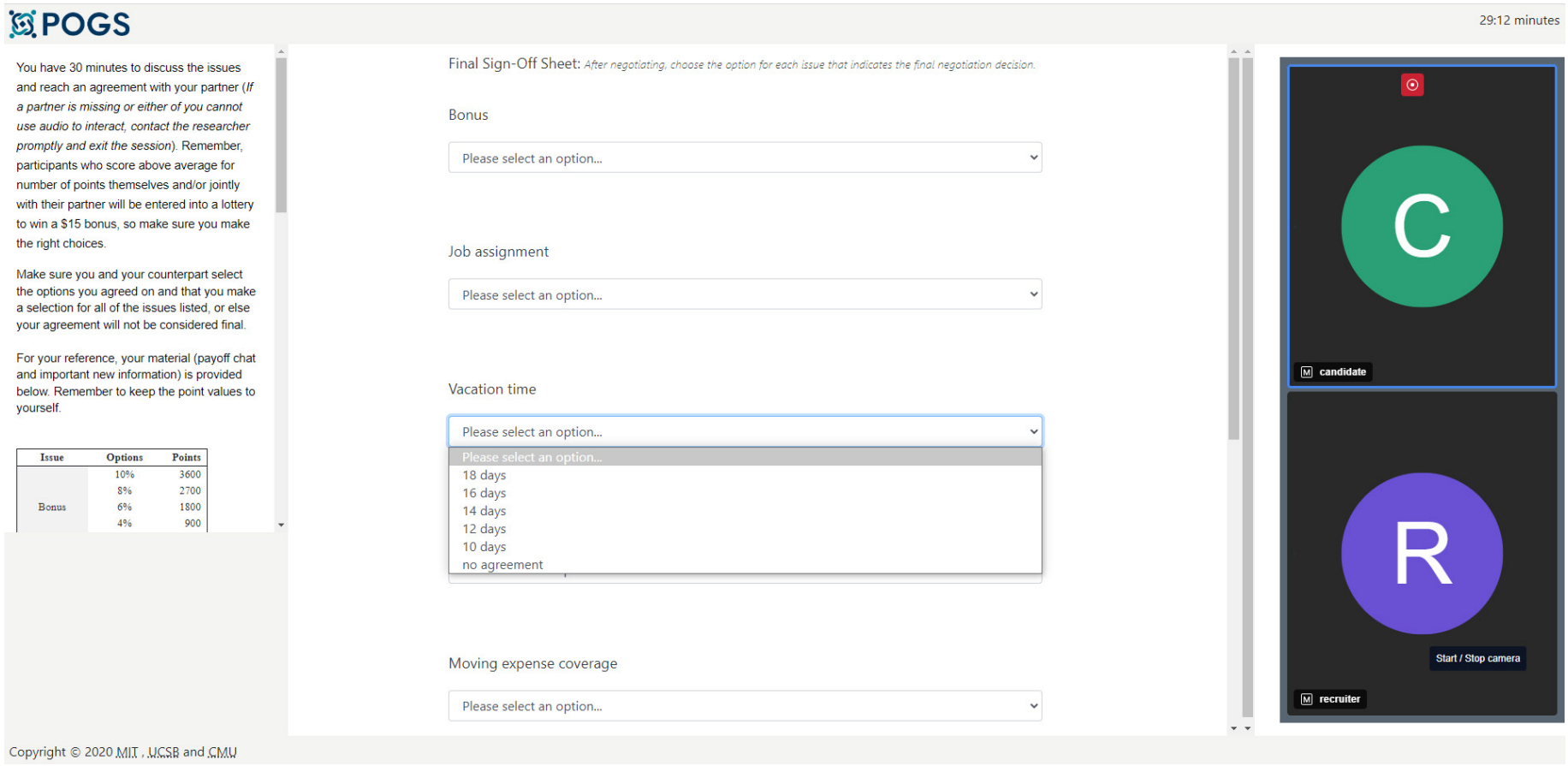
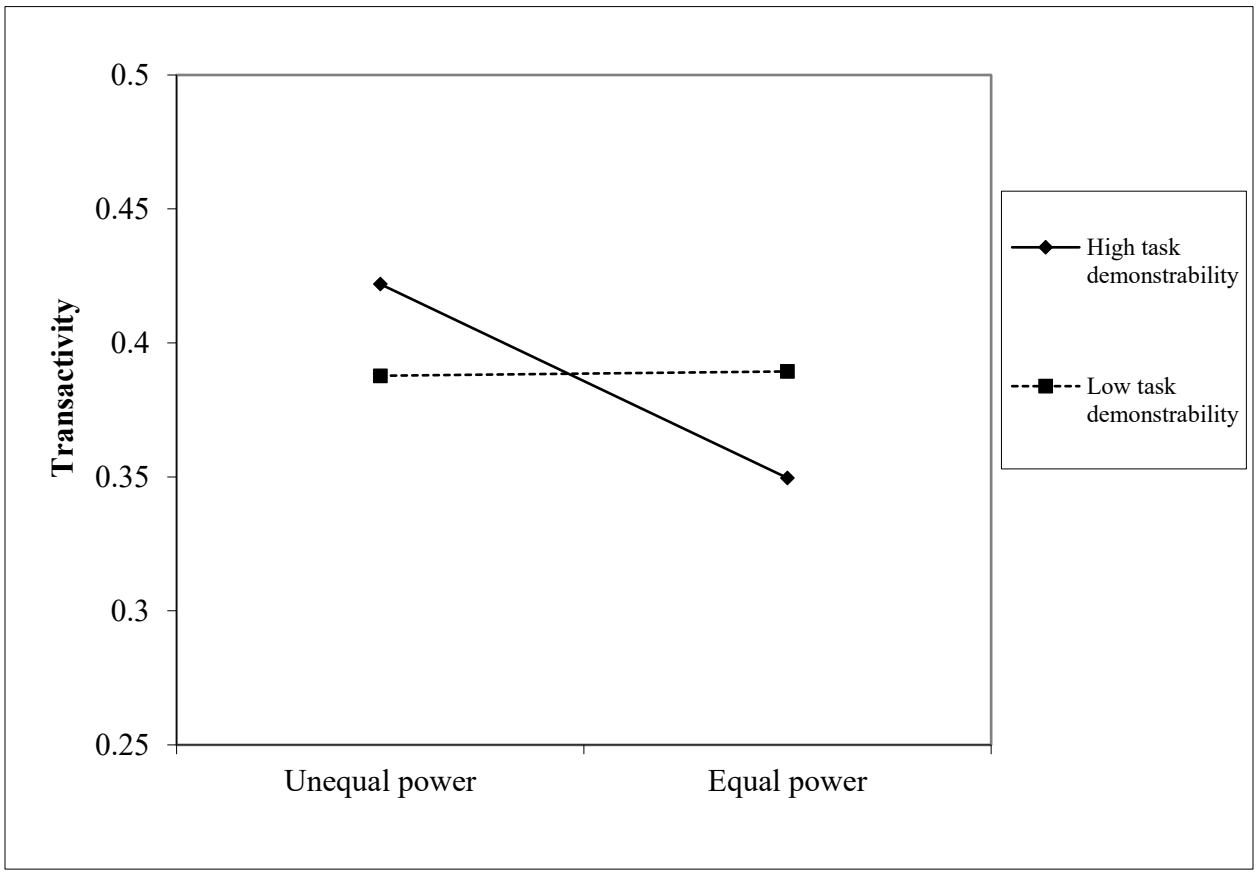
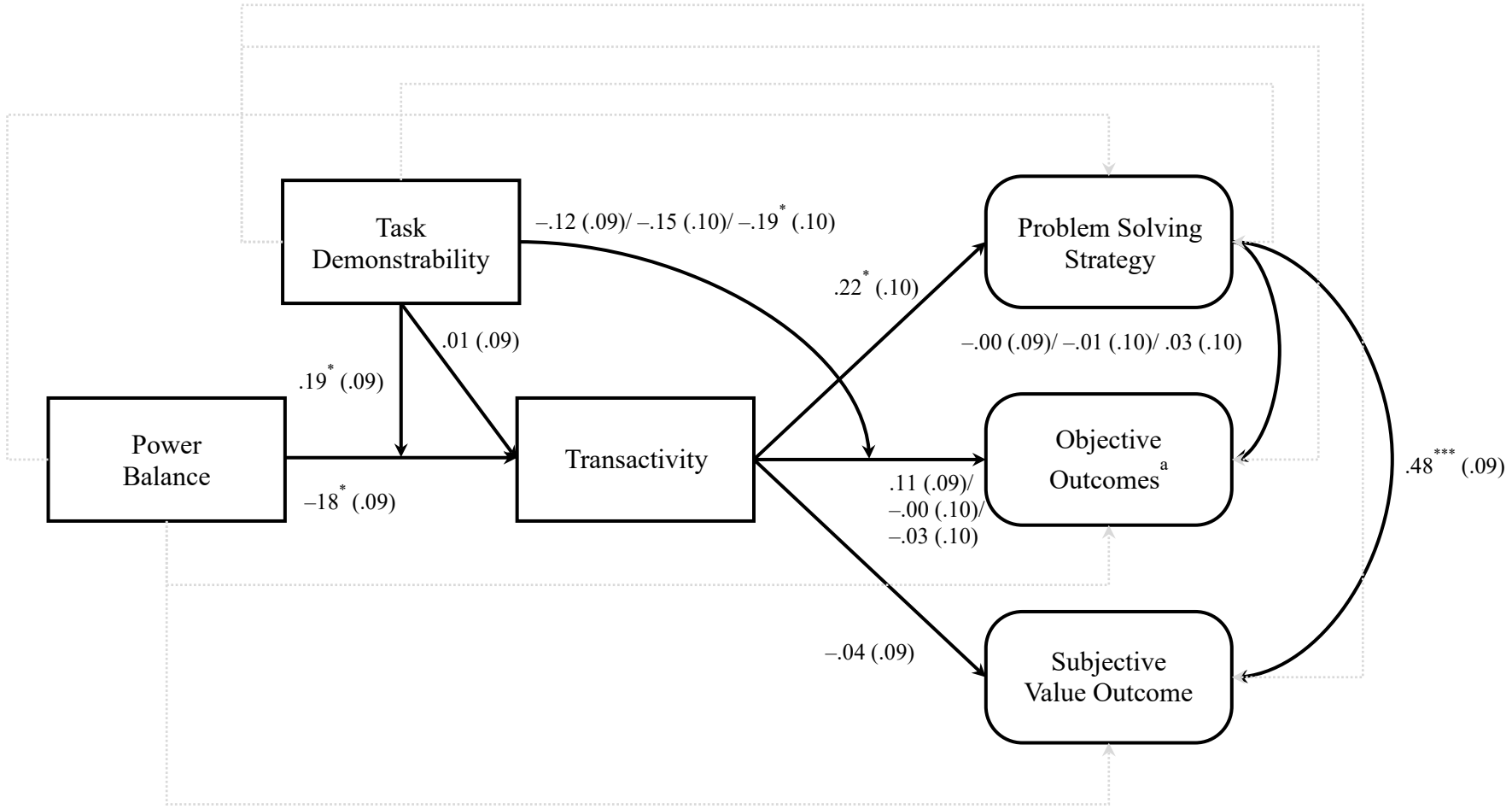


Figure 6: Interaction of Task Demonstrability and Power Structure on Transactivity



Note. Slope for high task demonstrability (coded as –1) was significantly different from zero (effect = –.04, t = –2.89, p < .01); the slope for low task demonstrability (coded as 1) was not significantly different from zero (effect = .00, t = .07, p > .10).

Figure 7: Path Analysis Results



Note. $N = 108$ dyads. Unstandardized path estimates are reported, with standard error shown in parentheses. [a] Objective outcomes ($N = 103$ dyads) include joint sum, Pareto efficiency, and integrative quotient, and the effects on these outcomes are presented in the order joint sum, Pareto efficiency, and integrative quotient. The results of all paths are presented in Appendix D. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix A: Transactivity Coding Manual (Written Communication)

General principle of coding

In evaluating Ego's comments, we (annotators) primarily focus on the level of engagement or involvement in their written communication with Alter. Specifically, we assess the extent to which Ego invests effort in understanding and building upon Alter's ideas and reasoning. Thus, our central questions to consider during coding include: "Did Ego strive to identify or represent the meaning of Alter's argument?" and "How much effort did Ego put into working on or operating upon Alter's argument?" We assume that Ego's communication ability and motivation for collaboration can be inferred from the level of effort they exhibit, with highly capable and motivated individuals providing more accurate, relevant, and logical responses.

Dimensions of transactivity

Coders will rate the perceived exertion of Ego's efforts across three dimensions:

Active Listening, Challenging Views, and Idea Extension.

Active Listening involves receptive communication whereas Challenging Views and Idea Extension involves expressive communication. In line with the principle, Active Listening pertains to the identification of Alter's argument, while Challenging Views and Idea Extension pertain to the operation of Alter's argument.

Annotation guidelines

Each dimension is rated *independently* from each other. To be noted, dimensions may overlap at the sentence level. For Active Listening, a binary rating is used. For Challenging Views and Idea Extension, a 3-point scale is used: 0 (*Not at all*), 1 (*A little*), 2 (*A lot*).

When coding, first, coders need to fully understand the meaning of the original post written by Alter. Second, coders will identify the dimensions according to the sentence structure Ego used. Third, coders will assess to what extent the focal response made by Ego is accurate, relevant, and logical. When it is unclear, refer back to what Alter said. The specific scoring rubric and examples of each dimension are explained in the following.

❶ Active Listening

To begin with, code whether the focal subject, Ego, made efforts to understand Alter's message by paraphrasing and/or asking Alter for further explanation to make sure Ego clearly understood Alter's points. These engaging behaviors are likely to foster mutual respect, a pre-condition for transactivity. Active listening requires Ego to focus on Alter's argument. Here a score of "Yes (1)" indicates Ego's acknowledgment of Alter's contribution as is, in a non-judgmental manner.

Transacts. Paraphrasing, "Soliciting Clarification"

Sentence-starters (structure). For each transact, examples include:

- *Paraphrasing*: "I agree/disagree that…"; "I like how you…"
- *Soliciting Clarification*: "Have I understood correctly that…?"; "Can you tell me more about…?"; "Help me understand your idea about…"

Structure. Typically, for *Paraphrasing*, Ego paraphrases Alter's claim and warrant following the agreement or disagreement statement. Also, look for keywords and phrases used by Alter that are similar in meaning. For *Soliciting Clarification*, Ego asks for clarification; Ego is not asking for justification of Alter's argument (i.e., Justification Request) or exploration of what Ego proposes (i.e., Exploration Request).

Criteria. "Did the Ego attempt to represent Alter's ideas and/or reasoning?" Put differently, was Ego eager to listen to Alter, rather than to be heard? Active Listening is coded "Yes (1)" when there is *Paraphrasing* and/or *Soliciting Clarification* transacts in Ego's response to Alter. Otherwise, code "No (0)".

Coding example.

- Example of "Yes (1)"

  Alter: "…In a production line where production goes on 24 hours a day, having 5 hour shifts would definitely increase the total number of shifts in a day and thereby the total number of people employed on the assembly line. In order to maintain the same costs level, the company will have to reduce either the wages or the stagger the number of people in each shift…"

  Ego: "That's a good point. I wasn't really thinking <u>about manufacturing but a reduction in hours would definitely decrease production in that type of setting. Especially if you then have to hire more people but if you are providing benefits to more people it would be more costly</u>."

  - *Explanation*: Here Ego attempted to paraphrase Alter's idea. Although Ego's paraphrasing was inaccurate in the sense that Alter did not argue that production would necessarily decrease, Ego showed the way he/she understood Alter's idea in a comprehensive manner.

- Example of "No (0)"

  Alter: "…Some companies are able to fully hire a new staff, but many won't be able to do this…"

  Ego: "<u>I think you make great points</u> but there is one to add…"

  - *Explanation*: The above statement is a typical case where the Ego does not go further to summarize or make a restatement of the claims and/or warrant that Alter presented.

❷ Challenging Views

Challenging Views indicate the extent to which Ego was clear/direct and extensive in qualifying Alter's point of views and expressing their opposing position. Coders should focus on the tone and the sentence structure to evaluate the clarity and strength of the challenge (i.e., counterarguments, rebuttals, expressing doubts, etc.), taking into account the interpersonal aspects of the communication. That is, the focus is on *how* Ego conveyed their challenging views—did Ego express their disagreement in a competitive or cooperative manner?

※Note: Coders do not code the extent to which Ego's argument is relevant and/or well-reasoned, which is coded under ❸ Idea Extension.

Criteria. "To what extent did Ego challenge Alter's argument?" Challenging Views dimension is coded "A lot (2)" when Ego clearly states the opposing position. A moderate level of Challenging Views (i.e., when coded "A little") is assumed to be communicating disagreement and criticism in a constructive way. As a rule of thumb, check how comprehensive and structured Ego's critical review is, focusing on the *structure*.

Coding example.

- Example of "A little (1)"

Alter: "…I think it's also important to keep updating their strategic plan to make it more beneficial because the market is changing so fast that a company's strategic plan should be constantly evolving with it."

Ego: "I agree with most that you said but not with the idea of updating the strategic plan very often…"

  - *Explanation*: Here Ego challenges one of the ideas developed by Alter—Ego agrees to most of the ideas but qualifies one of them and suggests how it may not work out.

- Example of "A lot (1)"

Alter: "…I would have to assume that the team would be next to impossible to rectify in due time to complete the deadline for WS1, and I would respectfully decline the position…"

Ego: "You have only described opportunities for James. The bar has been set low by the poor performance of the group which has been operating without a strong leader. James can be the new spark that keep everyone on track..."

  - *Explanation*: Ego reframes Alter's argument and develops opposing viewpoints. Ego goes on explaining how Alter's argument can be interpreted in different ways. Ego's position is direct and clear.

❸ Idea Extension

Last, code the extent to which Ego was elaborative in conveying their own ideas and thoughts in relation to what Alter said. The focus lies in evaluating the boundary-spanning and operational nature of the content that Ego expressed in (1) exploring and/or (2) challenging Alter's argument. Specifically, this involves coding the *uniqueness of Ego's claim* and *robustness of Ego's reasoning*. To what extent does Ego demonstrate their own ideas and the reasoning process behind them?

The extension of Alter's argument can take two forms: agreement- and disagreement-based. That is, Ego can expand Alter's ideas and thoughts based on convergent and divergent thinking, respectively. Notably, Ego may demonstrate both forms of extension, whereby Ego explores and qualifies Alter's argument. Specific coding schemes for consensual exploration (agreement-based idea extension) and challenge (disagreement-based idea extension) transacts are provided in the following. For both cases, two main questions to keep in mind while coding are "To what extent is Ego's response *unique*?" *and* "How *elaborative* was Ego's response?"

❸-① ***Agreement-Based (Consensual) Idea Extension.*** Specifically, "How elaborative was Ego's response in terms of exploring parallel lines of thought?" By consensual exploration, Ego provides additional evidence or thought, either declaratively (*Elaboration*) or interrogatively (*Exploration Request*), or applies Alter's point to different contexts (*Application*), such that Alter's argument becomes more complete and generalizable.

Transacts. "Elaboration" (Extension), "Exploration Request", "Application"

Sentence-starters (structure). Examples include:

- *Elaboration*: "Also, I think (believe) that…"; "To add on to your point…"
- *Exploration Request*: "Have you also thought about (considered)…?"
- *Application*: "In my personal experience…"; "We can also observe this in…"

Structure. *Elaboration*, *Exploration Request*, and *Application* aim to make Alter's argument more compelling, whereby the original idea becomes clearer and more generalizable. Particularly, look for parts of Ego's comments where Ego expresses their *own* thoughts that are directly tied back to the original idea.

Criteria. Idea Extension is coded "A lot (2)" when one of the following criteria is met. Otherwise, code "A little (1)" or "None (0)". As a rule-of-thumb, code "A lot (2)" when Ego demonstrates their reasoning process in-depth or provides multiple new ideas.

- Offered rationale and evidence to support the argument
- Illustrated the argument with examples
- Demonstrated logical reasoning

Coding example.

- Example of "A little (1)"

Alter: "…that extroversion became a cultural ideal and if extroversion is indeed the perceived ideal, maybe we have CEOs who learned how to be extroverted on the job because that is what is expected of them… there are other ways, and probably better ways, to assess for leadership and diversity of thought…"

Ego: "You make a very interesting point. CEO extroversion could be a result of society's perception that it is crucial or more important than the other aspects and traits you mention. I agree that these are equally if not more important to hiring decisions. It would be interesting to see how this cultural ideal varies across countries/societies."

  - *Explanation*: Ego paraphrases Alter's argument comprehensively and adds another thought (effects of cultural differences) that is tied back to Alter's point about cultural ideal; however, Ego does not go further in developing their idea.

- Example of "A lot (1)"

Alter: "…Firstly, he should communicate with his boss ahead of time to know about her demands and also tell her the realizable results. Secondly, keep his team members and boss be aware of the operating progress of all projects by regular meetings and E-mail reports…"

Ego: "I agree that James should take on this project. I feel first that he should talk with senior management and ensure that he is given the proper authority needed to make all of these things happened. He needs the authority to dismiss and/or replace personnel who do not show up to meetings, complete their work, or meet deadlines. Sure, things happen that are out of his control and out of the control of his employees; but if you are on a team where people are simply not completing their work then you as a leader should have the authority to change the situation."

  - *Explanation*: Ego provides a new variable to consider in line with Alter's thoughts and also demonstrates why it is important in greater detail.

❸-② ***Disagreement-Based (Critical) Idea Extension*** Specifically, "How elaborative was Ego's response in terms of their reasoning *against* Alter's argument?" By challenging, Ego critically evaluates and analyzes Alter's reasoning in a declarative or interrogative manner (*Critique*) and/or presents opposing arguments (*Counter-argument*)—uncovering assumptions and exploring alternatives—such that Alter's argument may become more robust, rigorous, and competitive.

Transacts. Critique (incl. Justification Request, Competitive Extension), Counter-argument

Sentence starters (structure). Examples include:

- *Critique*
  - Declarative: "I would be careful about…"; "It is not clear why…"; "I am skeptical about"

  - Interrogative/elicitational (Justification Request, Competitive Extension): "Why/how do you think…?"; "What if…?"
- *Counter-argument*: "However, I believe…"; "I am afraid that…"

Structure. For *Critique*, Ego can critique Alter's reasoning using statement (declarative) and question (interrogative) sentence types. For a declarative critique, look for parts of the comment where Ego expresses doubts about Alter's rationale/evidence or lack thereof. *Justification Request* and *Competitive Extension* (i.e., extending the reasoning to an extreme that makes it implausible) is typically expressed with an interrogative tone. For *Counter-argument*, contrast conjunctions (e.g., but) or conditional tenses (e.g., if-clause) are typically used. To be noted, what follows contrast conjunctions may not be counter-argument; Ego can start off paraphrasing using these conjunctions.

Criteria. Idea Extension is coded "A lot (2)" when one of the following criteria is met. Otherwise, code "A little (1)" or "None (0)".

- Explicated when/how Alter's argument may not be supported
- Provided clear evidence to support the counter-argument

Coding example.

- Example of "A little (1)"

  Alter: "…If standardized testing scores weren't being used, there would need to be another way to make sure the review/decision process doesn't drag on for longer than it already takes. …It would be interesting to have some type of standardized testing for the hiring process in companies. They do already use standardized testing for certain occupations, like doctors and lawyers, but having one standardized test for all occupations wouldn't be helpful…"

  Ego: "I agree with your assessment of standardized testing in college admissions. However, I'm a firm believer that standardized testing should not be used in hiring. As you mentioned, there are multiple jobs that require candidates to pass a knowledge test in the state in order to practice their occupation. However, companies do not use the test's specific results in the hiring process because they recognize that the test is in no way a performance indicator for how a candidate can apply that knowledge to practical application."

  - *Explanation*: Ego could have provided the source of the evidence and more details to support the argument. Ego shares an interesting observation yet without much elaboration thereafter.

- Example of "A lot (1)"

  Alter: "I don't believe that standardized tests should be used for college admissions, hiring, or anyplace else. Different people may have different skill sets that standardized tests don't take into account. Moreover, people may not have the same opportunity to be as prepared as they can for these tests.

  Ego: "The problem with eliminating standardized testing to remove bias is that there isn't a less biased criteria to replace it with. Ultimately, the bias shown on standardized testing is the result of general disadvantages that impact all parts of the student's application. In fact, when you consider

recommendation letters…, essays…, and extracurricular activities that low income students simply can't afford, standardized testing is actually one of the less biased parts of the application…We also should do what we can to reduce the inequalities that cause all of these problems."

- *Explanation*: Ego develops the counter-argument in-depth, providing supporting pieces of evidence, thereby sharing their thought process.

Appendix B: Transactivity Coding Manual (Spoken Dialogue)

Considering that natural conversations often involve discussing various topics and frequently returning to previous topics, it may be helpful for annotators to identify the sequence of "conversational flows" or groups of statements, as explained below. This enables annotators to keep track of the subjects being discussed and, more importantly, to determine which prior turn or group of statements a focal statement builds on (i.e., referent). Note that identifying and coding conversational flows is optional, but it is strongly recommended for annotators to do so in the beginning for several dyads to gain a better understanding of the data structure and to ensure a shared understanding between annotators. When identifying conversational flows, please follow the guidelines below.

A conversational flow represents a progression of thoughts (ideas) and responses between two conversation partners that revolve around one theme. Specifically,

- A theme provides a context of the communication interaction with a distinct beginning and end of the focal conversational flow.
- Ideas and responses may involve more than one topic of interest, where the conversation partners discuss multiple issues from the beginning or bring new (or previously discussed) issues as the conversation proceeds.

First, identify the subject or theme (beginning) and the conclusion (ending) of a conversation unit, and group the observed statements of each unit. Then,

- Numerically code in ascending order the groups of observed statements.
    - Or simply use color code(s) to distinguish the beginning of each flow.
- Only one identifier is used for each group.
- Input the same identifier for all statements within a focal group.

In addition, in a separate column, identify those statements whose referent(s) are located in different conversational flow(s) (i.e., conversation flows that are external to the group a focal statement is located).

Dimensions of transactivity in conversations

Transactive statements exhibit how well the speaker (Ego) is engaging constructively with the partner's (Alter) reasoning, demonstrating the ability and willingness to make sense of and build on the displayed ideas and reasoning. Their thought processes are mostly demonstrated through the use of:

- Conditional reasoning (if-then)
- Compare and contrast

- Causal reasoning

Specifically, transactive statements in conversation can take the form of the following dimensions. A focal statement may be transactive in terms of multiple dimensions.

- Active Listening
    - Active Listening (initiating)
- Idea Extension
    - Idea Extension (initiating)
    - Multi-Issue Offer
    - Suggestion of Concession
- Challenging Views

Note. In a negotiation setting, both partners typically enter the conversation with pre-existing priorities and preferences, as well as pre-conceived positions as they prepared for the negotiation. Thus, it is possible to be transactive by building on each other's thoughts that are not explicitly shared. For example, one partner might ask for clarification about the other's thoughts (before being explicitly shared) or elaborate on their own ideas (before being prompted). This can occur because both partners have a shared understanding of the topics they need to discuss and agree upon. In such cases, the referent could be the mutually agreed-upon topic itself (which they know they have to discuss), rather than a specific statement or idea shared by the conversation partner. Based on this understanding, 'Active Listening (initiating)' and 'Idea extension (initiating)' pertain to those rare occasions where partners structure their statement based on an implicit referent of the topic (conversation flow) they initiated. In addition, 'Multi-Issue Offer' and 'Suggestion of Concession' are additional dimensions specifically relevant to these situations, recognizing the unique dynamics present in negotiation conversations.

Annotation guidelines

Code in binary for each dimension (in a separate column): When one or more transacts exist in a focal segment or statement (i.e., the coding unit) in relation to the referent statement(s), code "1" in the corresponding dimension(s). In addition,

- For each statement to be coded (i.e., focal statement), look for its referent statement(s). A focal segment without a clear/explicit referent is not coded, except for *Active Listening (initiating)* and *Idea Extension (initiating)*.
- Coders do not have to code which statement(s) is the referent.

- For a train of thought ("continuation")--composed of more than one segment--when interrupted, code transactivity for the most relevant segment (i.e., the one clearer in reasoning; often the concluding segment).

❶ Active Listening

The focal speaker (ego) explores an idea by (1) addressing a question to the partner (alter) to solicit elaboration on the partner's thoughts (or asking for clarification, priorities/preferences), (2) completing the partner's reasoning, or (3) paraphrasing the dyadic position (or summarizing the agreement). To be noted, for (1) and (2), the speaker may paraphrase the partner's ideas and position. Examples (underlined) of active listening include:

- ***Ego***: And so what's left; job assignment and starting date
  Alter: I might not really… the job assignment...
  Ego: So what do you care about? If you prioritize it?
  Alter: So I care more about your starting date.

- ***Alter***: Division A would be, that's where we have the... I think that's where you would be the best fit, actually Division A.
  Ego: So because in that case, I can make maximum use of my skill sets.

- *After the discussion...*
  Ego: Okay. So salary is 86,000. Location is San Francisco. Insurance coverage is 90%.

- Notably, questions that parrot the partner's previous statement are *not* transactive. They are typically very short. For example:

  - ***Alter***: Okay, so just start with okay. Okay, Congratulations, you've already got an offer. So what are your expectations for salary?
    Ego: For salary?

- In addition, although a direct response is not transactive, a direct response to the partner's question that demonstrates *reasoning* is transactive (Active listening). In the example below, although the reasoning is weak, the speaker tried to support the offer with some pieces of evidence:

  - ***Alter***: Yeah. How about my salary?
    Ego: ... um salary is, I mean, I guess based off of what I have here on the budget—pretty tight in terms of mobility, so maximum 85,000.

- Although rare, “relationship-building” transacts may be coded transactive (Active listening). For example:

    - ***Ego***: "Oh, then, um.. actually, as as a firm, we are people who like to see people stay with us for you know, a long tenure. And over the course of that, I mean, I'm sure you will see. You will have a lot of benefits of being a part of our family. And yeah, so I think you should come over soon and join us and we can go from there."

❶-① Active Listening (initiating)

Last, code in separate “Active Listening (initiating)” for those rare segments that build on the topic/issue or the entire conversation the have had, and exhibit behaviors that can help the focal speaker better understand the partner’s thoughts, by raising questions about the partner’s preferences and priorities. For example:

- ***Ego***: "... Okay, so what about the starting date? Trying to start sooner as opposed to later? What are your needs? What are your needs like?”
- To be noted, segments that are more rhetorical and expressed in a way that does not specifically ask for the partners’ preference/priority are not coded (e.g., “How about starting date?”).

❷ Challenging Views

The focal speaker (ego) challenges/qualifies the partner’s (alter) viewpoint while leaving room for integration of the differences. Challenging views demonstrate a collaborative spirit, acknowledging explicitly or implicitly that the partner may have different goals, preferences, and needs that support their viewpoint.

- For annotation, pay attention to the speaker’s tone and attitude to determine if they are being constructive (vs. confrontational/competitive). Is the speaker’s tone inviting further discussion and indicating a willingness to continue engaging with the topic? Assess the tone of a statement by examining its structure using the following criteria. Consistent with other dimensions, code in binary (0 = no challenging views, 1 = challenging views).
    - For a given statement, check if the speaker is providing a rebuttal/qualification: either (a) making a counteroffer, (b) pointing out problems with alter's offer or suggestion (e.g., why it does not work for the speaker), or (c) qualifying alter’s statement (by modifying or adding context). If this precondition (rebuttal or qualification) is met, then evaluate if the speaker is making an effort to bridge the

gap, such as by suggesting more issues to be considered, revisiting the problem later, and raising follow up questions.

- More specifically, for those statements that involve rebuttals, look for suggestions that demonstrate a collaborative approach (e.g., logrolling) and language that expresses hedging (e.g., probably). Code the statement as '1' if it contains either or both of these elements. Additionally, even if these elements are absent, a focal text can still be coded as '1' if it has a high-level tone/approach that promotes collaboration, as interpreted through the examination of the context.

- It is important to note that the coding of 'Challenging Views' does not focus on whether the speaker recognizes or expands on the partner's ideas and thoughts (i.e., Active Listening or Idea Extension), but rather if they are **expressing** their qualification in a constructive way. Simply, whereas other dimensions focus on the content of speech/text, Challenging Views specifically focuses on the **tone or structure**.

- Examples:

  - *An example that contains all forms of challenging views*
    Alter: I'm willing to offer you 3% annual, uh 3% bonus.
    …
    Ego: Yeah. Considering that, you know, cost of livings is increasing. A bonus, of maybe, you know, I mean, we could probably reach on a compromise elsewhere. Like, I take less of a vacation, but you give me more of a bonus. Something like that. What do you think?

  - *The speaker makes a rebuttal (that is presumably beneficial for the partner) while suggesting tradeoff*
    Alter: I might be able to go 4.5 [for bonus]?
    Ego: There's only like 4% or 6%.
    Alter: Okay, so–
    Ego: I can compromise with you at 6% if you can work with me on a different aspect.

  - *This example showcases hedging and a high-level tone that is conducive for collaboration.*
    Alter: And I can give you Boston, which is like good place for 86,000. Because we have been recruiting people around 80,000 and I'm offering you 6000 more, with a good insurance coverage. And also, I'm giving you, like, 80% of moving expenses.

…
Ego: Yeah. That's a decent offer. Not quite what I have in mind. So maybe I could tell you what I have in mind, we could try to find some kind of a middle ground here.

- *The following demonstrates a high-level, collaborative mindset (at least superficially).*
  Alter: Okay. We'll do. Okay. Now. Starting date? Yes. How early do you want me to start? I can start as early as you want.
  Ego: Okay.
  Alter: As early as you know, first of June, or?
  Ego: No, actually, I, I think we can accommodate the situation. And you said you need vacation time as well. So let's do it- Let's do it in July.

cf. Regarding continuation: If a focal statement is a continuation of what has been previously stated, code it as a challenging view if it introduces a *new* form (or *clarifies* the intent for cooperation/collaboration). For most of the cases, code for the first instance. For example, the second statement made by Ego below expands upon the first point, which has already been coded as challenging views. However, the second statement explicitly indicates a willingness to cooperate.

Alter: I can go beyond 6%.
…
Ego (1): Okay, then how about we tie vacation time and bonus together?
Alter: Okay. How many-How much vacation time do you need?
Ego (2): Okay, I'm willing to take a bit of, you know, 6 uh... If you're giving me 6% then I'll need at least, you know, 20 days.

cf. More on hedging and logrolling: First, it is important to note that hesitation is not the same as hedging. Second, suggestions for tradeoffs that display an overtly aggressive or defensive tone and do not show a cooperative spirit should not be coded as challenging views.

cf. Regarding post-hoc optimization: If partners work together to optimize something they previously agreed on, it can be difficult to determine which statement made by the *other person* (alter) is being challenged. In these situations, do not label it as challenging views. However, if the rebuttal is clear and specific, even if the overall conversational flow is focused on optimization, it should be considered a valid challenging view.

❸ Idea Extension

The speaker extends an idea by (1) making a proposal (and asking for feedback), (2) critically evaluating the argument or raising counter-argument (offer), and/or (3) integrating different ideas (including *Multi-Issue Offer*, *Suggestion for Concession*). In particular, check if the speaker clearly demonstrated the thought process (reasoning). Examples include:

- *Alter and Ego discussed starting date and bonus earlier*
  Ego: <u>If I were to start later, could you move the bonus up another 2%?</u>

- *Sometimes the reasoning is articulated more subtly--*
  Alter: No, I cannot negotiate on the start date. I need to start as early as possible.
  Ego: <u>Okay, well, to start as early as possible, unfortunately, we won't be able to give you the 10% bonus</u>.

- *Here, the speaker critically engaged with the partner's proposal*
  Alter: Um, so maybe let's, let's start with... locations... So we'd really like to move you into our San Francisco office.
  Ego: <u>Ah.. San Francisco. Yeah. San Francisco is good. But it's much costlier, much more cost, much costlier than Atlanta, or Chicago for that matter. So, San Francisco is fine. But that would have to sort of that will affect the salary that I'm expecting...</u>

- To be noted, cases where the speaker makes a proposal without much substance--attempting to "feel out" the partner's position--are not coded transactive. For example, see Ego's second segment below:

  - ***Alter***: How much?
  - ***Ego***: 60%.
  - ***Alter***: 60? No.
  - ***Ego***: How about 70? Then?

- Similarly, proposals or counter-proposals across multiple issues are transactive *unless* the speaker or their partner already made a similar proposal and the speaker is just swapping out a specific element.

  - ***Ego*****:** like, even if you get to choose ①Atlanta or something you wouldn't want to do ②84?
  - ***Alter***: No, it would still be it would still be a big I think a big bang.
  - ***Ego***: Can you do *New York* 84?

- Sometimes the speaker proposes optimizing the results for both parties near the end of the negotiation by going over each issue again. The referent is not clear; the proposal refers to the previously held discussions as a whole. For example:

    - ***Ego***: So now, maybe we can try with insurance. We'll try like with all the others, and try to negotiate once more to see like if we are on the same page?

- Regarding continuation (see 'Annotation guidelines' above), code for the segment that is most relevant/clearer in reasoning. For example:

    - ***Ego (1)***: Okay. Well, okay, if I could get you if we could do Plan C for insurance coverage…
      Alter: Okay.
      Ego (2): Um, then I think I can do 84,000. Let's see.. What are we doing? Okay, the same. I can do.. is it.. What's your ideal location? Can you tell me that?

***cf.* More on continuation**: There may be cases where more than one segment is clearly transactive. To illustrate, statement *Ego (3)* below is a continuation of *Ego (2)*, where *Ego (3)* and *Ego (2)* display causal and conditional reasoning, respectively.

* *Note*: Statement *Ego (2)* may be a continuation, a "proposal without substance" (see above), or a simple repetition of *Ego (1)*.

- ***Ego (1)***: If I could start June 1 you can get Plan E.
  Alter: No.
  Ego (2): If I could start June 15 you can get Plan E. Why not?
  Alter: No.
  Ego (3): Because that way, you get what you want. I get what I want. It's a compromise for me, and then you get exactly what you want for.

- Similarly, in the following example, statement *Ego (2)* is a continuation of *Ego (1)* (compare & contrast reasoning), and it extends the idea of *Ego (1)* in relation to Alter's question.

    - *Alter*: Okay, how about okay, but what about the cost of living? Is it like Atlanta is too costly? I know, San Francisco is very costly. So I don't want to move over there.
      Ego (1): Atlanta is much more reasonable than say Chicago.

Alter: Okay.
Ego (2): They're much more reasonable than San Francisco.

- Or, the speaker may continue with the line of thought in order to help the partner better understand the logic. For example:

  * *Note*: Alter's second statement is not transactive; simple repetition.

  - *Alter*: But I compromised on a lot of things also right.
    Ego (1): I mean, it's not dependent on whether you compromise on five things, and I compromise on two, what if the compromise on two is more than quality?
    Alter: That's what I'm saying. I'm already compromising on a lot of things.
    Ego (2): But that's what I'm saying a lot of things doesn't mean that you compromise more than the amount, right? Maybe one compromise in salary is more than five compromises and five other things, right.

- There may also be cases where the continuation segment extends the idea by bringing in an issue discussed earlier. Then, multiple segments can be coded transactive. In the following example, *Ego (2)* brings in the issue of vacation, which was discussed in an earlier conversational flow, and makes a proposal (see transacts for negotiations below as well).

  - *Alter*: Let's hit the midpoint get let's get C.
    Ego (1): C. Okay. In that case, if you take insurance coverage, of Plan C, your salary would be at max of 82 then.
    Alter: No.
    Ego (2): Okay, let's take them in chunk. Okay. So let's see on the salary and bonus, no. Okay, let's, let's see salary and vacation time then. So if you take a salary of, of 84, for example, I can give you a vacation time of up to 15 days.

- Finally, there may be cases where the continuation emerged due to the partner *not* listening to the speaker's previous statement closely. In this case, it is *not* coded transactive. For example, see statements made by Alter and Ego (2) in relation to Ego (1).

  - *Ego (1)*: As I said earlier, I mean, I I'd rather go for any other easier division than working for division a, and settling for a lesser bonus, but if

you want me to stick to division A, I not drop below like I don't expect anything below 8%.
Alter: How about 6% of the time?
Ego (2): No, it's a lot of work. It seems to me like as I see it here Division A is a lot of work.

❸-① Idea Extension (initiating)

Additionally, code in separate "Idea Extension (initiating)" for those rare segments that build on the topic/issue or the entire conversation the have had, and exhibit behaviors that extend the argument and display clear reasoning. Typically, these are found in the beginning of a flow. For example:

- *Ego*: "Okay. Okay, vacation time. I would like to start with 25 days, but I'm pretty positive that you're not gonna go for 25 days. So I'm willing to compromise at 20 days."

The following are transacts ("Multi-Issue Offer" and "Suggestion of Concession") unique to the negotiation context. These transacts involve integrating different goals and interests, and often display conditional reasoning and/or compare-contrast reasoning. If the reasoning is not fleshed out, a given statement is not coded transactive. Similar to Active Listening (initiating) and Idea Extension (initiating), the referent is not confined to a specific prior statement when coding the following transacts.

❸-② Multi-Issue Offer

The speaker makes a multi-issue (vs single-issue) offer, bringing two or more different issues to the table. Importantly, as long as the speaker proposed a specific ***offer*** for one issue, code it as a multi-issue offer. A direct response to the offer--typically a counter-offer (without substance)--is not coded transactive. As an example, the speaker below is taking into account three issues, including insurance, location, and salary:

- *Ego*: "I could move down to Plan E and move down to a lower location. If you could move me up a salary brack… bracket."

❸-③ Suggestion of Concession

The speaker suggests concessions or package tradeoffs with respect to *specific* ***issues*** (without making a specific offer). For example:

- ***Ego***: "Can you look into increasing my salary for a change in location somewhere?"

- Moreover, "Suggestion of concession" may come in a different form, where the speaker is not asking for possible concessions on specific issues, but suggesting directions--asking for the *possibility of concessions*. For example:

  - ***Ego***: "Alright. Are there any other positions that you're looking to increase with- able to make changes in other areas?"

- ***cf***. A speaker may incorporate both transacts. In this case, code transactive for both dimensions. For example:

  - ***Ego***: "Okay, let's take them in chunk. Okay. So let's see on the salary and bonus, no. Okay, let's, let's see salary and vacation time then [*suggestion of concession*]. So if you take a salary of, of 84, for example, I can give you a vacation time of up to 15 days [*multi-issue offer*]."

- ***cf***. Segments that clearly indicate one's reservation point is *not* coded transactive as it does not extend the argument, but rather discourage concessions.

Final notes:

- A [direct] response without reasoning is *not* coded transactive (see the definition of active listening on p. 2). Response that demonstrates reasoning and/or paraphrases the partner's statement is transactive. For example:

  - ***Alter***: I'm sorry, I care equally. I care equally so two are equal to me, is one more important to you than the other?
    Ego: So um, for me, yeah, I do care equally. And job assignment and starting date.

  - ***Ego***: Sounds good. When would you like to start?
    Alter: How about the end of May? [*this is also a direct response*]
    Ego: I don't think that works for me.
    Alter: What's the earliest?*
    Ego: I was thinking like middle of July? [*a direct response*]

- Repetition of one's own statements is not coded transactive. For example, see the second statement made by Ego. To be noted, Alter's statement demonstrates paraphrasing of Ego's previous statement (and thus, transactive).

    - ***Ego***: I'm looking for increase in salary a little bit if I can do away with a lower plan.

      Alter: You said you're looking for more salary if you can get a lower...?

      Ego: I mean, I can negotiate on the plan if I can get a higher salary.

- Differences between 'asking for preferences/priorities (part of Active Listening) and 'asking for feedback' (part of Idea Extension): 'Asking for feedback' is directly tied to a particular proposal that a speaker made, whereas 'asking for preferences/priorities' under Active Listening pertains to those segments where a speaker asks for the partner's preferences/priorities either (a) without making a specific offer or (b) makes multiple offers and ask what they prefer/prioritize (for case (b), the segment would be coded both Idea Extension and Active Listening).

Appendix C: Sample Experiment Material

This is an exercise involving a negotiation between a job recruiter and a job candidate. You will play the role of the **job candidate**. You have already received a job offer, and now you will be discussing the final agreement with the recruiter. There are 8 issues to discuss:

- Bonus
- Job assignment
- Vacation time
- Starting date
- Moving expense coverage
- Insurance coverage
- Salary
- Location

As you will see in the **point sheet on the next page**, each of the issues has 5 potential options that are associated with different point values based on how important they are to you.

For example, your salary can range from $100,000 to $120,000. There are 5 different amounts you and the job recruiter can agree on, and each is associated with a different number of points for you (see point sheet). The same is true for all of the other issues.

Thus you and your partner need to negotiate the final details for these issues, which will determine how many points you earn. You will have up to 30 minutes to reach agreement on all 8 issues. In order for your agreement to be considered "final" you need to agree with your partner on all 8 issues, and you each need to sign off on the final agreement.

IMPORTANT**: **You should not share your list of point values with your negotiation partner, but instead communicate in the same way you would in other negotiations you might have in daily life.

Please review the points associated with different options carefully and think about how you want to approach the conversation with the job recruiter. As you examine the point values, you will see that the highest number of total points you can earn is 14,000, which results from succeeding in getting the recruiter to agree on the option you favor most for each issue. The lowest number of points you can earn is –9,200, resulting from agreeing to your least-favored option for each issue (see point sheet).

Additionally, there is important new information you should review before the meeting (see **important new information on the next page**).

After you review these details for a few minutes you will be asked to respond to some questions to make sure you understand how the exercise works before proceeding.

REFER TO THE POINT SHEET &
IMPORTANT NEW INFORMATION ON THE NEXT PAGE

Point Sheet

Do not communicate the points; Keep them to yourself

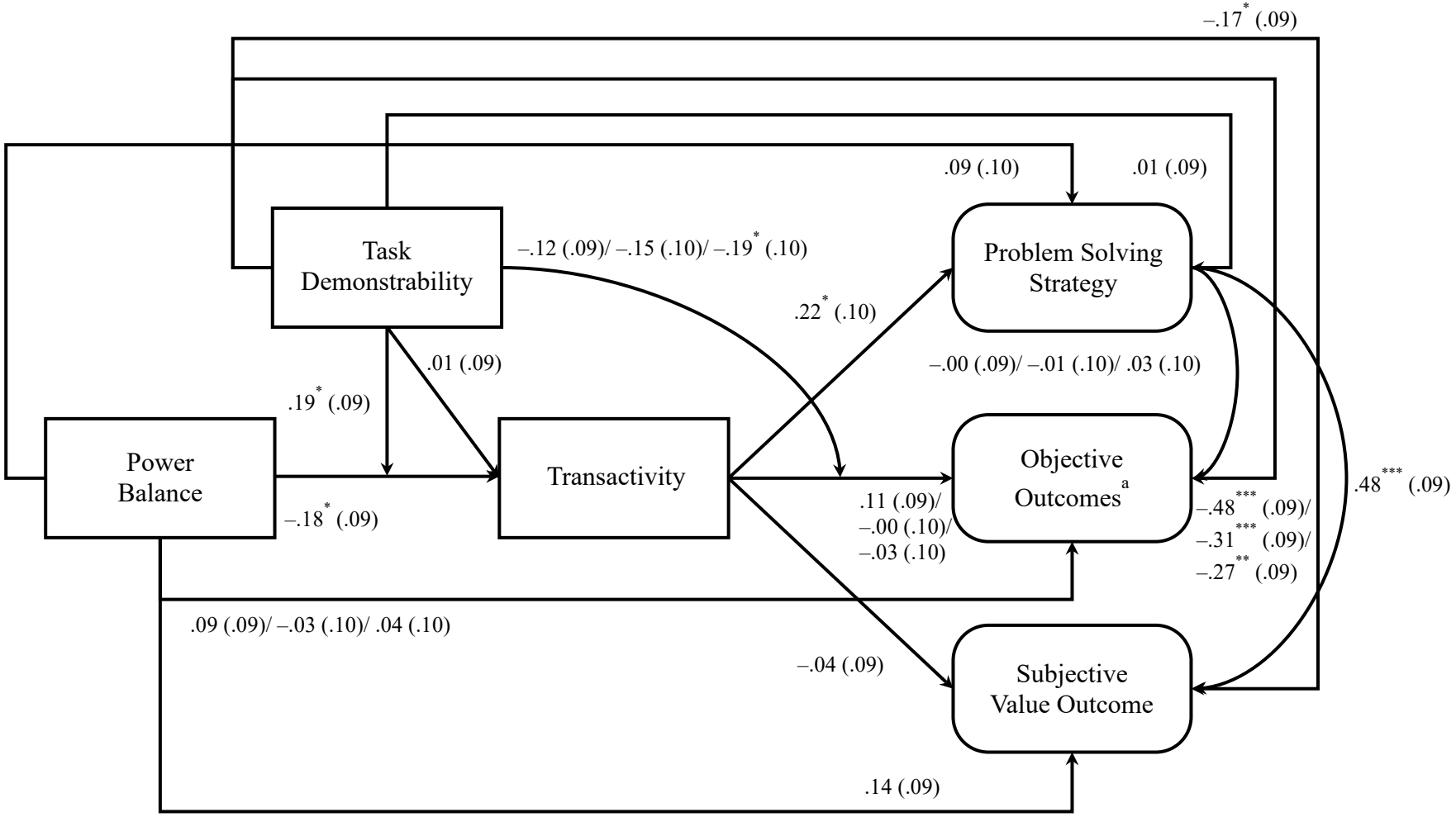
Issue	Options	Points	Issue	Options	Points
Bonus	10%	4000	Moving Expense Coverage	100%	3200
	8%	3000		90%	2400
	6%	2000		80%	1600
	4%	1000		70%	800
	2%	0		60%	0
Job Assignment	Division A	0	Insurance Coverage	Plan 1	2400
	Division B	–800		Plan 2	1800
	Division C	–1600		Plan 3	1200
	Division D	–2400		Plan 4	600
	Division E	–3200		Plan 5	0
Vacation Time	18 days	1600	Salary	$120,000	0
	16 days	1200		$115,000	–1500
	14 days	800		$110,000	–3000
	12 days	400		$105,000	–4500
	10 days	0		$100,000	–6000
Starting Date	June 1	1600	Location	San Francisco	1200
	June 15	1200		Atlanta	900
	July 1	800		Chicago	600
	July 15	400		Boston	300
	August 1	0		New York	0

Important New Information

You have just received word that a recruiter from another equally prestigious company has made you an offer. The final offer from that company is worth 2,400 points to you, which is not favorable. You can choose, therefore, not to reach an agreement with the recruiter you are about to meet with and choose, instead, to be hired by this new company for a total of 2,400 points.

In addition, the recruiter you are about to meet with has received a message from another equally qualified candidate, who indicated that they will accept a final offer from the recruiter worth 5,600 points to the recruiter, which is quite favorable for the recruiter.

Appendix D: Path Analysis Results (Full)



Note. $N = 103$ dyads. Unstandardized path estimates are reported, with standard error shown in parentheses. [a] Objective outcomes ($N = 103$ dyads) include joint sum, Pareto efficiency, and integrative quotient, and the effects on these outcomes are presented in the order joint sum, Pareto efficiency, and integrative quotient. * $p < .05$, ** $p < .01$, *** $p < .001$.