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# Follow my Language!

## Effect of Power Relations on Syntactic Alignment

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### Abstract

Communication accommodation is a phenomenon in social interactions in which people adjust their language to that of their interlocutor. A component of communication accommodation is research on power and dominance relations which suggests language use is dependent on power position. There are different linguistic markers which imply power standing of people. For example, when high power individuals interact with people in low power positions, the language of the interaction tends to follow the language of the high power individuals. While previous studies have mostly focused on the word-level features, we show that not only people in low power mirror word usage of people in high power, but they also adjust their syntactic structures to those in high power. Notably, we apply a computational tool on two corpora and show that individuals in low power align their syntactic structures to those in high power while people in high power do not.

**Keywords:** Syntactic Alignment; Communication Accommodation; Language of Power; ConversAtion level Syntax SImlarity Metric; Social Status; Coordination

### Introduction

Human language is an important tool which both captures and is affected by underlying psychological states and social interactions. Semantic analysis has received extensive attention over the years and the majority of the studies have focused on the role of semantics, and more specifically word-usage, in exploring psychological factors in evident language, such as political orientations and moral concerns (Pennebaker & Stone, 2003; Dehghani, Sagae, Sachdeva, & Gratch, 2014; Graham, Haidt, & Nosek, 2009; Dehghani et al., 2016; Mehl, Robbins, & Holleran, 2012; Maass, Karasawa, Politi, & Suga, 2006; Dehghani et al., 2013; Ramirez-Esparza, Chung, Kacewicz, & Pennebaker, 2008). At the same time, several studies have shown that syntactic features also carry vital information about individuals' and groups' characteristics, such as emotional states and personality (Bresnan & Hay, 2008; Vigliocco & Franck, 1999; Jahr, 1992; Gawda, 2010; Boghrati, Johnson, & Dehghani, 2017).

In the past decade, the development of various automatic tools for measuring syntactic features and capturing syntactic similarity (Lu, 2010; Kyle & Crossley, 2015; Graesser, McNamara, Louwerse, & Cai, 2004; Kyle, 2016; Niederhoffer & Pennebaker, 2002; Ireland & Pennebaker, 2010) has paved the way for researchers to explore a wider variety of novel and existing psychological questions by focusing not only on word usage but also on syntactic features.

A recent example of these tools is ConversAtion level Syntax SImlarity Metric (Boghrati, Hoover, Johnson, Garten, & Dehghani, 2017, CASSIM) which measures the syntactic similarity between two documents based on their sentences' constituency parse tree similarity. Employing CASSIM, Boghrati, Hoover, et al. (2017) studied Communication Accommodation Theory (Giles, 2008, CAT) and the interactive alignment model (Pickering & Garrod, 2004) in social media conversations. Specifically, they demonstrated the presence of syntactic alignment in social media.

These and other related theories propose that people adjust features of their communication dynamics, such as vocal patterns and gestures, while interacting with others in order to maximize or minimize their social differences (Shepard, Giles, & Le Poire, 2001). When producing an utterance, people often face multiple syntactic structure choices that convey relatively the same meaning. Syntactic alignment suggests that the availability of these choices is dependent on what people have recently heard or produced (Bock, 1986). For example, Boghrati, Hoover, et al. (2017) showed that when people write comment as response to a post, they tend to follow the syntactic structures used in that post compare to their previous writing style.

Several models have been introduced to explain the basic underlying cognitive mechanism of syntactic priming (Reitter, Keller, & Moore, 2011; Chang, Dell, & Bock, 2006), while other theories have focused on higher social-cognitive explanations of this phenomenon. For example, the social exchange process theory, a component of communication accommodation theory, states that people assess the utilities and costs of their actions and choose accordingly. Although, priming might decrease personal identity, it is also a mechanism to become similar to others and thus attract their attention (Giles, 1979). For example, research shows that people who are in low power positions tend to adapt their language to the language of their superiors (Danescu-Niculescu-Mizil, Lee, Pang, & Kleinberg, 2012). In their study, Danescu-Niculescu-Mizil et al. (2012) examined function word classes and demonstrated the linguistic coordination among people with different power status. However, this work was focused only on word-level patterns, i.e., what words people choose rather than how they put the words together. In a different study, Kacewicz, Pennebaker, Davis, Jeon, and Graesser

(2013) identified a range of linguistic markers which indicate whether a speaker is speaking to a superior or to a subordinate.

Building off of the results of capturing syntactic alignment in social media using CASSIM, in the current study, we aim to investigate the relationship between syntactic features and power dynamics. Our goal is to employ a tool for measuring syntactic features and examine whether syntactic alignment can indicate if a person is in high power or in low power. Particularly, we apply CASSIM on two real-life situations in which people with different power positions have verbal communications: the U.S. Supreme Court dialogues among lawyers and justices, and Wikipeda conversations among editors with administrative and non-administrative access (Danescu-Niculescu-Mizil et al., 2012). These two corpora are specifically suitable for our purpose as conversations occur between interlocutors who are positioned in different power positions and interact to achieve a goal.

In the following sections, we first describe the method used in this study to measure syntactic similarity among conversations. Next, we explain the two studies we conducted to explore the relationship between syntax and power. For each study, we first describe the dataset and our approach, then we demonstrate and explain the results. Finally, we discuss our results and conclusions.

## Method

In this section, we explain our approach for measuring syntactic structures of conversations. Notably, our goal is to assess a syntactic similarity score for verbal conversations between two people. These scores will help us determine whether syntactic alignment can be a marker of power status and dominance.

To measure syntactic similarity scores, we used Conversation level Syntax SIMilarity Metric (Boghrati, Hoover, et al., 2017, CASSIM). CASSIM relies on edit distance difference of constituency parse trees to evaluate syntactic similarity of documents or conversations. Given two documents, first, CASSIM generates constituency parse trees for the sentences in each document. Second, it calculates the edit distance between each two sentences' constituency parse trees. Edit distance captures the number of operations (adding, removing, or replacing) needed to transfer one tree to another. Next CASSIM matches the most syntactically similar sentences across the two documents using Hungarian algorithm. Finally, it provides a score between 0 and 1 where higher numbers indicate higher similarity between the two documents. For more details on how CASSIM works see Boghrati, Hoover, et al. (2017).

As mentioned earlier, in the current paper, we use two corpora for studying the relationship between syntactic alignment and power status: the U.S. Supreme Court dialogues and Wikipedia conversations. These two corpora include conversations among people who are in different power positions and interact to achieve a desirable goal. In the following two

analyses, we employ CASSIM to compare each two pair of consecutive turns in a conversation between two persons with different power status and assess a syntactic similarity score. We then treat these scores as the degree to which interlocutors coordinate with one another in terms of syntactic structure use. For instance, in the example shown in table 1, we measure the syntactic similarity of the lawyer's response to what the justice has just uttered and also the syntactic similarity of the justice's reply to the lawyer. The first score is the syntactic coordination score of the lawyer toward the justice while the second score serves as the syntactic coordination score of the justice toward the lawyer.

## Studies

As noted earlier, Communication Accommodation Theory (Giles, 2008) suggests that people in low power adjust their language to people in higher power position. In other words, the language used by people during a communication is likely to reflect the language of the person in the higher power role (West & Turner, 2013).

The main hypothesis of our analyses is drawn upon the above mentioned theories (Giles, 2008; West & Turner, 2013). We are primarily interested in examining the following hypothesis:

- People in low power tend to accommodate their syntactic structures toward people in high power while people in high power generally do not converge toward people in low power.

In the following subsections, for each study, we first introduce the corpus, then describe the process, and finally report and discuss the results.

### The U.S. Supreme Court Study

For the first analysis, we used the U.S. Supreme Court dialogue corpus collected by Hawes, Lin, and Resnik (2009) and later Expanded to include the final votes by Danescu-Niculescu-Mizil et al. (2012). We applied CASSIM on the conversations happening among the justices and lawyers in each case. Then, we conducted independent t-tests to examine our hypotheses. In the following, we first describe the dataset and our procedure. Then, we report and discuss the results.

**Data** The U.S. Supreme Court corpus includes oral arguments among justices and lawyers. During a case, the lawyers have thirty minutes to defend their party. The justices, a group of nine individuals, may interrupt the lawyers to ask questions or clarifications which often lead to interactions between the lawyers and the justices. After the arguments for each case, the final decision is made by the majority votes of the justices.

The oral arguments includes 204 cases with the total of 50,389 verbal exchanges among 11 justices and 311 lawyers. For more details about the corpus see Danescu-Niculescu-Mizil et al. (2012).

Table 1: U.S. Supreme Court dialogues example

<p><i>Justice O'Connor:</i> Would you mind explaining to us how these two cases relate? The Court of Appeals for the Federal Circuit decision went one way and the Tenth Circuit went another. And are the claims at all overlapping? How are they differentiated?</p> <p><i>Mr. Miller:</i> No, Justice O'Connor. They're – they're not overlapping. The claims in the Federal Circuit case involved three contracts covering fiscal years 1994, 1995, and 1996. And the Cherokee contract at issue in the case that went through the Tenth Circuit is fiscal year 1997 contract and funding agreement. The section – remedial section of the act, section 110</p> <p><i>Justice O'Connor:</i> But they're certainly at odds on the legal theory.</p>
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**Analysis** To explore the relationship between power status and syntactic structure alignment, we re-framed our hypothesis stated earlier for the U.S. Supreme Court corpus as following:

- Lawyers align their syntactic structure use toward justices more than justices coordinate toward lawyers.
- Lawyers align their syntactic structure use toward Chief justices more than they do toward Associate justices because Chief justices are in higher power position compare to Associate justices.
- Lawyers align their syntactic structure use toward justices who eventually vote against them (i.e. whom they are more dependent on) more than they do toward justices who voted for them.

**Results** We used CASSIM to measure the syntactic similarity score between each two pair of consecutive turns in a conversation between a lawyer and a justice. We then labeled the turns where a lawyer speaks to a justice as low-to-high and the turns where a justice speaks to a lawyer as high-to-low. As table 2 shows, applying a t-test with CASSIM score as dependent variable and comparison type (corresponding to low-to-high condition or high-to-low condition) as independent variable demonstrated that lawyers adjust their syntactic structure toward justices more than justices do toward lawyers  $t(48012) = 7.69, p < 0.001, d[95\%CI] = 0.07[0.05, 0.09]$ .

Further, recognizing the second hypothesis, we examined whether lawyers coordinate more toward the Chief justice or the Associate justices. Because Chief justices are in higher power position compare to Associate justices, we hypothesized that syntactic structure alignment between lawyers and Chief justices is stronger than between lawyers and Associate justices. Similar to the previous hypothesis, we used CASSIM to compare lawyers syntactic structure use toward Chief justices and their syntactic structure use toward Associate justices. As table 2 shows, applying an independent t-test with comparison type (Chief-justices or Associate-justices) as independent variable and CASSIM scores as dependent variable showed that lawyers coordinate their syntactic structure use toward Chief justices more than they do toward Associate justices  $t(3048.9) = 7.71, p < 0.001, d[95\%CI] = 0.16[0.12, 0.2]$ .

Finally, we used CASSIM to compare syntactic structure alignment of lawyers toward justices who voted against them, and justices who voted for them. We hypothesized that lawyers coordinate their syntactic structure towards justices who lean against them more than justices who may be in favor of them. The reason for this is because lawyers need to convince justices who are against them. As a result, they are more dependent on them (Emerson, 1962). The results confirm our hypothesis: Applying a t-test with comparison type (opposite-side or same-side) as independent variable and CASSIM scores as dependent variable show that lawyers tend to mimic the syntactic structure to justices who voted for the opposite side more closely compare to justices who voted for their side  $t(20329) = 3.35, p < 0.001, d[95\%CI] = 0.04[0.02, 0.07]$  (See table 2).

**Discussion** In this study we examined the relationship between power and syntactic structures in the U.S. Supreme Court oral arguments among lawyers and justices. We used CASSIM to measure syntactic structure alignment in the arguments. As table 2 demonstrates, our results showed that lawyers, who are in lower power position, adapt their syntactic structures toward justices. Further, lawyers tend to use syntactically more similar language to Chief justices compare to Associate justices. The difference emerges because Chief justices are positioned in higher power status compare to Associate justices, and therefore we expect more syntactic alignment.

Finally, we showed the effect of dependency in power difference on syntactic alignment. The need for convincing another person in a conversations creates a form of dependency (Emerson, 1962). Our results show that lawyers align their syntactic structures toward justices who eventually voted against them more than they align toward justices who eventually voted for them. One possible explanation is that because lawyers desire to alter justices' votes toward their own side, they feel more dependency towards justices on the opposite side which leads to higher in-balance in power positions. As a result, they tend to mimic the language style of opposing lawyers more closely.

## Wikipedia Study

In the second study, we used a Wikipedia conversations corpus introduced by Danescu-Niculescu-Mizil et al. (2012). We

Table 2: Supreme Court Results

Hypothesis	t	df	Effect Size	[95% CI]	p
Lawyers coordination toward justices	7.69	48012	0.07	[0.05,0.09]	<.001
Lawyers coordination toward Chief justices	7.71	3048.9	0.16	[0.12,0.2]	<.001
Lawyers coordination toward justices on the opposite side	3.35	20329	0.04	[0.02,0.07]	<.001

Table 3: Wikipedia Result

Hypothesis	t	df	Effect Size	[95% CI]	p
Non-Admin editors coordination toward admin editors	2.59	66678	0.02	[0,0.03]	<.001

applied CASSIM on the conversations among editors with administrative and non-administrative access to compare their syntactic structures and to examine whether non-admin editors align their syntactic structures toward admin editors. In the following subsections, we first describe the corpus, then explain the procedure, and finally report and discuss the results.

**Data** The Wikipedia corpus includes conversations among editors with either administrative or non-administrative access about changes to different articles. Generally, these interactions are collaborative discussions in order to achieve a common goal. Some Wikipedia editors have administrative roles which gives them permission for certain functions (such as page deletion, page protection, or blocking and unblocking) and therefore higher status compare to editors with non-administrative access.

This corpus includes 240,436 conversational exchanges among editors with known status, that is either administrative role or non-administrative role, on the talk pages about changes to articles. For more details see Danescu-Niculescu-Mizil et al. (2012).

**Analysis** In this analysis, to investigate the effect of power status on syntactic alignment, we directly examined the hypothesis stated in Section 3: People in low power coordinate toward people in high power while people in high power do not. In the Wikipedia corpus, administrative editors exhibit high power compared to non-administrative editors. Notably, we are interested in investigating the following hypothesis in this study:

- Editors with non-administrative role adapt their syntactic structures toward editors with administrative role while editors with administrative role do not converge toward editors with non-administrative role.

**Results** We used CASSIM to compare syntactic structures used by administrative editors and non-administrative editors in conversation exchanges. We then labeled the conversation exchanges as admin-to-nonadmin when an editor with administrative role replies to an editor with non-administrative role and nonadmin-to-admin when an edi-

tor with non-administrative role replies to an editor with administrative role. As table 3 shows, applying an independent t-test with comparison type (corresponding to either admin-to-nonadmin or nonadmin-to-admin) as independent variable and CASSIM scores as dependent variable demonstrated that editors with non-administrative role coordinate their syntactic structure use toward editors with administrative role more than administrative editors coordinate toward non-administrative editors  $t(66678) = 2.59, p < 0.001, d[95\%CI] = 0.02[0, 0.03]$ .

**Discussion** In the second study, we used a corpus of conversations among editors of Wikipedia with either administrative or non-administrative role to explore the relationship between power dynamics and syntactic alignment. Wikipedia editors with administrative roles, have access to certain functions and are, therefore, in higher power position compare to editors who do not have administrative role. While, results of a study by Danescu-Niculescu-Mizil et al. (2012) showed that users coordinate toward administrative editors more than non-administrative editors and also that administrative editors coordinate toward users more than non-administrative editors do, in our study, we only focused on the interactions between administrative editors and non-administrative editors. Our analysis showed that editors with non-administrative role adjust their syntactic structure use toward editors with administrative role more than administrative editors do toward non-administrative editors. The results support our main hypothesis that people in low power positions adapt their syntactic structures toward people in high power positions.

## General Discussion and Future Work

The two analyses in this study provided evidence for the relationship between power status and syntactic alignment. Our results demonstrate that individuals in low power positions accommodate their syntactic structure towards those in high power positions more than high power individuals do towards low power people.

Notably, in the first analysis, we used a corpus of the U.S. Supreme Court oral arguments and showed that lawyers (who are in low power) coordinate their syntactic structure toward

justices (who are in high power) more than justices coordinate toward lawyers. Further, we also showed that lawyers tend to adapt their syntactic structure toward Chief justices more than Associate justices which can be explained by the difference in power position of Chief justices and Associate justices. Finally, we investigated the effect of dependency in syntactic alignment. Our results showed that lawyers adjust their syntactic structure toward justices who at the end voted against them more than justices who were on their side and voted for them.

In the second analysis, we examined our main hypothesis in a corpus of Wikipedia conversations among editors with administrative and non-administrative access. The same effect held in this analysis, that is, non-administrative editors (who are in low power) coordinate their syntactic structure toward administrative editors (who are in high power) more than administrative editors do toward non-administrative editors.

As stated in the social exchange theory (Giles, 1979), people assess the utilities and costs of their actions prior to acting. For example, language alignment may attract others in a cost of decreasing personal identity. Therefore, drawing from the results of our analyses, a possible explanation is that when people in different power positions communicate, those who are in low power try to converge to people in higher power as it brings them greater utility in form of establishing rapport and becoming closer to those in power. While, people in high power see no utility in converging toward people in low power. However, we may acknowledge that factors such as role (Branigan, Pickering, McLean, & Cleland, 2007), task (Reitter & Moore, 2014) or other social mediated factor (Weatherholtz, Campbell-Kibler, & Jaeger, 2014) might impact syntactic convergence. (Reverdy & Vogel, 2017)

Building on the results of our analyses, we aim to study syntactic structures in finer grain details and explore syntax categories which are more common among people in low or high power. In other words, our goal is to study whether there are syntactic structures which can play as linguistic markers of people in different power positions. Further, we intend to investigate which syntactic structures are more likely to be mirrored by people in lower power positions.

In summary, our results support our hypothesis that the relationship between language alignment and power is not limited to word-level features. The same effect may be found in the syntactic structure use of people in different power positions, that is, low power people align their syntactic structure toward high power people more than high power people do toward low power people.

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## References

Bock, J. K. (1986). Meaning, sound, and syntax: Lexical priming in sentence production. *Journal of Experimental*

*Psychology: Learning, Memory, and Cognition*, 12(4), 575.

Boghrati, R., Hoover, J., Johnson, K. M., Garten, J., & Dehghani, M. (2017). Conversation level syntax similarity metric. *Behavior research methods*, 1–19.

Boghrati, R., Johnson, K. M., & Dehghani, M. (2017). Generalized representation of syntactic structures. In *Cogsci*.

Branigan, H. P., Pickering, M. J., McLean, J. F., & Cleland, A. A. (2007). Syntactic alignment and participant role in dialogue. *Cognition*, 104(2), 163–197.

Bresnan, J., & Hay, J. (2008). Gradient grammar: An effect of animacy on the syntax of give in new zealand and american english. *Lingua*, 118(2), 245–259.

Chang, F., Dell, G. S., & Bock, K. (2006). Becoming syntactic. *Psychological review*, 113(2), 234.

Danescu-Niculescu-Mizil, C., Lee, L., Pang, B., & Kleinberg, J. (2012). Echoes of power: Language effects and power differences in social interaction. In *Proceedings of the 21st international conference on world wide web* (pp. 699–708).

Dehghani, M., Bang, M., Medin, D., Marin, A., Leddon, E., & Waxman, S. (2013). Epistemologies in the text of children's books: Native-and non-native-authored books. *International Journal of Science Education*, 35(13), 2133–2151.

Dehghani, M., Johnson, K., Hoover, J., Sagi, E., Garten, J., Parmar, N. J., ... Graham, J. (2016). Purity homophily in social networks. *Journal of Experimental Psychology: General*, 145(3), 366.

Dehghani, M., Sagae, K., Sachdeva, S., & Gratch, J. (2014). Analyzing political rhetoric in conservative and liberal weblogs related to the construction of the ground zero mosque. *Journal of Information Technology & Politics*, 11(1), 1–14.

Emerson, R. M. (1962). Power-dependence relations. *American sociological review*, 31–41.

Gawda, B. (2010). Syntax of emotional narratives of persons diagnosed with antisocial personality. *Journal of psycholinguistic research*, 39(4), 273–283.

Giles, H. (1979). en p. smith. 1979. accommodation theory: Optimal levels of convergence. H. Giles and St. Clair (eds.), *Language and Social Psychology*, 45–87.

Giles, H. (2008). *Communication accommodation theory*. Sage Publications, Inc.

Graesser, A. C., McNamara, D. S., Louwerse, M. M., & Cai, Z. (2004). Coh-metrix: Analysis of text on cohesion and language. *Behavior research methods, instruments, & computers*, 36(2), 193–202.

Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of personality and social psychology*, 96(5), 1029.

Hawes, T., Lin, J., & Resnik, P. (2009). Elements of a computational model for multi-party discourse: The turn-taking behavior of supreme court justices. *Journal of the Association for Information Science and Technology*, 60(8), 1607–

- 1615.
- Ireland, M. E., & Pennebaker, J. W. (2010). Language style matching in writing: synchrony in essays, correspondence, and poetry. *Journal of personality and social psychology*, 99(3), 549.
- Jahr, E. H. (1992). Middle-aged male syntax. *International Journal of the Sociology of Language*, 94(1), 123–134.
- Kacewicz, E., Pennebaker, J. W., Davis, M., Jeon, M., & Graesser, A. C. (2013). Pronoun use reflects standings in social hierarchies. *Journal of Language and Social Psychology*, 0261927X13502654.
- Kyle, K. (2016). *Measuring syntactic development in l2 writing: Fine grained indices of syntactic complexity and usage-based indices of syntactic sophistication*. Unpublished doctoral dissertation, Georgia State University.
- Kyle, K., & Crossley, S. A. (2015). Automatically assessing lexical sophistication: Indices, tools, findings, and application. *TESOL Quarterly*, 49(4), 757–786.
- Lu, X. (2010). Automatic analysis of syntactic complexity in second language writing. *International Journal of Corpus Linguistics*, 15(4), 474–496.
- Maass, A., Karasawa, M., Politi, F., & Suga, S. (2006). Do verbs and adjectives play different roles in different cultures? a cross-linguistic analysis of person representation. *Journal of personality and social psychology*, 90(5), 734.
- Mehl, M. R., Robbins, M. L., & Holleran, S. E. (2012). How taking a word for a word can be problematic: Context-dependent linguistic markers of extraversion and neuroticism. *Journal of Methods and Measurement in the Social Sciences*, 3(2), 30–50.
- Niederhoffer, K. G., & Pennebaker, J. W. (2002). Linguistic style matching in social interaction. *Journal of Language and Social Psychology*, 21(4), 337–360.
- Pennebaker, J. W., & Stone, L. D. (2003). Words of wisdom: language use over the life span. *Journal of personality and social psychology*, 85(2), 291.
- Pickering, M. J., & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and brain sciences*, 27(02), 169–190.
- Ramirez-Esparza, N., Chung, C. K., Kacewicz, E., & Pennebaker, J. W. (2008). The psychology of word use in depression forums in english and in spanish: Texting two text analytic approaches. In *Icwsn*.
- Reitter, D., Keller, F., & Moore, J. D. (2011). A computational cognitive model of syntactic priming. *Cognitive science*, 35(4), 587–637.
- Reitter, D., & Moore, J. D. (2014). Alignment and task success in spoken dialogue. *Journal of Memory and Language*, 76, 29–46.
- Reverdy, J., & Vogel, C. (2017). Linguistic repetitions, task-based experience and a proxy measure of mutual understanding. In *Cognitive infocommunications (cogincom)*, 2017 8th IEEE international conference on (pp. 000395–000400).
- Shepard, C. A., Giles, H., & Le Poire, B. A. (2001). Communication accommodation theory. *The new handbook of language and social psychology*(1.2), 33–56.
- Vigliocco, G., & Franck, J. (1999). When sex and syntax go hand in hand: Gender agreement in language production. *Journal of Memory and Language*, 40(4), 455–478.
- Weatherholtz, K., Campbell-Kibler, K., & Jaeger, T. F. (2014). Socially-mediated syntactic alignment. *Language Variation and Change*, 26(3), 387–420.
- West, R., & Turner, L. H. (2013). *Introducing communication theory: Analysis and application* (2013 ed.).