Influence of Social Perception and Social Monitoring on Structural Priming

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Abstract

Although structural priming has been considered to be an independent cognitive process, recent evidence suggests that structural priming is modulated by sociocognitive factors such as social perception; speakers are more likely to mimic the sentence structure of a socially desirable interlocutor than the structure of a less desirable interlocutor. This study aims to further address the role of sociocognitive factors in language use by investigating how individual differences in social perception and tendency to align with others (i.e., social monitoring) modulate same-verb structural priming. In particular, we investigate how likely students are to repeat a sentence structure of a teacher depending on their perception of the teacher and their social monitoring tendency. Our results demonstrate that students’ tendency to imitate a sentence structure of the teacher is positively influenced by their perception of the teacher but negatively by social monitoring. We suggest that the effects may be accounted for in terms of their influence on attention and memory encoding.

Keywords: Social monitoring (self-monitoring); Social perception; Socially mediated priming; Structural priming; Teacher–student relationship

1. Introduction

Repetition is a central aspect of human behavior. One form of repetition well documented in language use is structural priming, a tendency to produce a syntactic structure that was previously encountered rather than an alternative structure (Bock, 1986). For example, if speakers whose task was to describe Fig. 1 were primed with a passive sentence (e.g., “a chicken was chased by a fox”), they are more likely to describe the event

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using a passive sentence than an active sentence (e.g., “a policeman was bitten by a dog” as compared to “a dog bit a policeman”).

Psycholinguistic research has traditionally assumed that structural priming arises automatically as a result of either the activation of a recent structure (e.g., Branigan, Pickering, & Cleland, 1999; Dell, 1986; Pickering & Branigan, 1998) or implicit procedural learning (e.g., Bock & Griffin, 2000; Chang, Dell, & Bock, 2006; Jaeger & Snider, 2013). In particular, the activation account suggests that a recently used linguistic structure activates its representation in memory, increasing the probability of reusing the same structure than the alternative structure. The implicit learning account suggests that structural priming is not due to transient activation of a linguistic structure, but long-term changes in weights associated with mappings between message and syntactic representations. Critically, both accounts postulate that structural priming is a largely automatic cognitive process independent of other factors.

Yet recent research suggests that structural priming is not entirely independent, but is modulated by sociocognitive factors. For example, Balcetis and Dale (2005) found that participants who interacted with an amiable, unassuming confederate were more likely to repeat the sentence structure of the confederate than those who interacted with a mean snobby confederate. More recently, Weatherholtz, Campbell-Kibler, and Jaeger (2014) found that structural priming was modulated by social factors such as participants’ perceived standardness of an accent and their conflict management style; participants who perceived the speaker’s accent to be more standard and who preferred compromise as a conflict management strategy showed greater priming effects. Such socially mediated structural priming is consistent with social influences on phonetic alignment in sociolinguistic literature (e.g., Babel, 2010; see Hay & Drager, 2007, for a review). Sociolinguistic research suggests that social modulations of linguistic alignment arise commonly
because speakers use linguistic alignment as a strategy to identify or enhance closeness with an interlocutor, showing greater alignment with a socially desirable interlocutor (e.g., Giles, Taylor, & Bourhis, 1973).

It is worth noting, however, that the interlocutors in the previous structural priming studies exhibited clearly socially desirable or undesirable traits (e.g., nice vs. mean) such that they had a significant influence on participants’ perception over a brief or no social interaction. Yet an interlocutor in everyday communication may not exhibit such clear-cut traits and individuals’ perception of the same interlocutor often varies depending on their long-term interaction with the interlocutor. Individuals’ sensitivity and ability to adapt to the interlocutor or, more broadly, to social situations also varies. These considerations then raise an interesting question: How do individual differences in social perception and tendency to adapt to social situations modulate structural priming in the real world? Our consideration of individual differences is similar to that of Weatherholtz et al. (2014), but our study is different in several respects. We examine the influence of individual differences in a real-world interactional setting without manipulating social traits of an interlocutor. We investigate how structural alignment is modulated by an interaction strategy not limited to conflict situations, that is, individual’s sensitivity and ability to adapt to social situations.

In order to obtain ecologically valid data, we address the question in a school setting. In particular, we investigate how likely students are to repeat the structure of scripted sentences read by a teacher depending on their perception of the teacher and their tendency to adapt to social situations. The use of scripted sentences does not allow us to observe syntactic alignment in a fully interactive setting. Nonetheless, the extent that students mimic the sentence structure of the teacher should provide insights into how sociocognitive factors modulate linguistic alignment in the real world, significantly extending previous studies that manipulated social perception over a brief or no social interaction. We additionally investigate students’ perception of the course and course performance as potential predictors of structural alignment.

2. Method

2.1. Participants

We recruited participants from a high school in Korea. They were first-year students in the same classroom with the same homeroom teacher. Of the 33 students, only 29 (19 females) participated in the study due to scheduling constraints. Despite a high risk of spurious effects (Type I errors) and null effects (Type II errors; see Simmons, Nelson, & Simonsohn, 2011; Weatherholtz et al., 2014, for further discussion), the small sample was unavoidable as we aimed to address the role of individual variability with the same interlocutor. At the time of testing, students had known the teacher for about 4 months. They participated in the study for 10,000 won (US $10) per hour. All participants were native speakers of Korean.
2.2. Materials and procedures

Participants completed a structural priming task followed by a survey measuring social perception and social monitoring tendency. Structural priming was measured using transitive (active/passive) constructions in a picture description task. We used 16 target images that could be felicitously described using active and passive sentences (e.g., see Appendix A, Fig. 1). On each trial, a target image was preceded by a prime image involving the same verb. We constructed two lists by pairing each prime image with an active and a passive sentence in Korean. Each list had a forward and backward order. The location of the agent and patient (left or right) were counterbalanced across two lists. The target trials were combined with 16 filler trials. The filler images were similar to the targets in style, but they did not depict transitive events (e.g., intransitive events).

Students were asked to perform the picture description task with their homeroom teacher, who was also their math teacher. The teacher and a student sat opposite each other with PCs between them. They could not see each other’s screen. The teacher and the student described pictures to each other and verified each other’s descriptions. The experiment was set up such that the teacher always described a prime picture. Instead of spontaneous descriptions, the teacher produced scripted prime sentences shown on the monitor. The student’s task was to press “J (YES)” if the teacher’s description matched their own picture, and “F (NO)” otherwise. Immediately after their response, the prime picture was replaced by a target picture and the student described the target image. Their speech was recorded with a desk microphone. When the teacher responded to the student’s description, the target picture was replaced by a prime picture for the next trial. Students were familiarized with the procedure in the practice session.

After the picture description task, students completed an online survey. We measured students’ perception of the teacher using the teacher–student relationship positivity scale developed by Gehlbach, Brinkworth, and Harris (2011, 2012) (see Appendix B). The scale consists of nine items and assesses the teacher–student relationship in terms of students’ perception of the teacher (e.g., “How much do you like the teacher’s personality?”) and the course (e.g., “How motivating are the activities that the teacher plans for class?”). Since (a) students’ perceptions of the teacher and the course are not necessarily the same and (b) we intended to distinguish the influences of the two, we divided the scale into the teacher and the course category based on Gehlbach et al. (2011) and calculated the average score for each category.

To measure students’ tendency to adapt to social situations, we used a 13-item self-monitoring scale developed by Lennox and Wolfe (1984). We chose the scale because (a) it is commonly used to measure the extent to which an individual is sensitive and able to modify their behavior in response to external situations (e.g., “In social situations, I have the ability to alter my behavior if I feel that something else is called for.”) and (b) it is readily available. Those who score high in self-monitoring are more likely to attune their behavior to others, whereas those who score low in self-monitoring care less about how others behave (e.g., Snyder, 1987). The self-monitoring scale included reverse scoring items, which we used to assess consistency of participants’ responses. We henceforth
refer to self-monitoring as social monitoring because self-monitoring in psycholinguistic research refers to speakers’ monitoring of their own speech (e.g., Levelt, 1989).

All survey items were scored on a 7-point Likert scale (e.g., 1 = Not at all; 7 = Very much). The order of survey sections was randomized and each section was presented on a different webpage. To prevent later responses from affecting earlier responses, students were not allowed to go back to previous questions. The entire study took about an hour.

2.3. Coding and analyses

Five participants who did not complete the survey (three participants) or showed opposite trends on the reverse scoring items on the social monitoring scale (two participants) were excluded from the data analyses. For the remaining 24 participants, we transcribed and analyzed their speech for the choice of active/passive structure. Utterances that did not contain a subject, object, and verb (“A policeman was bitten.”) were excluded from further analyses. In total, <3% of the trials were removed (10 out of 384).

The results were analyzed using a mixed logit regression (Jaeger, 2008). To reduce researcher degrees of freedom (i.e., the flexibility in the data analysis and interpretation of results) and to increase comparability, we closely followed the statistical approach adopted in Weatherholtz et al. (2014). One exception was that we did not employ automated factor analysis with pre-determined inclusion thresholds. Rather, we determined a priori which questions to include as predictors in the analysis. This was feasible because our study included fewer predictors than Weatherholtz et al.’s.

We first analyzed active/passive responses (Active response = 1, Passive response = 0) as a function of prime (active/passive) to replicate structural priming independent of social perception and social monitoring. Prime condition was coded with sum contrasts (Active condition = −1, Passive condition = 1). The model included the maximal by-subject and by-item random effects structure justified by the design (random intercepts for subject and item, and by subject and item random slopes for prime).

To assess how the priming effect is modulated by individual differences in social perception and social monitoring, we then analyzed matching responses (whether students repeated the sentence structure produced by the teacher; Matching response = 1, Non-matching response = 0) as a function of prime, perception of teacher, and social monitoring. We also included students’ perception of the course and course performance as potential predictors of structural alignment. We ran a full model with prime condition, teacher perception, social monitoring, course perception, course performance, and all two-way interactions between prime condition and each predictor. Prime condition was sum contrast coded (Active condition = −1, Passive condition = 1), and numeric predictors were centered prior to analyses. We then performed a step-wise reduction procedure to locate the simplest model that did not differ significantly from the full model in terms of variance explained. Because models with maximal random effects did not converge in most cases, we included a random slope for each factor if inclusion improved the fit of the model. The final model included prime condition, teacher perception, and social monitoring as fixed effects and participant and item intercepts as random effects with a
random slope for prime by participants (Table 1). We report the coefficient for each independent variable and its level of significance. Coefficients in mixed logit models are given in log-odds.

3. Results

Fig. 2 plots the proportion of active sentences as a function of whether the teacher produced active or passive sentences. As can be seen, students produced significantly fewer active sentences when the teacher used a passive structure than an active structure (41% vs. 80%, $\beta = 1.34$, $z = 4.92$, $SE = 0.27$, $p < .001$). This replicates the well-established structural priming in previous literature.

Crucially, we found that the structural alignment was significantly modulated by individual differences in social perception and social monitoring. As can be seen in Fig. 3a, students with more positive perception of the teacher exhibited a greater priming effect.

Table 1
Summary of the best mixed logit model for structural alignment

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coefficient</th>
<th>SE</th>
<th>Wald Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.42</td>
<td>0.91</td>
<td>1.56</td>
<td>.11</td>
</tr>
<tr>
<td>Prime condition (Active vs. Passive)</td>
<td>-0.54</td>
<td>0.12</td>
<td>-4.40</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Perception of teacher</td>
<td>0.20</td>
<td>0.09</td>
<td>2.14</td>
<td>.03</td>
</tr>
<tr>
<td>Social monitoring</td>
<td>-0.30</td>
<td>0.12</td>
<td>-2.45</td>
<td>.01</td>
</tr>
</tbody>
</table>

Fig. 2. Proportion of active sentences when the active and the passive structure were primed. Error bars represent the 95% CIs for the difference between the participant means.
There was, however, no effect of course perception or course performance ($p > .5$); structural priming was not influenced by how positively students perceived the course or how well they did in the course. This suggests that students’ perception of the teacher matters more than the perception of the course for their tendency to repeat the sentence structure of the teacher. In contrast to the perception of the teacher, social monitoring had a negative effect on structural alignment. As can be seen in Fig. 3b, students who scored high in social monitoring were less likely to repeat the sentence structure of the teacher. No two-way interactions were significant ($p > .5$).

Taken together, our results suggest that students’ use of active/passive structure is best explained by the joint influence of recent syntactic exposure and their perception of the teacher and social monitoring tendency.

4. Discussion

Our results demonstrate that when the prime and the target involved the same verb, the extent that students imitate a sentence structure of the teacher is positively influenced by their perception of the teacher but negatively by social monitoring tendency.

The effect of the teacher perception is not surprising given the finding of Balcetis and Dale (2005). The effect of social monitoring, however, is the novel finding of this study and it is not clear how the two effects can be accounted for in a comparable way. One possibility is that the effects may be accounted for in terms of attention and memory encoding (see Weatherholtz et al., 2014, for similar discussion). Whether structural priming results from the activation of syntactic information (e.g., Dell, 1986; Pickering &
Branigan, 1998, 1998) or implicit learning (e.g., Bock & Griffin, 2000; Chang et al., 2006; Jaeger & Snider, 2013), it requires listeners to encode their interlocutor’s sentence structure and to associate it with existing syntactic information in memory. Critically, the strength with which information is encoded in memory is modulated by attention (e.g., Kruschke, 1992, 2011).

Attention, however, is a limited resource and speakers need to choose what information to attend to. If social perception and social monitoring influence how much attention listeners devote to their interlocutor’s speech, it may account for their effects on structural alignment. For example, if listeners like their interlocutor, they may focus their attention on the interlocutor and what he or she is saying. Indeed previous research suggests that students with a more positive perception of the teacher pay more attention to the teacher during class (Wentzel, 1997). If students with positive perception of the teacher tend to focus more on the teacher and what he or she is saying, it may cause their sentence structure to be better encoded, resulting in greater priming. By contrast, if students with high social monitoring pay attention to a number of social stimuli to enact socially desirable behavior, this may result in the decrease in the relative amount of attention available for encoding the interlocutor’s speech and, consequently, in weaker priming. Our results are, however, based on self-reported measures. To better understand the nature of socially mediated structural alignment, future research needs to test whether measures of actual behavior are similarly predictive of structural alignment.

The close relationship between structural priming and teacher perception in our study has implications for practice. Previous research shows that structural priming promotes language learners’ use of target structures (e.g., Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Shin & Christianson, 2012). If social perception influences structural priming, our findings suggest that a positive relationship between a student and a teacher may facilitate students’ learning of target structures in a language learning setting. This is indeed consistent with previous research suggesting that the positive aspects of teacher–student relationships are associated with students’ achievement (Goodenow, 1993; Midgley, Feldlaufer, & Eccles, 1989).

A potential caveat to our results is that our data are based on a rather small number of participants (see Jaeger, 2011, for rule of thumb estimates for sample sizes). Although the small number of participants is not uncommon in social perception and alignment research, it results in a high risk of Type I and Type II errors in a study with high researcher degrees of freedom (Simmons et al., 2011; Weatherholtz et al., 2014, for further discussion). To reduce researcher degrees of freedom, we closely followed many aspects of the procedures adopted in Weatherholtz et al. (2014); we decided a priori what analyses to conduct based on principled grounds and did not explore additional variables. Although our study is not the first to demonstrate socially mediated structural priming (Balcetis & Dale, 2005; Weatherholtz et al., 2014), future research needs to test a larger population to assess the reliability of our findings. As our study involved same-verb structural priming, future research may also test whether our findings extend to structural priming without verb repetition.
In sum, our results suggest that structural alignment is best explained by the joint influence of recent syntactic exposure and sociocognitive variables such as social perception and social monitoring. By demonstrating such effects in a real-world setting, our study contributes to the small but growing body of literature on social influences on structural alignment. Although we suggest that attention may play a role in mediating sociocognitive variables and structural priming, relatively little is known about the influence of attention on structural priming. Given the theoretical and practical implications of the current findings, further research may help to identify attentional mechanisms that are operative between social factors and structural alignment.

Notes

1. The survey included questions regarding interventions to improve the teacher–student relationship, which goes beyond the scope of this study. The present analysis therefore did not include predictors based on these questions. The decision was made prior to conducting analysis.
2. The same results are obtained using forward model selection.

References


Appendix A: Experimental stimuli

Target events used in the experiment

1. The policeman chased the thief.
2. The dog bit the policeman.
3. The tornado overturned the car.
4. The cat scratched the nurse.
5. The peacock pecked the man.
6. The snake caught the mouse.
7. The cowboy hit the boxer.
8. The nun pushed the crown.
9. The ambulance hit the man.
10. The bird ate the fish.
11. The baseball broke the window.
12. The bull butted the fireman.
13. The porcupine pricked the rabbit.
14. The bee stung the boy.
15. The horse kicked the doctor.
16. The boy pinched the girl.

Appendix B: Teacher–Student relationship positivity scale (Gehlbach et al., 2012)

1. How much do you enjoy learning from <teacher’s name>?*
2. How friendly is <teacher’s name> toward you?
3. How often does <teacher’s name> say something encouraging to you?
4. How respectful is <teacher’s name> towards you?
5. How excited would you be to have <teacher’s name> again next year?
6. How motivating are the activities that <teacher’s name> plans for class?*
7. How caring is <teacher’s name> towards you?
8. How much do you like <teacher’s name>’s personality?
9. Overall, how much do you learn from <teacher’s name>?*

Course items are marked with an asterisk (*).