Automated and Partner-Specific Factors Influencing Lexical Entrainment

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Abstract

Both automated priming (Pickering & Garrod, 2004) and partner-specific adaptation (Brennan & Hanna, 2009) have been proposed to underlie lexical entrainment (the repetition of words across interlocutors). Since activation levels of infrequently used words are relatively low, the effect of automated priming is predicted to be weaker in L2- than in L1-conversations, leaving more room for deliberate partner-specificity (Costa, Pickering, & Sorace, 2008). We tested this prediction by means of a production experiment, in which we varied whether participants interacted in their L1 or L2, and whether they addressed the confederate who had introduced a certain reference or another addressee. We found that in their L2, participants repeated references more frequently when addressing the person who had introduced the reference. Yet we did not find this effect of partner-specificity in the L1 conditions. Therefore, our results support the proposed combination of the two accounts.

Keywords: Speech production; alignment; lexical entrainment; interactive-alignment account; conceptual pact

Introduction

When people interact in dialogue, the referring expressions they use tend to converge (e.g. see Branigan, Pickering, Pearson, & McLean, 2010). For example, if one person refers to a landmark as 'the cathedral', it is likely that a conversation partner would refer to it as such as well, rather than saying 'the church'. This process is known as *lexical entrainment* (Garrod & Anderson, 1987). Different explanations have been proposed for this observation, either relying on automated processes (Pickering & Garrod, 2004) or on the more deliberate process of grounding (Brennan & Clark, 1996; Clark, 1996). In the current study, we test predictions made by each of these two accounts.

Accounts of Lexical Entrainment

Lexical entrainment can be measured by comparing the ways in which people refer to objects, locations, times, actions, people, etc. If two interlocutors use the same expressions, they are said to be lexically entrained (Garrod & Anderson, 1987). Brennan and Clark (1996) describe three factors that influence reference production that are independent of a conversation's history: informativeness, lexical availability, and perceptual salience. If all speakers choose their referring expressions based on these factors, they may end up choosing the same references as a result. However, most referents can be referred to in very many ways (Brennan & Clark, 1996). Therefore, these three factors alone are insufficient to explain the (frequent) occurrence of lexical entrainment. Rather, the course of a conversation needs to be taken into account too.

Brennan and Clark also propose four factors influencing reference production that are related to the conversation history: recency, frequency of use, provisionality and partner-specificity. The first two factors imply that speakers choose the reference that was used successfully for a certain referent most recently, taking into account the frequency of occurrence as well. That is, if a certain referring expression has repeatedly been used successfully (e.g. 'couch') and then an alternative reference is used successfully only once (e.g. 'sofa'), speakers may still revert to the more frequently used reference afterward. The factors recency and frequency of use together provide an explanation of lexical entrainment.

These two factors are compatible with a view that lexical entrainment is based on automated priming (Pickering & Garrod, 2004). In a (partly) connectionist model of cognition (Anderson & Lebiere, 1998; McClelland & Rummelhart, 1986; Rummelhart & McClelland, 1986), both frequency of use and recency affect the availability of chunks of information, such as lexical items. In line with such models, Pickering and Garrod (2004) propose that through the process of automated priming, interlocutors align their linguistic representations, which causes them to produce similar utterances. For example, when hearing a certain reference, linguistic representations are associated with it in the process of interpretation. As a result, the activations of these representations increase, which makes it more likely that they will be used in the process of language production. Therefore, a referent that has been heard frequently or recently is more likely to be produced. This automated account of lexical entrainment, known as the *interactive-alignment* account, predicts that lexical entrainment will occur whenever speakers are exposed to, and thus primed with, linguistic input.

Effects of provisionality and partner-specificity are not necessarily predicted by such an automated account. These

factors have to do with a more active view of dialogue, in which interlocutors are actively trying to establish common ground (Clark & Brennan, 1991). According to Brennan and Clark, "[w]hen speakers present a reference, they do so only provisionally, and they then work with their addressee to establish that it has been understood" (Brennan & Clark, 1996, p. 1484). Once this is established, interlocutors are said to have formed a *conceptual pact*, which they are likely to maintain. Since a conceptual pact results from an active process, conceptual pacts are established between specific interlocutors only (partner-specificity). Therefore, they cannot simply be transferred to new interaction partners. Rather, the process of grounding a referring expression will have to start anew with any new interlocutor. Therefore, in Brennan and Clark's account of lexical entrainment, entrainment is more likely to occur when interlocutors share a conversation history.

Adaptation in L2 and L1

Consistent with the interactive-alignment account of lexical entrainment, Costa, Pickering and Sorace (2008) propose that lexical entrainment will be less pronounced when at least one of the interlocutors needs to speak a second language (L2) instead of the native language (L1). Since some lexical items may have been used very rarely by an L2 speaker, their basic level activation may be very low. Therefore, even though recency enhances this activation, it may still be too low for the lexical item to be repeated. This could lead to partially failed entrainment, as in the following example, taken from Costa et al. (2008, p. 538):

(1) L2 speaker: I need a piece of paper with nothing on it
L1 speaker: A blank sheet of paper?
L2 speaker: Yeah, a blank piece of paper.

The more frequent word 'blank' is successfully entrained on, which can be explained as it reaching a level of activation that is sufficient for production. However, the infrequent word 'sheet' is not repeated, which may evidence a too low activation level, even after the recent occurrence. Thus, interlocutors are less likely to entrain on words they have encountered only infrequently, such as less familiar words in their L2.

Apart from the automated process of priming underlying lexical entrainment, which Costa et al. (2008) propose to be the default, they also recognize that speakers can make conscious decisions to either suppress the outcomes of this automated process, or to entrain in situations where automated priming does not facilitate entrainment. This leaves room for the factors proposed by Brennan and Clark (1996), such as partner-specificity. Bortfeld and Brennan (1997) for example, found that native speakers were more likely to entrain on the reference 'wheel' to refer to a tire when interacting with an L2-speaker, than when interacting with another L1-speaker. This seems to illustrate a conscious decision by the L1-speaker, based on their knowledge of their interlocutor's proficiency in the L2. Thus, deliberate motivations for entrainment can also play a role in L1-L2 conversations. Costa et al. (2008) predict that there will always be some extent of lexical entrainment due to automated priming, but this extent will be larger when interlocutors have similar activation profiles for lexical items, such as in L1-L1 conversations, than when they have dissimilar activation profiles, such as in L1-L2 or L2-L2 conversations. Therefore, more deliberate ways of reaching alignment of representations may be more likely to come into play in L1-L2 and L2-L2 conversations.

Present Study

We are not aware of any empirical study that tested the predictions made by Costa et al. (2008). Therefore, in this study we aim to test the predictions previously laid out, as well as the predictions made by Brennan and Clark's theory on conceptual pacts (Brennan & Clark, 1996). To do so, we measure the degree of lexical entrainment when speakers are talking to an interlocutor who just addressed them (No Switch condition) and when they need to switch to a different addressee (Switch condition). In addition, we assess whether there is a difference in the extent to which this factor affects lexical entrainment when interlocutors communicate in their native language (Dutch, L1-L1), as compared to when they communicate in their second language (English, L2-L2).

In order to keep track of who adapts to whom, we use a controlled experiment, in which participants interact with a confederate. The confederate introduces certain references in one speech turn. We measure the degree to which these references are repeated by the participant in the subsequent speech turn.

The prediction following from grounding theory is that participants are more likely to (partially) repeat a reference when interacting with the partner who introduced the reference than when switching partners. Even though interactivity is limited in our study, participants can decide to accept the reference (provisionally) introduced by the confederate, introduce an adaptation of it, or introduce a completely new reference. It is expected that participants are less likely to produce a completely new reference for a given referent, when interacting with a partner who already introduced a reference for that referent.

The interactive-alignment account does not necessarily predict such a difference between the Switch and No Switch conditions, since whether a referent is reproduced solely depends on automated priming and the linguistic input does not differ across these settings. However, the characteristics of the person who introduced the reference may serve as a prime as well, such that an automated account may also predict a (slight) difference, with more lexical entrainment in the No Switch condition (e.g. Horton & Gerrig, 2005).

In both the L1 (Dutch) and L2 (English) conditions, the confederate uses scripted route directions, with references that were designed in advance. In the L2 conditions, these

references include lexical items that participants may have come across only infrequently. Therefore, the account by Costa et al. (2008) predicts that the automated process of priming plays a more important role in our L1 conditions than in our L2 conditions. Since the effect of automated priming is predicted to be weaker in the L2 conditions, the effect of deliberate partner-specificity is predicted to be stronger there.

Method

Participants

Forty-eight (14 male) native Dutch first-year students from Tilburg University participated in our study as part of their curriculum. They were aged between 18 and 35 years old (M = 21.94, SD = 3.59). In the Netherlands, formal teaching in (British) English starts around the age of twelve. Hence, all participants knew English as a second language, but they were not raised with it.

Design

We used a 2 x 2 between participants design with two factors: Partner (levels: No Switch, Switch) and Language (levels: L1/Dutch, L2/English). As dependent variable, we used the mean number of (partial) repetitions of the confederate's descriptions of certain landmarks. Two confederates were counterbalanced across the different conditions. Both confederates were male, native speakers of Dutch, from the same (linguistic) region, similar in age (22, 24) and overall appearance (e.g. length, body type, dress, haircut, complexion and hair color).

Task and Material

A confederate and a participant took turns describing two routes to each other, which were depicted on bird's-eye view maps of a city (see Figure 1). While one interlocutor described a route as depicted on their map, the other interlocutor tried to draw this route on a map that was identical, except that the route was not depicted on it yet. Interlocutors were instructed not to interrupt one another during the route descriptions.

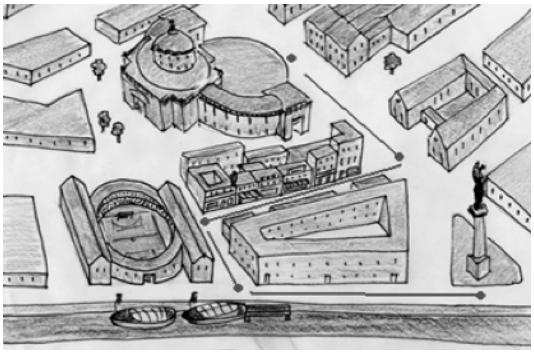

Figure 1: Example of a map used in the experiment.

Procedure

Participants were randomly assigned to the No Switch or Switch conditions, as well as to the L1 (Dutch, L1-L1) or L2 (English, L2-L2) conditions. In the L1 conditions, the entire experiment was carried out in Dutch. In the L2 conditions, the routes had to be described in English, but instructions were given in Dutch.

In the Switch conditions, two participants came to the lab, where two confederates showed up as participants as well. The experimenter took the four 'participants' to a room and handed out written instructions to the participants and confederates, who were allowed to ask clarification questions. Once all was clear, one confederate and one participant were selected by the experimenter to start the experiment in another room. In each room, the participant and confederate were seated across from each other, with a table in between that had a low visual barrier on it, such as to keep the listening interlocutor from already seeing the route. A camera was positioned on one end of the room, which was used to make recordings of the interaction.

In each of the two rooms, a confederate started the task by sequentially describing two routes to a participant, who was to draw these routes on corresponding maps. Once two routes were described, the two participants were asked to switch rooms, while the two confederates stayed in the same room (this procedure was explained in the written instructions). Each participant then described two routes to the confederate whom they had not yet interacted with. After these two descriptions, the participants switched rooms again and the cycle repeated once. That is, the participants heard two more routes from the confederate they first interacted with and described two more routes to the other confederate. Thus, in the Switch conditions, participants never described routes to the confederate who had given them route descriptions as well, but always to the other confederate.

In the No Switch conditions, there was only one confederate and one participant at a time. Both the participant and the confederate switched rooms after the confederate had described two routes and then the participants described two routes in the other room, to the same confederate. The interlocutors then switched rooms again and the cycle was repeated once. The switching of rooms was the same as in the Switch condition, to ensure equal intervals between hearing and describing routes. In the No Switch conditions, participants described routes to the confederate who had also given them route descriptions.

After all routes had been described, the participants and confederates filled out a questionnaire, including questions on their native and second language. In the English conditions, the questionnaire included the participant's high school grade in English and a short 'fill in the gaps' test on English. Finally, participants were asked consent for the use of their data for research and educational purposes. All participants consented to their data being used in this study.

Table 1: Examples of landmark descriptions given by the confederates.

Landmark Descriptions	
Dutch:	English:
historisch stadspaleis	historical city palace
hoge symmetrische fontein	tall symmetrical fountain
kleurrijke tramstation	colorful tram station
arenavormige voetbalstadion	arena-shaped soccer stadium
kleine intieme terras	small intimate terrace

Since all our participants were students in the same year, we did not inform them on the use of confederates before the study was completed, to ensure they would not know of this in advance. Participants could freely withdraw from the study at any point during and after the experiment.

Stimuli and Coding

Each route description given by a confederate included three unique critical references to landmarks; see Table 1 for some examples. Since word boundaries sometimes differ between English and Dutch, these references each consisted of three content units, for example 'historical city palace' or the Dutch equivalent: 'historisch stadspaleis'. The confederate started by describing two routes on two different maps. The participant was then to describe two different routes that were depicted on the same maps that the confederate's routes had been on. This allowed for the three landmarks that the confederate had described to be along the participant's route as well, such that partial or full repetitions of the confederate's references could occur. To reduce the possibility of participants accidentally using the same references as the confederate, that is, due to factors independent of the conversation history, the confederate used rather specific wordings (Table 1).

We first transcribed participants' descriptions from the videos. We then coded any literal repetition of content units originally contained in the confederate's critical references. Because full repetitions (3 content units) of references were rare, we report the total number of partial (1 or 2 content units) and full repetitions of the confederate's references. Since true dialogue was not possible between interlocutors, a conceptual pact may not have been fully established yet after the confederate had described the landmarks once. Therefore, participants may still shorten, elaborate on or adapt the reference (provisionally) introduced by the confederate. By counting each reference that contained a literal repetition of at least one content unit, these adaptations were mostly included in our measure of entrainment, while avoiding subjective coding. Note that although the confederate described twelve landmarks, it is possible for a participant to repeat a single landmark more than once. Hence, a participant could produce more than twelve repetitions.

Table 2: Mean (SD) number of (partial) repetitions of the confederate's landmark descriptions by participants.

Language condition	Partner condition	N	Number of Repetitions:
L1: Dutch	No Switch	11	9.72 (2.24)
	Switch	14	10.00 (2.94)
	Total	25	9.88 (2.60)
L2: English	No Switch	11	11.27 (3.26)
	Switch	12	8.42 (2.39)
	Total	23	9.78 (3.13)
Total	No Switch	22	10.50 (2.84)
	Switch	26	9.27 (2.76)

Results

We performed an ANOVA with Partner (levels: No Switch, Switch) and Language (levels: L1, L2) as independent factors. In line with the predictions, analysis of participants' (partial) repetitions of the confederate's descriptions, as listed in Table 2, showed a marginally significant interaction between the two factors, such that the difference between the No Switch and Switch conditions was larger in the L2 conditions than in the L1 conditions, $F(1, 44) = 3.86$, $p = .06$, $\eta^2_p = .08$. We did not find a main effect of Partner, $F(1, 44) = 2.63$, $p = .11$, $\eta^2_p = .06$, or Language, $F(1, 44) < 1$, $p = .98$ on the number of (partial) repetitions.

Posthoc analyses by means of independent-samples T-tests did not reveal an effect of Partner in the L1 conditions, $t(23) = .26$, $p = .80$. In the L2 conditions however, there was an effect of Partner, $t(21) = 2.41$, $p < .05$, $\omega^2 = .17$, such that participants repeated more of the confederate's references if they were interacting with the same partner ($M = 11.27$, $SD = 3.26$) than when they had to switch ($M = 8.42$, $SD = 2.39$).

Given our design, it is important that participants in the L2 (English) conditions were equally proficient in English in the No Switch and Switch condition. Analysis of the score participants obtained on the short English post-test did not reveal a difference between the English No Switch ($M = 7.00$, $SD = .89$) and the English Switch condition ($M = 6.83$, $SD = 1.19$), $t(21) = .38$, $p = .71$. Similarly, we did not find a difference in the reported high school grade in English between the English No Switch ($M = 7.55$, $SD = .96$) and the English Switch condition ($M = 7.08$, $SD = 1.12$), $t(21) = 1.05$, $p = .30$. (These high school grades are on a 1 to 10 scale, with 6 being sufficient and 10 being exceptional.) Since there seems to be a numerical difference in the high school grades between the English Switch and the English No Switch condition, we also performed an ANOVA on the data from the English conditions with high-school grade as a covariate. Similar as before, analysis of participants' repetitions of the confederate's descriptions revealed an effect of Partner, $F(1, 23) = 5.05$, $p < .05$, $\eta^2_p = .20$, such

that in the English conditions, participants repeated the confederate's reference more often when they interacted with the same partner, than when they had to switch. We did not find an effect of high school grade in this analysis, $F(1, 23) < 1$, $p = .84$.

Similar results were obtained when analyzing at most one repetition per landmark, and also when separate variables were computed for each half of the experiment (the order of the routes was counterbalanced across the first and second half of the experiment).

Discussion

Our results confirm the prediction that the effect of partner-specificity is stronger for non-native speakers than for native speakers (Costa, et al., 2008). When participants were asked to communicate in a foreign language (English), they more often repeated parts of a confederate's referring expressions when they were talking to the confederate who introduced the reference, compared to when they were addressing a third person. When speaking in their native language (Dutch), the difference between addressing the same or a different partner was not as large. This finding seems to support both grounding theory (Brennan & Clark, 1996; Clark & Brennan, 1991) and the interactive-alignment account (Pickering & Garrod, 2004).

In the English conditions, we found that when participants did not need to switch conversation partners in between hearing and giving route descriptions, they repeated the confederate's references to a greater extent than when they had to switch partners. This goes well with the prediction that conceptual pacts are partner-specific (Brennan & Clark, 1996). Even though our paradigm did not allow for interlocutors to freely interact in arriving at conceptual pacts, repeating part of a previously (provisionally) introduced reference can be seen as a first step in forming a conceptual pact. We found that in the L2 conditions, participants produced such a repetition more often to the person who had introduced the reference than to a person who had no knowledge of this conversation history. Therefore, these results support the account of lexical entrainment based on grounding theory (Clark, 1996; Clark & Brennan, 1991).

The prediction by Costa et al. (2008) that automated priming will be more prominent when interlocutors interact in their native language than when they interact in a foreign language also seems to be supported by our data. Our results show that the effect of partner-specificity, which can be thought of as a more deliberate factor, was stronger when participants were asked to interact in a foreign language as compared to when they interacted in their native language, exactly as predicted. The explanation offered by Costa et al., that the weaker effect of automated priming in L1-L2 and L2-L2 conversations would allow more room to such deliberate factors seems very plausible. Because the lexical items from the native language are very familiar, they are easily primed by recent uses. This process does not depend on whom is being addressed. Therefore, no effect of partner-specificity is predicted in the L1 conditions, which is in line with our findings. Yet when using the L2, the activation levels of less frequently used lexical items may be too low for these items to be primed by a single recent use. Therefore, the effect of automated priming is weaker in L2 conversations. Speakers may therefore make a more deliberate decision on whether to entrain on a given reference or not in the L2 conditions, which could very well depend on whom they are interacting with. The stronger effect of partner-specificity that we found in the L2 conditions thus indirectly supports the interactive-alignment account.

Can our findings be accounted for without the interactive-alignment account? One can think of many reasons why we did not find an effect of partner-specificity in the Dutch (L1) conditions. For example, there were only few turns and participants were not free to engage in dialogue. However, these factors equally apply to the English (L2) conditions, in which we did find an effect of partner-specificity. This also holds for the argument that in the second half of the experiment, there may be some conversation history in the Switch conditions. (Critical landmarks from the first half of the experiment did not occur in the second half.) Thus, from grounding theory alone, it is hard to explain why we did not find an effect of partner-specificity in the L1 conditions, whereas we did find this effect in the L2 conditions.

A possible explanation of our results in terms of a deliberate process is that in the L2 conditions, participants did not repeat the confederate's references as frequently when they had to switch partners, because they were less certain of their new interaction partner's proficiency in English. Therefore, they may have used more common references instead. At the same time, when interacting with the same partner, the already introduced reference was most likely to be understood. This explanation fits the numerical pattern in our data, as the larger effect of partner-specificity in the L2 conditions seems to result both from there being more repetitions in the No Switch condition and from there being fewer repetitions in the Switch condition (see Table 2). However, although to a lesser extent, similar deliberate considerations apply to the L1 conditions. Moreover, in the L1 condition in which participants had to switch partners, there seems little reason for participants to repeat the reference introduced by the confederate at all (which they did to the same extent as in the No Switch condition), other than because of automated factors. Therefore, deliberate partner-specificity alone does not convincingly explain all of our results.

Can our findings be accounted for without deliberate partner-specificity? The interactive-alignment account predicts that interlocutors will show less lexical entrainment in their L2, but it does not predict an effect of either addressing the person who introduced the reference or

another person. That is, a main effect of the factor Language would be predicted, rather than an interaction between the factors Language and Partner. Horton and Gerrig's *association account* states that conversation partners automatically form an association between a given expression and a conversation partner (e.g. Horton & Gerrig, 2005). Hence, the conversation partner may serve as a prime as well, leading to more entrainment when interacting with the same partner as compared to when switching partners. This could provide an automated account of partner-specificity. Yet importantly, if partner-specificity were fully automated, there is no reason to expect its effect to be stronger in the L2 than in the L1 conditions. That is, a main effect of the factor Partner would be predicted, rather than an interaction between Partner and Language. Yet although we did not find an effect of partner-specificity when interlocutors interacted in their L1 (Dutch), we did find that in their L2 (English), participants showed more lexical entrainment when they kept interacting with the same partner than when they had to switch. This interaction effect cannot be accounted for by an automated account alone. Therefore, a combination of both the interactive alignment account (Pickering & Garrod, 2004) and more deliberate partner-specificity (Brennan & Clark, 1996), as proposed by Costa et al. (2008), explains our results best. Moreover, this account *predicted* the results that we found.

Our study illustrates that automated and deliberate accounts of adaptation in dialogue are compatible (also see Brennan & Hanna, 2009; Costa, et al., 2008; Pickering & Garrod, 2004). In future work, it would be interesting to further explore what factors influence the extent to which automated and deliberate factors come into play, as well as to assess which factors are more automated and which are more deliberate, given a certain setting. Next to the theoretical merit, this could provide insight into how and when to facilitate effective communication.

Conclusion

Our results on lexical entrainment support both the interactive-alignment account (Pickering & Garrod, 2004) and the account of partner-specific conceptual pacts (Brennan & Clark, 1996). However, neither of these two theories alone predicted the pattern of results that we found. When interacting in their second language, speakers were shown to entrain more on previously heard references when interacting with the person who introduced these references, than when interacting with another partner. When speakers interacted in their native language, this effect did not reach significance, evidencing an interaction between the factors of whether or not speakers used their native language and whether or not speakers switched conversation partners. This interaction was previously predicted, yet not tested, by Costa et al. (2008), who combined the two theories and predicted that the effect of automated priming on lexical entrainment would be stronger when interlocutors interact in their native language, compared to when at least one of them uses a non-native language. Therefore, when interlocutors interact in their non-native language, the effect of more deliberate factors, such as partner-specificity, will be (relatively) stronger. This is exactly what we found. Our findings thus support the view that both automated priming and deliberate partner-specific adaptation influence the degree of lexical entrainment between interlocutors.

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