Syntactic priming reveals the influence of contextual and interactional information on syntactic processing

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This chapter is concerned with how the ability of speakers and writers to produce syntactic structures is constrained by contextual and interactional factors. During language production we are often faced with a choice between syntactic alternatives. These syntactic alternatives are different in terms of their surface structure while being very similar in meaning, for example: an active versus a passive utterance, a verb phrase formulated as double object versus prepositional object. We will argue that it is important to keep in mind that language production is always situated in context and, in the case of a dialogue or conversation, also situated within a social interaction. We can experimentally track whether contextual and interactional factors influence the speaker's or writer's choice between syntactic alternatives and whether they influence the ease with which the chosen syntactic alternative is produced. A method which can be used to do so is called syntactic priming or structural priming. Experimental data on syntactic priming reveal which information constrains syntactic encoding: factors which can be identified as determiners of syntactic priming are aspects that influence syntactic processing. Syntactic priming research can therefore provide a wealth of insight into how syntactic structures are processed.

In this chapter we will call upon experimental syntactic priming evidence to demonstrate that the production of a syntactic structure is in large part determined by the wider setting in which the structure is uttered. The speaker or writer who produces a syntactic structure cognitively processes the wider setting in which the structure is produced. The wider setting includes the language context (e.g. exposure to syntactic structures in preceding sentences) as well as interactional aspects of the communicative setting (e.g. characteristics of the person to whom a speaker addresses a sentence). A variety of contextual and interactional aspects of the setting have been shown to influence syntactic production in syntactic priming experiments. We will discuss these further in the coming sections of this chapter. Syntactic priming findings evidencing the influence of contextual and interactional information point toward the need to incorporate these influences in theories of language production. We will evaluate several theoretical proposals with respect to their ability to accommodate the influence of this information on syntactic encoding.

1. Why investigate syntactic priming?

Before elaborating on the range of contextual and interactional aspects that can influence the production of syntactic structures, we will first give some background information on syntactic

priming research and delineate what experimental investigations of syntactic priming can bring to the table.

Syntactic priming refers to facilitation of syntactic processing when a syntactic structure is repeated across consecutive sentences (Kempen, 1977; W.J.M. Levelt, 1989). Corpus analysis have demonstrated that syntactic priming occurs in spontaneous speech and in naturally occurring written texts (e.g. Gries, 2005; Snider, 2008). In addition, syntactic priming has been shown to occur in psycholinguistic experiments in a laboratory setting.

The first experimental demonstration of syntactic priming dates back to 1986 (Bock, 1986) and inspired numerous investigations of the phenomenon in the years that followed, up until this date. Terminology commonly refers to the first sentence in a pair of consecutive sentences as the "prime" and the second sentence as the "target". The most replicated finding in these experiments is that one's syntactic choice is sensitive to syntactic priming: speakers choose to repeat, in the target utterance, aspects of the syntactic structure of the prime sentence. This has been termed a syntactic persistence effect. For instance, there is an increased likelihood for speakers to choose the same grammatical voice (active versus passive) or the same type of dative construction (double object versus prepositional dative) in consecutive sentences. As an illustration of the magnitude of a syntactic persistence effect: the difference in the likelihood to produce e.g. passive voice due to syntactic priming ranges from 5 to 10% (Chang, Dell, & Bock, 2006). A syntactic persistence effect has been demonstrated experimentally for many different kinds of syntactic structures and in many different languages including, but not limited to, double object versus prepositional object datives (e.g. Bernolet & Hartsuiker, 2010; Bock, 1986; Bock & Griffin, 2000; Branigan, Pickering, & Cleland, 1999; Hartsuiker & Kolk, 1998; Kaschak, 2007; Kaschak & Borreggine, 2008; Pickering & Branigan, 1998), active versus passive voice (e.g. Bock, 1986; Bock & Griffin, 2000; Hartsuiker & Kolk, 1998; Segaert, Menenti, Weber, & Hagoort, 2011), noun phrases (e.g. Cleland & Pickering, 2003), frontal locative versus locative state sentences (e.g. Hartsuiker, Kolk, & Huiskamp, 1999), high versus low attachment (e.g. Branigan, Pickering, & McLean, 2005; Scheepers, 2003) and optional complementizers (e.g. Ferreira, 2003).

The facilitation in syntactic processing that speakers experience due to syntactic priming can be tracked not only by investigating the choice speakers make between syntactic alternatives (i.e. the syntactic choice), but also by investigating the ease with which the chosen syntactic alternative is produced (i.e. the speech onset latencies, also referred to as production latencies). Facilitated syntactic processing can manifest itself in a reduction of the amount of processing resources that is recruited to produce the target sentence. Several experimental investigations of syntactic priming have reported that repeated syntactic structures are produced faster: repeated syntactic structures are accompanied by faster speech onsets or by a faster onset of written production (Corley & Scheepers, 2002; Segaert, et al., 2011; Smith & Wheeldon, 2001; Wheeldon & Smith, 2003; Wheeldon, Smith, & Apperly,

2011). As an illustration of the size of syntactic priming in production latencies: when a sentence in active voice is repeated, the speech onset of production speeds up by approximately 50 milliseconds (Segaert, et al., 2011). Although syntactic priming effects in production are less often investigated using speech onset latencies than using a measure of syntactic choice, we will argue in this chapter that both manifestations of syntactic priming provide valuable and complementary insights into the workings of syntactic encoding.

Syntactic priming also occurs during language comprehension: syntactic processing is facilitated for the comprehension of consecutive sentences with the same syntactic structure. In experimental investigations, syntactic priming in comprehension is shown in anticipatory eye-movements to pictures (Arai, van Gompel, & Scheepers, 2007; Carminati, van Gompel, Scheepers, & Arai, 2008; Thothathiri & Snedeker, 2008; Traxler, 2008), in faster reading (Traxler & Tooley, 2008) and in picture-matching choices for ambiguous phrases (Branigan, et al., 2005). When syntactic structures are repeated, during production or comprehension, there is also a facilitation effect in the brain. This facilitation can be measured with a brain imaging technique such as functional magnetic resonance imaging (fMRI). Facilitation in the brain shows itself as a reduced brain response when an item is repeated. For repeated syntactic structures, facilitation effects have been found in frontal and temporal brain regions which are known to be responsible for processing syntactic structures (Devauchelle, Oppenheim, Rizzi, Dehaene, & Pallier, 2009; Noppeney & Price, 2004; Segaert, Kempen, Petersson, & Hagoort, 2013; Segaert, Menenti, Weber, Petersson, & Hagoort, 2012; Weber & Indefrey, 2009). In this chapter, however, the focus will be on syntactic priming effects that manifest behaviorally and during language production.

It is interesting that facilitated syntactic processing for language production occurs regardless of whether the syntactic prime is comprehended or self-produced. Comprehended syntactic primes have been shown to have comparable effects on syntactic choices as self-produced syntactic primes (Bock, Dell, Chang, & Onishi, 2007; Branigan, Pickering, & Cleland, 2000; Ferreira, Kleinman, Kraljic, & Siu, 2012; Potter & Lombardi, 1998; Reitter, Moore, & Keller, 2006). Additionally, facilitation in brain regions responsible for syntactic processing is similar for self-produced and perceived syntactic primes (Segaert, Kempen, et al., 2013; Segaert, et al., 2012). Speakers are thus not only primed by their own sentences but also by interlocutors in the conversation. This is what Pickering and Garrod (2004) have dubbed alignment between speakers in a conversation.

After describing how syntactic priming is studied in the controlled setting of the laboratory, the next logical step would be to determine what these syntactic priming investigations add to current theories on the production of syntactic structures. A syntactic priming effect is a demonstration of an influence of syntactic processing, that is, a preceding sentence influences the syntactic choices made by the speaker or writer and influences the ease with which the chosen syntactic alternative is produced. A range of different aspects has been identified in the literature as determinants or

modulators of syntactic priming. Any factor that determines or interacts with the syntactic priming effect (e.g. makes it stronger or weaker) is an aspect that is considered during syntactic encoding. By identifying the factors that determine syntactic priming, we can identify which information constrains syntactic encoding. This makes syntactic priming a very useful vehicle to investigate syntactic processing and further shape theoretical proposals on syntax production. Syntactic priming research thus has the potential to make broad contributions to our understanding of language. In the next sections of this chapter, we will discuss contextual and interactional aspects which have been shown to influence syntactic processing in experimental investigations of syntactic priming.

2. The influence on syntactic processing of recent experience with syntactic structures (from immediately preceding sentences to sentences processed several days ago)

One contextual factor that determines syntactic processing of a sentence is exposure to other sentences with similar syntactic structures. Recent exposure to other sentences includes immediately preceding sentences as well as sentences processed minutes, hours or even several days before. These different grains of experience all appear to shape syntactic processing.

Analyses of written corpus texts reveal that the strength of the syntactic priming effect on a target sentence increases with the number of primes preceding said sentence (Jaeger & Snider, 2008). The likelihood of producing passive clauses and that complementizers and relativizers was found to increase with the number of sentences in the same construction used previously in the corpus. This indicates that not only immediately preceding syntactic structures, but also syntactic structures in the larger context of a target sentence determine syntactic processing (here the context is considered to be the same corpus). Also psycholinguistic experiments using syntactic priming report on the influence of experience with syntactic structures in the larger context of a target sentence (here the context is considered to be the same experimental session). The likelihood of repeating double object and prepositional object dative constructions was found to be determined by the number of times with which each constructional alternative occurred earlier in the experiment (Kaschak, Loney, & Borreggine, 2006). Not only the production likelihood but also the production latencies for primed active and passive clauses were found to be determined by the relative frequency with which they occurred in a training session before the experiment started (experiment 2 of Segaert, et al., 2011).

These observations support the idea that syntactic priming effects could be a consequence of implicit learning (Bock & Loebell, 1990; Chang, et al., 2006; Chang, Dell, Bock, & Griffin, 2000): with every instance of a syntactic structure, implicit learning occurs and the knowledge that syntactic encoding builds upon is updated. There is in fact a longstanding interest in the role of implicit learning for the acquisition and use of syntactic structures (Allen & Reber, 1980). Chang et al. (2006; 2000) implemented error-based implicit learning as a syntactic priming mechanism in a connectionist

model. Error-based implicit learning means that a language user continuously learns by predicting upcoming syntactic structures. Consequently, a deviation between the syntactic structure that was expected and the structure which was actually observed (this is dubbed the prediction error) serves as a signal to adjust the language user's knowledge. In the Chang et al. model, knowledge is adapted by adjusting weights in the connectionist network. A crucial aspect of the model is that it always continues to learn, as it continuously updates connection weights as more sentences are processed. Changes in connection weights for a particular syntactic structure last over long time intervals; they stay in place until the next sentence with this particular structure is processed, which in turn further shapes the connection weights. It must be noted though that it is the predicting error during language comprehension that shapes syntactic priming; it is less clear how this model would predict production to production syntactic priming (Meyer & Hagoort, 2013). The theory that syntactic priming is an example of implicit learning does explain how experience with syntactic structures leads to long lasting influences on syntactic processing. This links to views that syntactic priming plays a role in language change (Chang, 2008) as the psycholinguistic knowledge of language users changes as a result of experience and this is achieved through a mechanism of implicit learning.

In fact, syntactic priming experiments have demonstrated that experience with syntactic structures indeed changes the relative bias (i.e. the relative preference) of speakers and writers for one of two syntactic alternatives. Increased exposure to a syntactic alternative changes the base rate of producing this syntactic structure (for alternative word orders for auxiliary verb and past participle: Hartsuiker & Westenberg, 2000; for datives: Kaschak, 2007). Changes in the base rate due to experience have been shown to be long lasting. In their experiment, Kaschak, Kutta and Schatschneider (2011) induced a bias for the double object dative or for the prepositional object dative and tested this bias one week later. They found that the established change in the base rates for these syntactic alternatives indeed persisted over an entire week. This lends further support to the idea that language users continuously learn from experience with syntactic structures in an implicit way and that syntactic priming contributes to language change.

Jaeger and Snider (2013) advocate the idea that syntactic priming is a consequence of a syntactic processor that implicitly learns and flexibly adapts to the context. They argue that this is necessary to achieve efficient communication in a continuously changing environment. Jaeger and Snider (2013) analyzed the syntactic priming effects in a corpus of conversational speech as well as in spoken and written production in psycholinguistics experiments. Based on their findings, they concluded that language users adapt with the aim to minimize the experienced prediction error while they are processing subsequent syntactic structures. Language users create expectations using all the information that is available to them. This includes information that is based on recent experience with syntactic structures (immediately preceding sentences as well as sentences that were processed in the larger context). It also includes information that is based on prior knowledge about the base rate

production of syntactic constructions. We will further discuss the latter issue in the next section of this chapter.

3. The influence of lifelong experience with the relative frequency with which syntactic alternatives occur in language

The second contextual piece of information that determines syntactic processing is the language user's lifelong experience with the relative frequency with which syntactic alternatives occur in language. For example, actives occur much more frequently than passives: in English written discourse, the proportion of active transitives is about 88% and, in Dutch, about 92% (Cornelis, 1996). For some syntactic alternatives, for example for double object and prepositional object datives, the relative frequency with which syntactic alternatives occur is largely determined by the main verb. For instance, the English verb *to sell* prefers the prepositional object dative construction while *to show* is more common in the double object dative construction (Gries & Stefanowitsch, 2004).

Language users get experience with the relative frequency with which syntactic alternatives occur throughout the course of life. The frequency of syntactic alternatives in language can be implicitly learned. In the previous section we already introduced the hypothesis that the psycholinguistic knowledge of language users is obtained through implicit learning and changes as a result of experience (Bock & Loebell, 1990; Chang, 2008; Chang, et al., 2006). Through implicit learning, not only recent experience but also lifelong experience, for example with the relative frequency of syntactic alternatives, can influence syntactic processing.

The relative frequency of syntactic alternatives has been demonstrated to determine syntactic priming effects in a broad range of experiments using different syntactic structures. Syntactic priming effects on production choices are shown to be larger for the less frequent (i.e. the less preferred) syntactic alternative; this has been dubbed the inverse preference effect (Ferreira & Bock, 2006). Syntactic priming effects on production latencies are larger for passives than actives in Dutch and English (Bernolet, Hartsuiker, & Pickering, 2009; Bock, 1986; Bock & Loebell, 1990; Hartsuiker & Kolk, 1998), larger for the double object dative structure than the prepositional object dative structure in Dutch (Bernolet & Hartsuiker, 2010; the double object dative structure is generally less frequent in Dutch) and larger for the prepositional object dative structure than the double object dative structure in German (Segaert, Weber, Cladder-Micus, & Hagoort, 2013; the prepositional object dative structure is generally less preferred in German). Inverse preference effects have also been shown for optional that-complementizers (Ferreira, 2003), for high versus low relative clause attachment (Scheepers, 2003) and for frontal locative versus locative state sentences (Hartsuiker, et al., 1999).

Syntactic priming effects on production latencies on the other hand are shown to be larger for the more frequent (i.e. the more preferred) syntactic alternative; this has been dubbed the positive

preference effect (Segaert, et al., 2011; Segaert, Weber, et al., 2013). Syntactic priming effects on production latencies are larger for actives than passives (Segaert, et al., 2011) and are larger for double object datives than prepositional object datives in German (Segaert, Weber, et al., 2013; the double object dative structure is generally more preferred in German).

Knowledge on the relative frequency with which syntactic alternatives occur is proposed to be dynamic; syntactic processing is probabilistic in nature and can flexibly adapt to a new context (Jaeger & Snider, 2013). Knowledge on the relative frequency of syntactic alternatives is thus based on lifelong experience that is still continuously updated by new experience. In the first experiment reported in Segaert et al. (2011), we investigated the impact of lifelong experience with relative frequency bias on syntactic priming. The relative frequency bias of actives versus passives in Dutch is about 92% versus 8%. The relative frequency of these syntactic alternatives determined the syntactic priming effects: on production choices there was only a priming effect for passives and not for actives while on production latencies there was only a priming effect for actives and not for passives. In a second experiment, the impact of recent experience was investigated. Participants were subjected to experience with a new relative frequency bias of actives versus passives. A training block exposed participants to a high relative proportion of passive sentences (90% passives and 10% actives) and this substantially impacted on subsequent syntactic processing. Actives as well as passives now showed syntactic priming effects in both the production choices and the production latencies. The experience with the high proportion of passives thus added to, but evidently did not replace, the lifelong experience with the relative frequency of actives versus passives.

The syntactic priming research discussed in this section so far suggests that information about the relative frequency of syntactic alternatives influences syntactic processing and that this information is dynamic and subject to learning. Also knowledge of the relative frequency of syntactic alternatives for a specific given verb has been shown to determine syntactic processing (Melinger & Dobel, 2005; Trueswell & Kim, 1998; Trueswell, Tanenhaus, & Kello, 1993). This has also been demonstrated in syntactic priming effects (Bernolet & Hartsuiker, 2010; Jaeger & Snider, 2007, 2008, 2013; Reitter, Keller, & Moore, 2011; Segaert, Weber, et al., 2013). The prepositional object dative is generally preferred over the double object dative in Dutch, but the strength of this bias varies from verb to verb; for example it is stronger for 'doorgeven' (to pass) than 'geven' (to give). Since the double object dative is less preferred for 'doorgeven' (to pass) than for 'geven' (to give), priming the double object alternative with the verb 'doorgeven' (to pass) changes subsequent production choices more than priming this alternative with the verb 'geven' (to give) (Bernolet & Hartsuiker, 2010). The less preferred a syntactic alternative is for a given verb, the stronger the syntactic priming effect in production choices (verb-bound inverse preference effect: Bernolet & Hartsuiker, 2010; Segaert, Weber, et al., 2013). On the other hand, the more preferred a syntactic alternative is for a given verb,

the stronger the syntactic priming effect in production latencies (verb-bound positive preference effect: Segaert, Weber, et al., 2013).

Theoretical proposals centering around implicit learning explain (verb-bound) inverse preference effects of syntactic priming on production choices in the following way: less frequent syntactic structures are less expected so they are accompanied by a larger prediction error and greater changes in implicit knowledge (Chang, et al., 2006; Chang, et al., 2000; Jaeger & Snider, 2013). However, these proposals are unable to explain the effects of syntactic preference biases on production latencies. This is why in Segaert, Menenti, Weber and Hagoort (2011) we proposed an account of syntactic priming aimed specifically at explaining both inverse preference effects on syntactic choices and positive preference effects on production latencies. The account is based on inhibition (competition) between syntactic alternatives and there is a central role for implicitly learned knowledge of (verb-specific) base rate syntactic preference biases.

In the Segaert et al. (2011) competition account, syntactic encoding consists of two sequential stages: a *selection stage*, during which one of the alternative syntactic constructions is selected, and a *planning stage*, during which production of the selected construction is prepared. The choice of a syntactic alternative is determined exclusively during the selection stage. This choice is in part determined by the base-level activation of the competing nodes representing the alternative syntactic constructions. A syntactic alternative is selected when the activation level of the corresponding node reaches the selection threshold and fires. The average base-level activation of a node is established through a learning mechanism and positively correlated with the frequency of occurrence of the syntactic alternative it represents. The time it takes to reach a selection threshold is called the selection time. The selection time in stage one and the planning time in stage two contribute to the response latency as additive effects.

A central aspect of this account is that inhibition (negative activation) is transmitted between competing alternatives; the amount of inhibition transmitted is a positive function of the current activation level. The selection time is determined by the time needed to solve competition between the competitor nodes. This time *de*creases with an *in*creasing difference in activation levels between competitors at the moment competition starts: the higher the current activation of a node, the more inhibition it transmits to the competitor; the lower the latter's activation, the less inhibition it can retort. After a node has fired, the activation level drops gradually due to decay. Syntactic priming temporarily increases the activation level of the node representing the primed structure due to residual activation (inspired by the residual activation account of Pickering and Branigan (1998)). The competition model therefore assumes an *inverse (negative)* effect of preference on syntactic priming effects in response choices. When a structure is primed, the activation level of the corresponding node has reached the selection threshold during the prime sentence. When a less preferred structure (thus with a lower base-level activation) is primed, the chance that the activation level of the corresponding

node has not yet returned to this base-level activation during the target response is higher (compared to when a more preferred structure is primed). The response choices are thus more likely to be affected when less preferred structures are primed. Furthermore, the competition model assumes a *positive* effect of preference on syntactic priming effects in the response latencies. When priming increases the difference in activation levels between competitors (compared to the difference in base-level activation of these competitors), priming decreases the competition time in the selection stage. For a more preferred structure, priming increases the difference in activation levels between competitors more strongly, and thus priming decreases the competition time more strongly than for a less preferred structure. Effects on response latencies are not only determined by the selection time but are the result of the additive effects on the selection time and the planning time. We assume that priming always reduces the planning time as an effect of practice (W. J. M. Levelt & Kelter, 1982). We hypothesized in our account that the activation-and-competition network with competing syntactic nodes is represented for each verb separately. This way, the Segaert et al. proposal (2011) also accounts for verb-bound inverse preference effects on response choices and verb-bound positive preference effects on production latencies (Segaert, Weber, et al., 2013).

4. The influence of the interlocutor and attributes of the social interaction on syntactic processing in conversation

We mostly produce language with the goal to communicate a message to a conversation partner (i.e. an interlocutor). Communication is a joint venture, so how you communicate your message depends on your conversation partner to some extent. Even though research has demonstrated that one can be primed by pre-recorded sentences played by a computer as well as by a real-life interlocutor in a conversation (behavioral syntactic priming: Ferreira, et al., 2012; syntactic priming of brain responses measured with fMRI: Schoot, Menenti, Hagoort, & Segaert, 2013), when an interlocutor is present, attributes of the interaction with this interlocutor, even very subtle attributes, can modulate syntactic processing.

Firstly, syntactic processing is influenced by the role of the speaker in a communicative context, more specifically, whether the speaker had already been addressed in the conversation or whether the speaker had been an overhearer (Branigan, Pickering, McLean, & Cleland, 2007). A former addressee shares the goal to communicate with the interlocutor, whereas a former overhearer does not. Branigan et al. (2007) showed that former addressees are more strongly primed by syntactic structures of conversation partners than former overhearers. Syntactic processing can furthermore be modulated by the specific goal of a conversation. Reitter et al. (2006) investigated syntactic priming effects in a casual dialogue when the interlocutors' only goal was to communicate versus when interlocutors communicated in order to perform a task together. Syntactic persistence effects were

stronger when interlocutors were performing a task than when they were involved in a casual conversation.

Pickering and Garrod (Garrod & Pickering, 2009; Menenti, Pickering, & Garrod, 2012; Pickering & Garrod, 2004, 2013) provided an explanation of priming in conversation in terms interactive alignment. According to the interactive alignment account, successful conversation occurs when interlocutors comprehend the relevant aspects of what they are talking about in the same way. The mental model of the situation that interlocutors converse about is called the situation model. Conversation is successful to the extent that the situation models of conversation partners become aligned. Alignment of situation models occurs in part because interlocutors repeat each other's words and syntactic structures (i.e. priming), i.e. people who speak about the situation in a similar way will come to think about it in a similar way as well. The results of Branigan et al. (2007) and Reitter et al. (2006) can be interpreted in this interactive alignment framework: when there is a stronger need for interlocutors to align situation models, priming effects are stronger. A former addressee has a stronger need to align with the interlocutor than a former overhearer (Branigan, et al., 2007); similarly, when interlocutors converse to complete a specific task together, the need to align the situation model might be stronger than when interlocutors have a casual conversation (Reitter, et al., 2006).

Priming has also been a topic of study from the perspective of social psychology. In social interactions, imitation of each other's behavior (for example, hand or foot movements, face touching) is rather common. Such imitation is claimed to be unconscious and automatic (Chartrand & Bargh, 1999). Remarkably, it has been shown that imitation of, for example, hand and foot movements facilitates the interaction and increases the perceived likability between conversation partners (Chartrand & Bargh, 1999). It has furthermore been shown that some people use imitation as an unconscious strategy to make the interaction smoother and get along with conversation partners better (Cheng & Chartrand, 2003).

Syntactic priming can also be viewed as a form of imitation. Recently, research has shown that, similar to other imitation behavior, imitation of syntactic structures can also be a means of managing the interpersonal distance between conversation partners. Giles, Coupland and Coupland (1991) proposed that speakers align syntactic choices and other linguistic behavior to increase affiliation with a conversation partner. Deviating from a conversation partner's linguistic behavior on the other hand could serve as a way to create distance (i.e. the communication accomodation theory: Giles, et al., 1991). Balcetis and Dale (2005) manipulated the likability of conversation partners and found support for this idea; people show more syntactic priming for liked conversation partners than for disliked conversation partners. Linguistic alignment more generally has been demonstrated to enhance romantic attraction (Ireland et al., 2011). Moreover, people who perceive themselves as being similar to the interlocutor tend to show larger syntactic priming effects (Weatherholz, Campbell-Kibler, & Jaeger, 2012). In the same study it was also found that personality or, more specifically,

conflict management style, can impact syntactic processing. People who reported to handle conflict by compromising rather than insisting on their own view showed more syntactic persistence (Weatherholz, et al., 2012). Interestingly, even an attribute as complex as fertility has been shown to impact syntactic processing for conversation partners that match in terms of sexual orientation (Coyle & Kaschak, 2012). Heterosexual males did not show higher but lower levels of syntactic persistence for female conversation partners with a higher level of fertility. As an illustration of the magnitude of these effects: males who interacted with a confederate with high conception risk showed syntactic persistence 49,7% of the time, while males who interacted with a confederate with low conception risk showed syntactic persistence 62% of the time. This effect was absent for heterosexual females talking to a female conversation partner. At first sight, the findings of Coyle and Kaschak (2012) may seem at odds with the other studies mentioned in this paragraph since these suggest that syntactic persistence can serve as a means of strengthening the relationship between people. However, as Coyle and Kaschak (2012) suggest, not aligning with your conversation partner's syntactic choice could be a way of displaying fitness and creative behavior. Not aligning could capture the interest of a potential mate after which aligning with her syntactic choices could be a means of showing reciprocal interest and increasing affiliation. In fact, Coyle and Kaschak (2012) found that when heterosexual males rated their female conversation partners as more flirtatious, their tendency to display syntactic persistence increased.

When considering all findings, the conclusion thus emerges that syntactic persistence can indeed be a means to manage interpersonal distance and affiliation between conversation partners. This research thus provides further support for the idea that social factors, attributes of the interlocutor and variables of the interaction between conversation partners can have an impact on syntactic processing. It is less clear however which of these factors best predicts the extent to which syntactic persistence occurs and what the cognitive mechanisms are that drive the influence of these variables.

5. Summary and conclusions

Multiple factors can influence syntactic processing; in this chapter we focused on the influence of contextual and interactional factors on the production of syntactic structures as revealed in syntactic priming experiments. Syntactic priming findings demonstrate that a first contextual determiner of syntactic processing is recent experience with syntactic structures. Preceding syntactic structures, whether processed immediately preceding or several sentences earlier, determine the production of syntactic structures. Even sentences processed up to a week ago can determine syntactic production. However, not every preceding syntactic structure influences syntactic processing to the same extent. Language users have implicit knowledge of the relative frequency with which syntactic alternatives occur in language and this knowledge is constantly updated. Lifelong experience with alternation

biases is a second important contextual determiner of syntactic processing. Next to influences of language context, syntactic priming research also demonstrates the influence of aspects of the social interaction with a conversation partner on syntactic processing. Attributes of the speaker as well as the conversation partner and characteristics of the interpersonal relation between conversation partners can all influence syntactic processing. These demonstrations of contextual and interactional influences on syntactic processing suggest that language use is extremely variable. Every speaker has a unique collection of language experiences and the range of characteristics of a given social interaction that constrain syntactic processing is wide. Particularly interesting in this respect are accounts of syntactic processing that incorporate the role of language experience (e.g. Jaeger & Snider, 2013; Segaert, et al., 2011). The mechanisms through which social aspects of a communicative interaction influence syntactic processing are less well specified (Gambi & Pickering, 2013; Giles, et al., 1991). Future research and theoretical accounts of syntactic processing with a broad and combined view on including contextual as well as interactional influences could provide new and valuable insights into real-world syntactic processing in dialogue.

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