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Language learners, chess champions, and piano prodigies – insights from research on language contact and expert behavior

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Abstract: One of the central assumptions in Cognitive Linguistics is that the cognitive mechanisms underlying our language use are domain-general and thus apply to human behavior beyond language. Examples of such cognitive mechanisms are, among others, our ability to focus attention, to memorize and categorize, as well as processes related to chunking, generalization, and inhibitory control. Testing this core assumption, however, is often difficult, as it requires us to move beyond linguistic research and to actively look for links between our language use and other areas of human cognition. This paper is an illustration of what such links could look like, particularly focusing on links between research on (Dutch-German) language contact and expert behavior. In doing so, it shows (a) that there are many shared links, for example, regarding the cognitive mechanisms of entrenchment and chunking, and (b) that these shared links (as well as potential differences across the fields) can be used to improve our linguistic theorizing. In particular, I argue that linguistic research can benefit from the insights from research on expert behavior, especially from its more advanced insights modelling individual variation, and that the shared links can help us to test the core assumption that the cognitive mechanisms underlying our language use are indeed domain-general.

Keywords: Cognitive Linguistics, entrenchment, chunking, language contact, expert behavior

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1 Introduction¹

Many of the most central premises in Cognitive Linguistics evolve around the assumption that to explain language, we should turn to basic, domain-general cognitive (and social²) mechanisms and thus to mechanisms that apply to human behavior beyond language. When Cognitive Linguistics was first developed, it was this premise that was used to clearly distinguish it from Generative Grammar, which assumes language to have “its own ring-fenced mental processor [that] cannot be accessed by other cognitive systems [and that is] designed to work exclusively on linguistic input” (Ibbotson, 2020, p. 3). This renewed focus on domain-general (cognitive) mechanisms in Cognitive Linguistics (see for example Divjak, 2019, for a description on cognition in linguistic research before Chomsky) – such as attention, memory, categorization, or inhibition – was able to break through that “self-imposed isolation” (Schmid, 2016a, p. 3) that Generative Grammar had created, and as such reopened the possibilities for meaningful collaboration between linguistics and other research fields such as psychology, sociology, anthropology, and communication sciences (see also Schmid, 2016a). The power of such collaboration is further illustrated by Bybee (2011, p. 1), who compares languages to sand dunes, both phenomena that have “apparent regularities of shape and structure, yet [...] also exhibit considerable variation among individual instances, as well as gradience and change over time.” She argues that to understand such phenomena, we have to “look beyond the mutable surface forms to the forces that produce the patterns observed” and thus in the case of language, to look beyond the different linguistic structures that we observe in different linguistic subfields, to the shared cognitive mechanisms that together drive all of our (linguistic) behavior. In doing so, Cognitive

¹ I would like to thank Maria Mos and Ad Backus for their help conducting the research on Dutch-German language contact and for their feedback on this paper. This paper is partly based on the discussion chapter of my dissertation titled “A usage-based account of language transfer – a case study of German speakers in the Netherlands” (Barking, 2024).

² The focus of this paper mainly is on domain-general cognitive mechanisms; however, I want to acknowledge here that similar arguments can – and should – be made regarding domain-general social mechanisms. Here too, we can consider shared mechanisms and how they apply to language as well as to behavior beyond language.

Linguistics has the unique potential – and ambition, albeit often implicitly – to unite different research fields, both within and beyond linguistic research.³

The aim of the current paper is to contribute to this overarching ambition, by highlighting potential links between linguistic research and research on other areas of human cognition. To do that, I focus on two example research areas. On the linguistic side, I describe my own recent research on Dutch-German language contact, particularly focusing on language transfer⁴ from Dutch to German by native German speakers living in the Netherlands. For example, speakers might start to use loan translations like **Hintername* ('behind name' instead of *Nachname* 'after name' based on Dutch *achternaam*) or **Wecker setzen* ('to set an alarm' instead of *Wecker stellen* 'to put an alarm' based on Dutch *wekker zetten*). They also often apply Dutch grammar patterns to their German, resulting in innovative uses of grammatical elements or word order patterns in German. I discuss several example cases of their transfer and what they reveal about the underlying cognitive mechanisms that drive speakers' language transfer. On the human cognition side, I selected research on expert behavior. This is a relatively broad and heterogeneous research field. Researchers have, for instance, investigated the expertise of

3 See also Christiansen and Chater (2017) and Ellis (2019) for similar arguments for an integration of different disciplines, both within and beyond linguistic research.

"Reintegrating the language sciences also presents huge opportunities for linking together different aspects of the study of language: viewing language acquisition as the process of acquiring the ability to process specific constructions; seeing language evolution as shaped by the processing and learning biases of the brain; providing a historical explanation for language change and variation based on the diffusion and modification of constructions; and reconnecting linguistics with the construction of workable computer language processing systems. Although such reintegration has been hampered in the past by the fragmentation of the study of language across university departments, conferences and funding bodies, the tide is now shifting and an integrated science of language is gradually emerging." (Christiansen and Chater, 2017, p. 3).

"These are exciting times to work in usage-based approaches to language learning because the enterprise brings together people working from different but complementary empirical and theoretical approaches: cognitive linguistics, construction grammar, functional linguistics, cognitive psychology, learning theory, psycholinguistics, statistical learning theory, child language acquisition, neuroscience, corpus linguistics, computational science, natural language processing, emergentism and complex systems theory, conversational analysis, dynamic systems theory, sociolinguistics, and social learning theory." (Ellis, 2019, p. 50).

4 In the current paper, the term transfer is used as a neutral term to describe the changes in speakers' native language German due to their contact with Dutch.

professional chess and sports players, pilots, doctors, typists, firefighters, people who are starting to learn how to play an instrument and professional musicians, Poker and Scrabble players, London taxi drivers, burglars and police officers, and many more (Dane, 2010a; Hambrick et al., 2016; Nee & Ward, 2015). I believe that comparing research on language contact and expert behavior is interesting, precisely because the “mutable surface forms” (Bybee, 2011, p. 1) of the investigated behavior – Dutch-German language transfer versus, for instance, playing chess – are very different, but the “forces that produce the patterns observed” might in fact be related. This is because (a) from a usage-based perspective, we assume the cognitive mechanisms to be domain-general and (b) because speaking a language can be considered a form of expertise (e.g., Gobet, 2016, p. 16: “language acquisition is a form of expertise acquisition”), providing a first linking point between linguistic research and research on expert behavior.⁵

In this paper, I argue that exploring potentially shared links between the two research fields can advance our linguistic theorizing in two crucial ways: theory building and theory testing. To illustrate both advancements, I would like to highlight a number of research strands within the field of Cognitive Linguistics here that explicitly focus on the cognitive mechanisms that drive our language use and that explore to what extent these mechanisms are indeed domain-general.

In regard to theory-building, we can use insights from other research areas – such as memory, attention, categorization, or inhibition – to inform our linguistic theorizing. A great example of such a research line is Divjak’s (2019) research on language acquisition. She argues that linguists often focus on frequency as the driving factor of acquisition – and linguistic behavior in general – without considering which particular mechanisms are actually needed to yield the observed frequency effects. She argues that, to solve this problem, linguistic research needs to integrate insights from learning theory, for instance insights related to the processes of memory and attention (e.g., p. 16: “Linguists often overlook the fact that frequency effects are memory effects.”). In her book ‘Frequency in Language: Memory, Attention and Learning’, Divjak (2019) aims to facilitate such an integration by providing a detailed overview of these cognitive learning mechanisms and linking them to linguistic theorizing. Based on this integration, she concludes that many of the commonly used frequency measures and analysis methods used in

⁵ I want to stress here that the two selected research areas should be seen as case studies. Similar links could, for instance, be explored between research on expertise and language acquisition, or between research on language contact and other areas of human cognition, such as habits and habit breaking, decision-making, or the processes involved in social settings, such as identity formation, group dynamics, and peer pressure.

linguistic research – such as simple frequency counts in corpus data as a measure of cognitive entrenchment or presenting participants with words in isolation and thus outside of their natural context – clash with insights from research on learning. She therefore argues that we need to better incorporate these insights into our linguistic theorizing in order to build towards a more cognitively realistic model of our language use.

Regarding theory testing, we can use the links between linguistic research and research focusing on other areas of human cognition to test whether the mechanisms underlying our language use are indeed domain-general. As argued above, this is one of the most important assumptions in Cognitive Linguistics, but ultimately, it remains an assumption and we need to find ways to formulate falsifiable hypotheses to test it. The shared links across research fields might provide a great starting point to do just that. The reasoning is simple: If the cognitive mechanisms driving our language use are indeed domain-general, then findings regarding these mechanisms in other areas of human cognition should hold in similar ways for our language use. To the best of my knowledge, there is currently only one research study that, albeit implicitly, operates from this reasoning⁶, which is a study conducted by Ibbotson et al. (2012) and which conceptually replicates a classic study by Franks and Bransford (1971) on the processes of categorization and prototypicality. In the original study, participants were presented with pictures of different shape combinations in a training phase. In a following test phase, they were then presented with similar pictures and now had to indicate for each of the presented shape combinations whether or not they had seen that particular combination during the training phase. One of the shapes in the test phase could be considered the prototype, as it combined all the shapes together. The results showed that, even though the participants had not seen that prototypical shape combination before, they were actually really confident that they had done so, even more so compared to less prototypical shape combinations that they had actually seen. Ibbotson et al. (2012) used the same method to study transitive sentences. They argue that prototypically, these sentences are realized as “an agent intentionally instigating an action that directly results in the patient being affected” (p. 1270) and thus that *Mary kicks the ball* is more prototypical compared to *the wind closed the door* or

6 There is of course a lot of research that investigates the relation between language and cognition in other ways; see for example Bybee, 2011 (*Language, Usage and Cognition*), Divjak, 2019 (*Frequency in Language – Memory, Attention and Learning*), Ibbotson, 2020 (*What it takes to talk – exploring developmental cognitive linguistics*) for theoretical descriptions of the relation between language and cognition, and see research on, for example, the bilingual advantage and linguistic relativity as research areas that are directly based on potential links between language and other areas of human cognition, such as executive control or (visual) perception.

Peter climbed the mountain. Their results showed that adult speakers of English, similar to the results by Franks and Bransford (1971), often believed to have seen prototypical transitive sentences during the test phase that they had not in fact seen during the training phase. This result demonstrates “how a grammatical construction [...] can behave in similar ways to non-linguistic categories” (p. 1280) and thus – as we would expect if the cognitive mechanisms underlying our language use are indeed domain-general – that research findings in another area of human cognition also hold in regard to our language use.

The current paper focuses on both of these advancements, theory building and theory testing. Using the research fields of language contact and expert behavior as case studies, I explore potential links across the fields and discuss how they can enrich our understanding of language contact and of expert behavior. To do that, I specifically focus on the cognitive mechanisms of entrenchment and chunking. I provide a description of each mechanism within both linguistic research and research on expert behavior and then explore potential links across the two fields. Finally, I discuss the implications of integrating the two research fields and provide suggestions for future research that leverages the idea of shared cognitive mechanisms across fields.

2 Shared links across research fields

2.1 Entrenchment and experience

Entrenchment, one of the central mechanisms in Cognitive Linguistics, was first introduced to linguistic research by Langacker (1987, p. 59), who wrote that there is a “continuous scale of entrenchment in cognitive organization. Every use of a structure has a positive impact on its degree of entrenchment, whereas extended periods of disuse have a negative impact. With repeated use, a novel structure becomes progressively entrenched, to the point of becoming a unit; moreover, units are variably entrenched depending on the frequency of their occurrence.” This quote illustrates two important aspects of entrenchment: its close relation to usage and its different effects, such as affecting both strength of representation and holistic processing. The current section mainly focuses on the strength of representation; see section 2.3 about chunking for more information about entrenchment and holistic processing. Since its introduction to linguistic research, there has been a lot of research on the effects of entrenchment, generally showing that every time that speakers hear or use a word or a construction, its representation becomes increasingly entrenched, the word or construction therefore becomes activated more easily, and as a result is

also more likely to be selected again (Blumenthal-Dramé, 2016; Bybee, 2011; Schmid, 2016b), resulting in “a feedback loop in which frequency comes to serve as both a cause and an effect of entrenchment” (Schmid, 2016b, p. 10).

The notion of entrenchment also plays an important role in research on language contact and language change (Backus, 2021; Bybee, 2011; Hakimov & Backus, 2021). To illustrate that, I briefly describe one of my research studies on Dutch-German language contact (Barking et al., 2022a). In that particular study, we compiled a corpus consisting of German e-mails written by nine native German speakers living in the Netherlands (total word count: 1,370,708 words; ranging from 13,760 to 513,654 words per speaker). These speakers worked for a holiday home rental company situated in the Netherlands and wrote these e-mails as replies to customer questions. Therefore, the content was mostly about holiday home rental, such as information about houses, booking requests, payment information, etc. The e-mails contained many examples of transfer, sometimes lexical as in (1) and (2) in which an employee told the customer that their payment was ‘outwardly due’ on January 30th or that the holiday home was ‘thicker to’ the pool. In other cases, the transfer was more grammatical in nature, such as inserting the Dutch complementizer *om* or taking over the Dutch spelling as in (3).

- (1) German: Die Restzahlung wäre am 30 Januar **äußerlich** fällig.
 ‘The final payment is outwardly due on January 30th.’
 Dutch: De restbetaling moet **uiterlijk** op 30 januari betaald worden.
 ‘The final payment is due on January 30th at the latest.’
- (2) German: Das Ferienhaus Mentés II liegt **dichter** beim Pool.
 ‘The holiday home Mentés II is thicker to the pool.’
 Dutch: Het vakantiehuis Mentés II ligt **dichter** bij het zwembad.
 ‘The holiday home Mentés II is closer to the pool.’
- (3) German: Ihr Kollege war so freundlich, **um** Sie zu **fragen**, **um** uns **zurück zu rufen**.
 ‘Your colleague was so kind to ask you to call us back.’ (two times transfer of *um* based on the Dutch complementizer *om* ‘to’ which would not be used here in standard German; *fragen* transferred from Dutch *vragen* meaning both ‘to ask a question’ and ‘to request’; the German *fragen* can only be used in the sense of asking a question; *zurück zu rufen* spelled as three words instead of the standard spelling *zurückzurufen*)
 Dutch: Uw collega was zo vriendelijk **om** u te **vragen om** ons **terug te bellen**.
 ‘Your colleague was so kind to ask you to call us back.’

To analyze the language transfer more systematically, we zoomed in on one specific case of transfer in these e-mails, the placement of prepositional phrases (PPs). PPs are placed more frequently in the so-called postfield position in Dutch than in German (i.e., after the main verb; see example sentence (4) based on Fitch, 2011,

p. 372, who conducted a similar analysis in Pennsylvania German) instead of the middlefield position (i.e., before the main verb, see example sentence (5)). This might potentially result in covert transfer (Mougeon et al., 2005), that is, the speakers living in the Netherlands might over-use the postfield position in their German due to transfer from Dutch. Additionally, we collected data about participants' language use by using the bilingual language profile (Gertken et al., 2014). This questionnaire combines questions about language history, language use, language proficiency, and language attitudes into a continuous measure, referred to as dominance score, which has been shown to be indicative of other measures of bilingual speakers' language use (but see Titone & Tiv, 2023; Treffers-Daller, 2016, for a discussion of the limitations of these and similar self-reported measures).

- (4)

Ich	habe	den Mann	gesehen	in der Stadt.
I	have	the man	seen	in the city
[Subject]	[Aux]	[Object]	[verb]	[postfield PP]

‘I saw the man in the city.’
- (5)

Ich	habe	den Mann	in der Stadt	gesehen.
I	have	the man	in the city	seen
[Subject]	[Aux]	[Object]	[middlefield PP]	[verb]

‘I saw the man in the city.’

The results showed that participants differed in the extent to which they used the postfield position ($M = 10.46\%$, $SD = 8.58$, minimum: 3.34%, maximum: 26.42%) and that these percentages of postfield use were strongly correlated with their dominance score ($r = .82$, $p = .007$), indicating that they used the postfield position more frequently with increasing dominance in Dutch. These results illustrate a common finding in research on language contact: on the one hand, entrenchment results in less transfer (based on the conserving effect of frequency; Bybee, 2006, 2011), as evidenced by the speakers who still regularly speak German and who do not experience much language transfer from Dutch; on the other hand, entrenchment can also result in more transfer (based on “interference through entrenchment”, Backus, 2015, p. 30), as evidenced by the speakers who use a lot of Dutch in their daily lives and who, likely due to the increasingly entrenched Dutch words and constructions in their mental language representations, experience more transfer from Dutch. Based on this dual effect, De Smet (2016, p. 95) concludes that “entrenchment crucially underlies not only what is replicated but also what is newly created”, summarizing the complex way in which entrenchment influences our language use.

Shifting now to the research field of expert behavior, here too, the mechanism of entrenchment and its reliance on frequency and repetition plays an important role.

In particular, researchers assume expertise to be organized in cognitive schemas, also referred to as expert schemas, which develop “through continual training, practice, and performance” (Dane, 2010, p. 583) and researchers therefore stress the importance of repetition of behavior for expertise to emerge. One of the most influential lines of research on this topic is by Ericsson on the effects of what he refers to as deliberate practice. In a pivotal study, Ericsson et al. (1993) asked professors at the Music Academy in Berlin to nominate violin students who had the potential for careers as international soloists (“best violinists”). They also selected students from the same department who were not nominated (“good violinists”) and students from the music education program that had lower admission standards (“music teachers”), all matched for age and gender to the “best violinists” group. They then asked these musicians to estimate the amount of practice per week for each year they had been playing the instrument. On average, at age 20, the “best violinists” had practiced more than 10,000 hours, the “good violinists” had practiced about 7,800 hours, and the “music teachers” had practiced about 4,600 hours. These and similar findings lead Ericsson and his colleagues to conclude that it is deliberate practice – and deliberate practice only – that results in expert performance. Ericsson has maintained this view over the past two decades (e.g., Ericsson, 2007, p. 4: “the distinctive characteristics of elite performers are adaptations to extended and intense practice activities that selectively activate dormant genes that all healthy children’s DNA contain[s]”) and it has been largely influential in the field. For example, his article from 1993 is one of the most cited articles in the psychological literature and many researchers, inspired by his studies, conducted similar research projects to study the effects of deliberate practice on expert performance.

Despite this significance, Ericsson’s view on deliberate practice has also met with harsh criticism from other researchers, especially in regard to whether practice should be considered the *only* factor influencing expert performance. For example, Macnamara et al. (2014) conducted a meta-analysis on expert performance in games, music, sports, education, and professions, and showed that, while in many of these domains, practice could explain a substantial part of the variance between participants (i.e., 26% for games, 21% for music, 18% for sports, 4% for education, < 1% for professions), there also was a lot of variance that is left unexplained. Hambrick et al. (2016) take up this and similar findings in their detailed overview paper ‘Beyond Born versus Made: A New Look at Expertise’ and discuss what factors other than deliberate practice might explain individual differences in expert performance. Figure 1 shows the resulting model, also referred to as Multifactorial Gene-Environment Interaction Model (MGIM). In this model, domain-specific performance – such as playing chess, playing the violin, or speaking a language – is directly related to domain-specific knowledge, which conceptually corresponds to what we refer to as speakers’ mental language representations

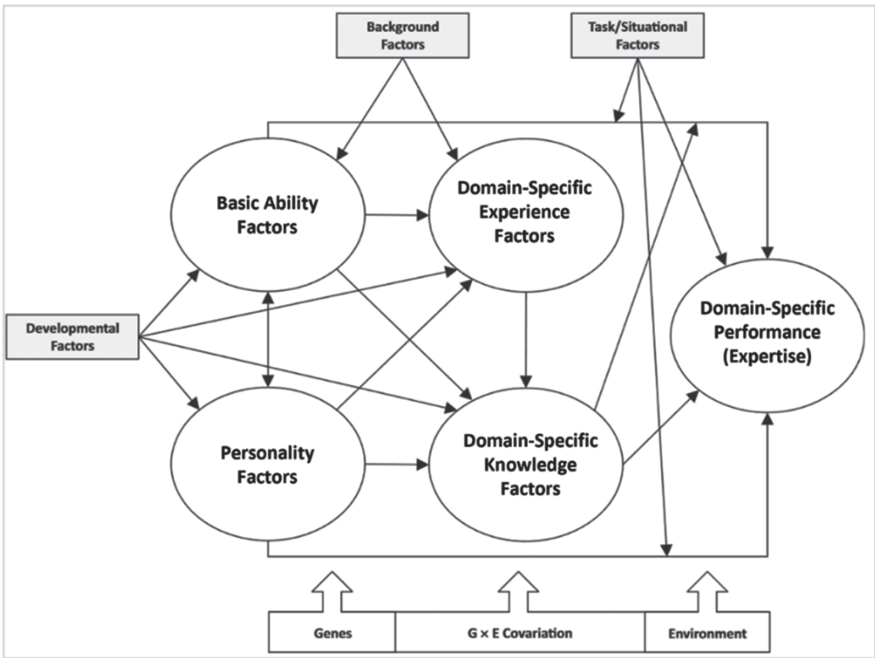


Figure 1: Multifactorial Gene-Environment Interaction Model, illustrating possible influence of different types of factors on expertise, adapted from Hambrick et al. (2016, p. 43).

in linguistic research. These representations are in turn influenced by domain-specific experience factors, basic ability factors, and personality factors. Interestingly, research on expert behavior has also extensively focused on how these factors interact with each other, for instance that ability and personality shape experience factors (e.g., you are more likely to do an activity that you are good at and that you enjoy), making it in turn more likely that someone achieves expert performance in the associated behavior. Ultimately, with this model, the researchers argue that it is crucial to focus on various factors like people’s experiences, their cognitive abilities, personalities and attitudes, and the interaction of all these factors to explain expert performance. I will return to this point in the discussion of this paper.

Research on expert behavior also focuses on the effects of non-exposure, by testing what happens when people stop practicing a certain behavior. One interesting research line in that regard is conducted by Woollett et al. (2009) on London taxi drivers. To become a taxi driver in London, taxi drivers have to undergo extensive training and testing over a period of 2-4 years in order to obtain an operating license. During that training, they learn the layout of 25000 streets in London (see Figure 2 for an illustration of what these taxi drivers have to memorize) and

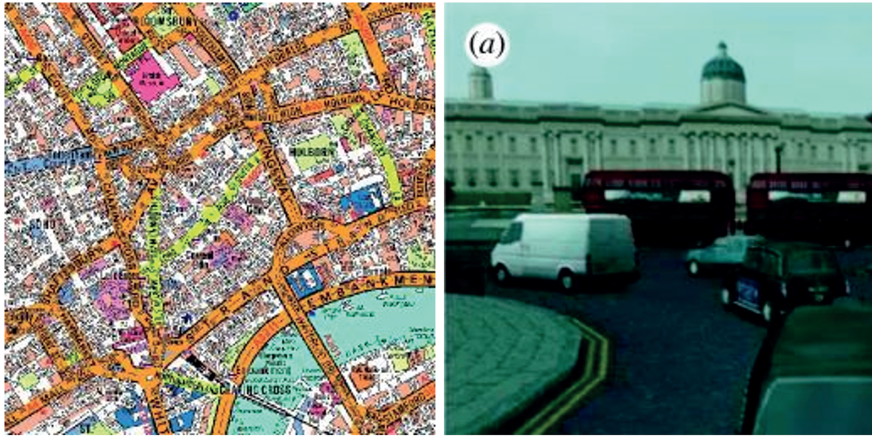


Figure 2: Central London, UK, 2009 (left; Woollett et al., 2009, p. 1408) and a screenshot of the VR London navigation test (right; Woollett et al., 2009, p. 1408).

thousands of places of interest. Additionally, the taxi drivers continuously practice how to navigate around central London, both during the training and also when they start working as actual drivers. In a series of experiments, Woollett et al. (2009) showed that this knowledge and practice results in some exceptional behavior, for instance in regard to their memory and even neurological changes that can be linked to their navigational practice and skills. In one particular study, the researchers wanted to test what happens when the taxi drivers stop all that practice, for instance because they retire. To do that, they invited a group of taxi drivers and retired taxi drivers (matched for age; years since retirement: $M = 3.6$ years) to their lab where they performed the so-called VR London navigation test. This test is based on the videogame ‘The Getaway’ and allows players to drive around a faithful representation of central London in VR (see Figure 2 for an example screenshot). Both the practicing and the retired taxi drivers were asked to navigate between different points in London. For each of the routes, the researchers determined the minimum length of that route and then calculated the difference between that length and the length of the routes that the taxi drivers drove during the VR experiment. The results showed that the routes of the retired taxi drivers were significantly longer than those of the practicing taxi drivers. Additionally, they performed worse on tests about their London layout knowledge, such as making proximity judgment between landmarks. Finally, the researchers even demonstrated that the previously observed neurological changes had largely disappeared for the retired drivers. Taken together, these results demonstrate the profound effects of the taxi drivers stopping their navigational practice due to retirement.

Already now, there are some clear links emerging between linguistic research and research on expert behavior, with both fields stressing the importance of usage/experience/practice for cognitive (expert) schemas to emerge and to become entrenched. In particular, frequent exposure to a particular behavior – for example frequent use of Dutch, frequent practice of the violin, frequently navigating around central London – strengthens representations associated with that behavior. Infrequent or potentially even non-existent exposure to the behavior results in a decrease of entrenchment (see again Langacker, 1987, p. 59: “extended periods of disuse have a negative impact [on entrenchment]”). The effects of this lack of exposure can in fact be quite far-reaching. For example, in the case of Dutch-German language contact, we see that the more participants become dominant in Dutch – and thus the more the Dutch words and constructions become entrenched for them relative to the entrenchment of their German counterparts – the more they experience transfer from Dutch. Building on this finding, in a follow-up experimental study, we even found that some speakers would not only use the transferred constructions such as **Wecker setzen*, but that they would also accept them in a judgment task and sometimes, likely due to extended non-use, would even reject the conventional German counterparts such as *Wecker stellen* (Barking et al., 2022b; see also Verschik, 2006, and Bahtina et al., 2021, for similar findings in acceptability tasks of Russian-Estonian and English-Estonian language transfer). Similarly in the case of the London taxi drivers, their retirement resulted in a drastic decrease in performance on London navigation and knowledge tests and even in a reversal of the changes in their brain structures. Of course, more research is needed to test whether the concept of usage as it is used in linguistic research (i.e., exposure and own usage of words and constructions) and the concept of experience/practice as it is used in research on expert performance (e.g., Ericsson’s concept of deliberate practice; knowledge and skills due to daily taxi driving) do indeed trigger the exact same cognitive mechanisms. The links across the two fields as described here provide a good starting point for further exploration.

2.2 Entrenchment and interference

Other research, both in the field of linguistics and in the field of expert performance, has focused on the effects of entrenchment, particularly in terms of memory interference.

In research on language contact, including my own research on Dutch-German language transfer, memory interference plays a crucial role. In particular, research has shown that language transfer often happens unconsciously and automatically (Barking, 2024; Davidson, 2019; Nycz, 2016; Rodríguez-Ordóñez, 2019), as words and constructions from the contact language, likely due to their high entrenchment,

become activated automatically and subsequently interfere with the selection of any alternatives in the speakers' other language. For example, native German speakers living in the Netherlands might be so used to some Dutch words and constructions – such as *achternaam* 'last name', *wekker zetten* 'to set an alarm', or the Dutch postfield position – that they experience interference when speaking German and transfer these words and constructions, resulting in unconventional German expressions such as **Hintername*, **Wecker setzen*, or a marked frequency increase of the postfield position. This automatic nature of language transfer becomes especially evident in the case of transfer by speakers who actually want to avoid it. To study this, we conducted a number of focusgroup discussions among native German speakers in the Netherlands (Barking, 2024) and showed that many of these speakers hold rather negative attitudes towards language transfer. They think that they should be able to speak their native language German without any mistakes and they see Dutch transfer as a deviation from standard German and thus as something that should be avoided. However, zooming in on their actual language use during the focusgroup discussions, we observed many cases of language transfer, often because participants did not notice the transfer while speaking or because they no longer recognized a construction as transfer (see again also Barking et al., 2022b, and Barking et al., 2024, who showed that German speakers in the Netherlands often accept transferred constructions in an acceptability judgment task).

Research in the field of expert behavior also focuses on the effects of entrenchment. On the one hand, researchers have found advantages of expertise: due to the repeated activation of the expert schemas, activation of these schemas and their associated behaviors becomes automatic, allowing experts to multi-task, to quickly assess situations, and to take effective decisions (see Ericsson, 2006, for a detailed overview of the advantages of expertise). On the other hand, researchers argue that there might be a trade-off between expertise and flexibility. They argue that repeated activation of the expert schemas might lead to what they refer to as cognitive entrenchment (Dane, 2010), leading experts to focus on only one solution instead of considering potential alternatives, making them less flexible and less able to adapt to new situations, and overall resulting in less creative thinking (Dane, 2010; see also Sternberg, 1996, p. 347: "One such cost is increased rigidity: The expert can become so entrenched in a point of view or a way of doing things that it becomes hard to see things differently."). To test this experimentally, Woollett and Maguire (2010) conducted another experiment using London taxi drivers as a case study. This time, the researchers invited a group of practicing taxi drivers to the lab and again presented them with a VR environment of London (see Figure 2). However, the researchers had made some changes to the layout (see Figure 3), and they then asked the participants to drive around that altered layout and to commit it to memory. After the training phase, the taxi drivers were tested on their abilities to navigate around the altered layout, and they had to draw a sketch map. Comparing their performance to their performance on a similar task, in which they

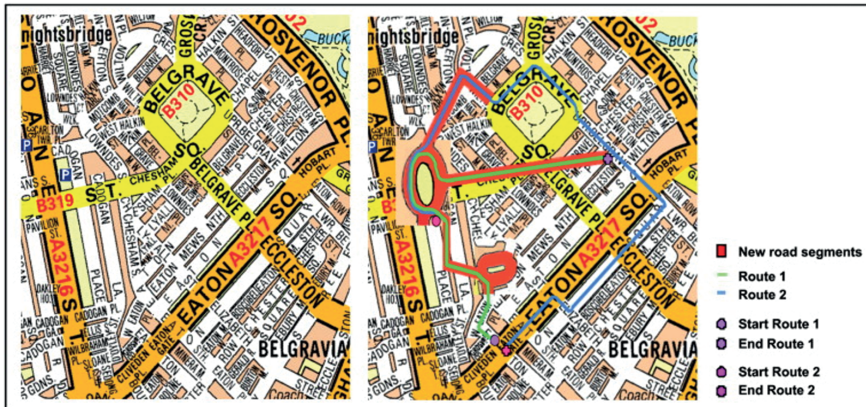


Figure 3: Map of London. Left: London as it is normally. Right: A map showing existing London integrated with ‘new’ London, where modifications are depicted in red. Note that participants never saw these maps, Woollett and Maguire, 2010, p. 569.

had to learn the layout of an area that was completely new to them, the researchers showed that the taxi drivers performed significantly worse on this task. Based on these findings, Woollett and Maguire (2010) hypothesize that the drivers experienced difficulties inhibiting their strong expert schemas of the actual London layout and that these expert schemas competed and interfered with the new representations that the taxi drivers tried to memorize during the experiment. As such, this study provides experimental evidence that in some cases, expertise might indeed hinder performance.

Again, these findings are similar to linguistic research, particularly research on language contact. For example, my own research on Dutch-German language contact showed how Dutch words and constructions can become so entrenched for the native German speakers living in the Netherlands that they become activated automatically, similarly to how the highly entrenched representations of the layout of central London become activated automatically for the London taxi drivers during the VR experiment. This activation in turn can result in memory interference, as evidenced both by language transfer (i.e., speakers transferring the activated Dutch words and constructions to their German, resulting for example in an over-use of the postfield position or in innovative constructions such as **Hintername* or **Wecker setzen*) and by the taxi drivers’ difficulties learning the altered layout of central London. Looking at these similarities, especially also in combination with the similarities already discussed in section 2.1 that both research fields stress the importance of usage/experience/practice, it indeed seems that the cognitive mechanism of entrenchment plays a central, often similar role in both linguistic research and research on expert behavior. These results therefore echo Langacker’s (2016, p. 39) claim that entrenchment is “not specific to language but a general phenomenon observable in any kind of learned

human activity” and that it might therefore provide “the opportunity to establish a new meeting ground for psychology and linguistics” (Schmid, 2016a, p. 3).

2.3 Chunking

Similar to entrenchment, the cognitive mechanism of chunking is also assumed to play an important role in human cognition. In fact, in their overview paper ‘Chunking mechanisms in human learning’, Gobet et al. (2001, p. 236) call it “one of the key mechanisms of human cognition [...] where each chunk collects a number of pieces of information from the environment into a single unit” and they argue that in doing so, it forms an important link between “the external environment and internal cognitive processes”. When introducing the concept of chunking in their overview paper, the researchers refer to a wide range of studies, including research on chess (see below for more information about chunking in chess research) and interestingly also on language acquisition. Similarly, linguists sometimes refer to other areas of human cognition when introducing the concept of chunking in their theories (see for example Langacker, 2013, p. 16 who argues that similar processes to language learning are observed when “learning to tie a shoe or recite the alphabet: through repetition or rehearsal, [...] a structure undergoes progressive entrenchment and eventually becomes established as a unit”). Such close links across research fields can also be observed when looking at linguistic research and research on expert behavior. To illustrate that, have a look at the quotes in (6) and (7).

- (6) Experimental studies on adult language have pursued the idea that frequent chunks (*good morning*) and more or less fixed formulaic sequences (*many happy returns, all the same, if you know what I mean*) are processed in a holistic manner, i.e. by means of an access-and-retrieval rather than an online, computational procedure. (Schmid, 2016b, p. 17)
- (7) At first, individuals rely on crude, slow and effortful strategies for obtaining the solution to the problem at hand. With each encounter of a stimulus, however, individuals store relevant traces/instances of the stimulus that can later be retrieved when they encounter the same stimulus/problem. The performance of a task is determined by two kinds of race. The first is between specific instances in memory and a general algorithm, while the second is between the instances themselves, the number of which grows with each encounter with the stimulus. Instance Theory traces automatization processes back to memory retrieval, that is when instances start winning the race against general algorithms. (Bilalić et al., 2008a, p. 76)

The first quote is about chunking in regard to our language use, making a distinction between holistic processing on the one hand (i.e., a frequently used collocation like *good morning* is likely retrieved as a unit) and an online, computational procedure on

the other hand (i.e., combining the words on the spot, for example, *good + morning*, which happens when a given expression is not (yet) stored as a chunk). The second quote, coming from the field of expert behavior, describes the so-called Instance Theory and it is applied by Bilalić et al. (2008a) to chess players, who they argue to first rely on “crude, slow and effortful strategies” to process a given chess position, but who over time store “specific instances” of various chess positions including what moves to do next. Eventually, these “instances start winning the race against general algorithms” of calculating every possible move, that is, the chess players start to rely on them to make quicker – and often, although not always – better decisions (see below for a more detailed description about chunking in chess). Both quotes, despite coming from two different fields, thus stress the tension between “an online, computational procedure”/ “a general algorithm” and processing based on specific instances in a holistic manner,⁷ already illustrating the close links between the research fields when it comes to the cognitive mechanism of chunking.

Further zooming in on linguistic research, there is ample evidence that chunking greatly influences our language processing and production. For instance, research has shown that processing of a chunk proceeds automatically once started

7 The current paper focuses on the first part of this opposition (i.e., holistic processing in the form of chunking), but of course the other part (i.e., the computational procedure) is equally important for linguistic research. In particular, there is a lot of research, especially on language acquisition, that focuses on the mechanisms of generalization/schematization, that is, on the mechanisms that allow speakers to establish any computational procedures in the first place. From a usage-based perspective, this process – just as entrenchment and chunking – is assumed to be gradual and tightly linked to (children’s) language input. To illustrate this, Tomasello (2000) describes the different steps needed for English-speaking children to notice that main sentences in English generally have an SVO word order: understanding communicative intentions, learning holophrases (e.g., *lemme-see*, *gimme-that*), producing simple multi-word expressions (e.g., *Where’s the X?*, *I wanna X*), forming generalizations about the structure of sentences containing specific verbs (e.g., ‘hitter’ before ‘thing hit’ before ‘thing hit with’), and finally, arriving at increasingly abstract schemas by further generalizing over these patterns. Similarly, research on language contact has investigated the mechanisms of generalization/schematization (see for example Muysken’s, 2013, bilingual speakers’ optimization strategies or Höder’s, 2018, diasystematic construction grammar, which respectively assume bilingual speakers to match L1 and L2 patterns where possible and to form language-independent constructions based on these matches; and see Barking et al. 2022c, Barking et al., 2023, and Barking et al., 2024, on a discussion of generalization/schematization in the case of Dutch-German language transfer). Interestingly, research on expert behavior too has focused on similar cognitive mechanisms, generally showing that, once an expert schema has emerged, experts are able to apply it to novel but partially familiar environments (Nee & Ward, 2015). An interesting study in that regard is again conducted by Woollett and Maguire (2010) on London taxi drivers. Testing their navigational skills in a new area outside central London, they conclude that taxi drivers’ “expertise might in part be underpinned by the development and use of *generalizable* and effective strategies for wayfinding” (emphasis my own, p. 565), again illustrating potential links across the research fields of language contact and expert performance.

(e.g., people activate the next words in a chunk before they have been uttered, helping them to efficiently process their speech input; Schmid, 2016b), that chunks are more likely to be affected by processes of language change (e.g., frequent chunks such as *going to* become processed as one unit potentially resulting in phonetic and morphological reduction as in *gonna*; Bybee, 2011), and that a lot of language contact effects seem to rely on transfer of entrenched chunks rather than the general pattern (e.g., Doğruöz, 2014; Doğruöz & Backus, 2009). I observed similar effects in my own research on Dutch-German language contact. For example, analyzing the corpus consisting of German e-mails written by native German speakers living in the Netherlands for their placement of prepositional phrases (Barking et al., 2022a; see explanation in section 2.1), we were also interested in the specific lexical instances that the speakers would use in combination with the postfield position. We therefore noted the verb, the preposition, and the verb-preposition-combination for each PP use and ran collostructional analyses (Gries, 2007; Stefanowitsch & Gries, 2003) to test which lexical elements were most attracted to the postfield position (Barking et al., 2022c). Zooming in on some of the highest attraction values, we found that many of them were the result of a single fixed expression. For example, sentences (8; prepositional phrases in the postfield position marked in bold) to (10), which were written by the same speaker, all make use of the same expression to start the sentence. This suggests that this speaker does not experience interference from the Dutch postfield position every time that she uses this expression, but rather that this has become a fixed multiword unit for her.

- (8) *Wie wir entnehmen können **aus unserem System**, sind Sie bereits von Ihrem Urlaub zurück.*
 ‘As we can see in our system, you have already returned from your vacation.’
- (9) *Wie wir entnehmen können **aus unserem System**, war der vollständige Betrag in Höhe von €451,70 am 01.02.2017 fällig.*
 ‘As we can see in our system, the payment of €451.70 was due on 01.02.2017.’
- (10) *Wie wir entnehmen können **aus unserem System**, hat der Kunde zwei Buchungen für die gleiche Unterkunft.*
 ‘As we can see in our system, the customer has two bookings for the same accommodation.’

Chunking also plays an important part in research on expert behavior. In fact, researchers argue that this process is what solves one of the main contradictions in the research field: that, on the one hand, research has shown people to have a limited working memory capacity, but that, on the other hand, experts are able to quickly process highly complex situations (Van Merriënboer & Sweller, 2005). For example, some of the first research in the field focused on chess players (De Groot, 1965; Chase & Simon, 1973) and presented them with different chess positions (see Figure 4 for an example). Some positions were taken from tournament games,

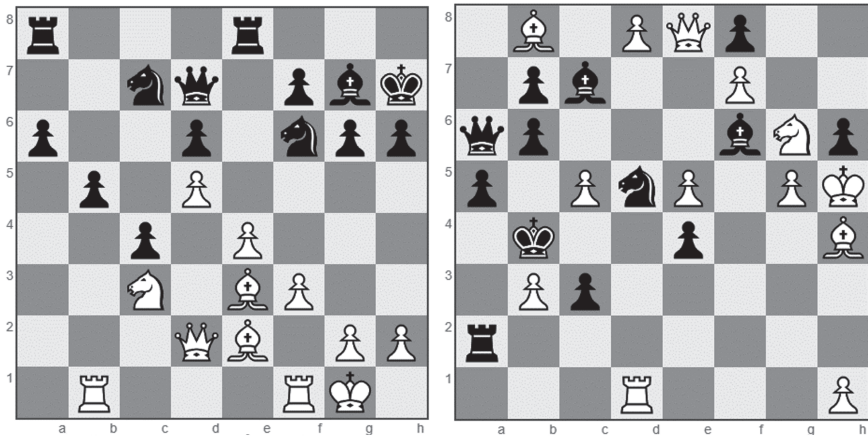


Figure 4: Types of positions typically used in chess memory research. A game position taken from a masters' game (left) and a random position obtained by shuffling pieces of a game position (right).

others were just random positions. Participants saw the positions for around ten seconds and were then asked to recall them. The results showed that chess players at and above master level recalled the positions almost perfectly when presented with positions from tournament games, but they performed only slightly better than novice players when presented with random positions (Chase & Simon, 1973). To explain these and similar findings across a variety of expert performances (Larrick & Feiler, 2015; Nee & Ward, 2015), researchers make use of the mechanism of chunking: they argue that people identify patterns in their experiences, group them together in their memory, and start to process them as holistic units, even though they might internally consist of many different elements such as many different chess pieces on a chess board. As such, this chunking process can explain why experts are able to quickly process and respond to complex situations despite their limited working memory capacity (Van Merriënboer & Sweller, 2005).

Interestingly, research on expert behavior often discusses the process of chunking in close relation to experience (see also the quote by Langacker, 1987, at the beginning of section 2.1 for a similarly close reasoning between chunking and entrenchment in linguistic research), both in relation to the emergence and the effects of chunks. For the emergence of chunks, Gobet (2005, p. 192) argues that “a direct consequence of chunk-based theories is that the time at task is essential to gain knowledge, as each process in the growth of the discrimination network [referring here specifically to a network of chunks] [...] is subject to a time cost. Thus, in learning algebra or becoming a violin virtuoso, time must be invested.” To test this empirically, research has for example investigated the chunk inventory of chess players, showing that experienced chess players have stored both more and larger (i.e., containing more chess

pieces) chess positions compared to novice chess players. In relation to the effects of chunking, researchers argue that chunks allow people to make quicker and better decisions. This is because people also include information about how to respond in their chunk inventory, resulting in expert schemas to become “abstract, prototypical maps or mini-recipes regarding how to respond” in a given situation (Nee & Ward, 2015, p. 2). For example, asking their participants to think aloud, Chase and Simon (1973) showed that experienced chess players often relied on heuristics to evaluate a chess position and to decide on their next move, whereas less experienced players were hindered by a step-by-step approach.

At the same time, just as was the case for the cognitive mechanism of entrenchment (see section 2.2), researchers have also observed negative consequences of chunking, often referring to the phenomenon of *Einstellung* (set) effect (Luchins, 1942), which can be explained with another example from chess research. In this experiment, Bilalić et al. (2008a) presented chess players at different levels (Grand Masters: $N = 6$, International Masters: $N = 6$, Masters: $N = 11$, Candidate Masters: $N = 11$) with chess problems such as the ones presented in Figure 5 and asked them to find the shortest move sequence resulting in a check mate. The first chess problem offered two solutions: the well-known theme of so-called smothered mate that results in check mate in five moves and a less familiar solution that results in check mate in three moves (see Figure 5). Most pieces in the second chess problem are placed in the same way, but with the black bishop on a different square, smothered mate is no longer possible, and the players needed to find

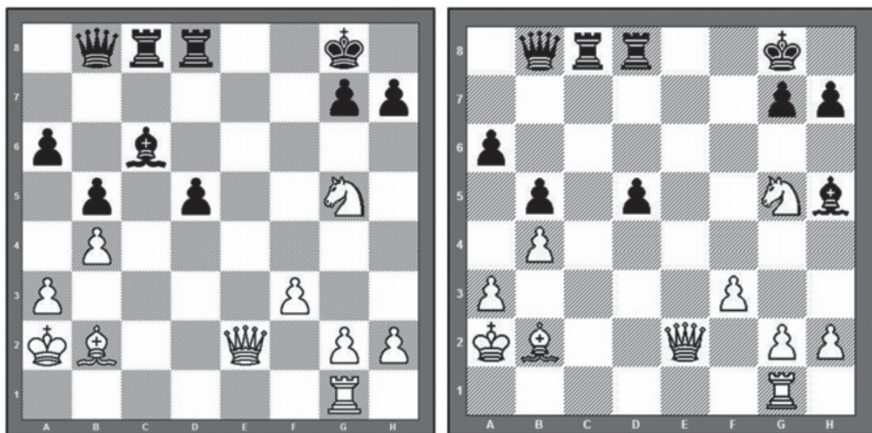


Figure 5: The 2-solution (critical) and 1-solution (extinction) problem (White to play). In the 2-solution problem the well-known smothered mate solution is possible: 1. Qe6+ Kh8 2. Nf7+ Kg8 3. Nh6++ Kh8 4. Qg8+ Rxg8 5. Nf7#. The shorter solution is: 1. Qe6+ Kh8 (if 1... Kf8 2. Nxh7#) 2. Qh6 Rd7 3. Qxh7#. In the 1-solution problem the black bishop has moved from c6 to h5. This disables the smothered mate solution but still allows the shorter solution (Bilalić et al., 2008a, p. 83).

the other solution instead. The only difference between the two problems was thus whether or not a familiar solution was available, yet the results across the two problems were very different: all Grandmasters, but only 50% of the International Masters, 18% of the Masters and none of the Candidate Masters found the shorter solution in the first chess problem, even though they were all able to find it in the second one. Based on the players' think-aloud protocols, the researchers conclude that the smothered mate solution was quickly spotted by all players and that they were then "trapped by the immediate appeal of the familiar solution" (p. 85), failing to find the more optimal one. In a follow-up study, Bilalić et al. (2008b) also added eye-tracking data, showing that, even when players were trying to search for a better solution, they remained fixated on the squares that were critical for the familiar solution, illustrating the powerful blocking effect of entrenched chunks, in this case, the entrenched smothered mate chunk.

Overall, when it comes to the cognitive mechanism of chunking, there are some clear links between linguistic research and research on expert behavior, with both fields assuming a similar chunking process: people first notice patterns in their experiences, for example frequently co-occurring words or chess pieces that are placed similarly in relation to each other across various chess positions, and they then store these patterns as chunks. As a consequence, these chunks are processed as holistic units, allowing both fast and effortless production (e.g., in the case of one of the native German speakers living in the Netherlands who likely produced the expression "*Wie wir entnehmen können aus unserem System...*" in a relatively automatic manner) and processing (e.g., in the case of the experienced chess players who were able to process and remember complex chess positions in just a number of seconds). At the same time, this rather automatic production and processing has also been shown to come at a cost, specifically when the activated chunks are not the most appropriate solution in a given situation. For example, for the native German speakers living in the Netherlands, transferred chunks might become activated and used, even when those speakers want to avoid language transfer. Similarly, chess players might not find the optimal move in a chess position because they focus too much on a familiar solution instead.

3 Discussion

The aim of the current paper is to discuss research on (Dutch-German) language contact and on expert behavior and to look for shared links across the two research fields. To do that, I focused on the cognitive mechanisms of entrenchment and chunking, and showed how these mechanisms play a similar role in both research fields. Please note here that more empirical research is needed to confirm that

the cognitive mechanisms are indeed shared across the different domains and to explore what that means for how we learn languages and other skills such as taxi driving or playing an instrument. In this discussion, I focus on the shared links and discuss how they can contribute to future (empirical) research on these questions, both in terms of theory building and theory testing.

3.1 Potentials for theory building

Overall, the discussion of research on language contact and on expert behavior showed that there are a lot of similar patterns and processes, such as (cognitive) entrenchment and its relation to frequency and repetition of behavior, people observing patterns in their experiences and chunking them together, behavior becoming automatic due to repeated exposure, or different schemas competing and interfering with each other. At the same time, the description of the two research fields also revealed some slight, but important differences, which I believe to be areas in which the research fields can benefit most from each other.

Research on expert behavior can benefit from linguistic research

Research on expert behavior can benefit from linguistic research, because it can map out important links between experience and mental (language) representations, much more so than research on expert behavior. This is because linguistic research showcases the dynamic nature of cognitive schemas (e.g., “entrenchment can essentially be regarded as a lifelong cognitive reorganization process [...] conditioned by exposure to and use of language”, Schmid, 2016b, p. 3). For example, my own research on Dutch-German language contact showed how German speakers, given a drastic change in their input from German to Dutch, continuously adjust their cognitive schemas, for instance by adding new constructions transferred from Dutch, by removing existing constructions due to non-use, or by forming new schemas by generalizing over patterns across their languages. Additionally, linguistic research offers researchers a broad methodological toolkit to explore the relation between usage and cognition. Compare for example the methodological approaches in the field of expertise (e.g., measuring behavior based on nominations or rankings, measuring experience based on self-reported amount of practice) with the much more fine-grained approaches in linguistic research (e.g., counting frequencies in corpus data, collecting production and judgment data, reaction times, eye tracking, etc., all providing insights into usage of individual words and constructions within a language).

As a result of the dynamic nature of language and the advanced methodological toolkit, linguistic research can contribute to research on expert performance in (at least) two important ways. First, linguistic research, especially from a usage-based perspective, has extensively explored the interrelation between experience and mental (language) representations (e.g., Bybee, 2006, p. 730: “usage feeds into the creation of grammar just as much as grammar determines the shape of usage”; Schmid, 2013, p. 76: “grammar [is seen] as being informed by and emerging from usage”; Ellis, 2019, p. 39: “language and usage are like the shoreline and the sea”). Note how this usage-based theorizing is not (yet) part of research on expert performance (as evidenced for instance by the missing bidirectional arrows between domain-specific experience, knowledge, and performance in the Multifactorial Gene-Environment Interaction Model, Figure 1). Second, researchers in the field of (socio)linguistics have extensively focused on the social factors that influence our language use and as such our mental (language) representations. They argue that language, as both an instrument for and a system that emerges through social interaction (Dąbrowska, 2016, 2020; Ibbotson, 2020), “links us socially and cognitively to each other, and to the larger society and cultures around us” (Titone & Tiv, 2023, p. 12). Combining these sociolinguistic insights with the insights from Cognitive Linguistics, usage-based approaches therefore argue that “we cannot hope to understand [language] structure without considering both cognitive and social factors and their interactions” (Dąbrowska, 2016, p. 486; see also Ibbotson, 2020; Schmid, 2016b) and therefore urge us to approach “the study of language as the combination of sociolinguistics and psycholinguistics” (Backus, 2021, p. 122). Again, research on expert behavior can benefit from this theorizing, for instance, by expanding on the concept of ‘environment’ in the Multifactorial Gene-Environment Interaction Model (Figure 1)⁸ and linking it to other key concepts in the model. Taken together, these insights into both the determinants and effects of experience greatly inform our understanding of the process of entrenchment as well as the effects of sociality/interaction/environment, which might also be relevant to – but more difficult to study in – research on expert behavior.

Linguistic research can benefit from research on expert behavior

Similarly, we can think about how linguistic research can benefit from research on expert behavior. First, research on expert behavior has extensively focused on individual variation, much more so than linguistic research in which the importance

⁸ I would like to thank the reviewer of this paper for raising this interesting observation.

of individual variation has only recently received more attention (e.g., Verhagen, 2020). This is likely because variation is so salient when it comes to expertise. As Hambrick et al. (2016, p. 1) argue, “no one can deny that some people are vastly more skilled than other people in certain domains”, and Macnamara et al. (2014, p. 1608) add that the question ‘why [...] so few people who take up an instrument such as the violin, a sport such as golf, or a game such as chess ever reach an expert level of performance’ has therefore been the “topic of a long-running debate in psychology”. To explain this variation, expertise researchers focus on factors that relate to people’s experience – something that has also been extensively studied in Cognitive Linguistics –, more innate factors such as people’s cognitive abilities and their personality traits, as well as how these factors interact (see section 2.1 and see Figure 1). This advanced theoretical modeling might also be fruitfully applied in linguistic research, urging us to investigate speakers’ language use, their cognitive abilities, personality traits and attitudes, and the interaction of all of these factors, to fully understand and embrace the importance and insights of individual variation.

Second, research on expert behavior raises a number of interesting questions new to linguistic research, for example whether (cognitive) entrenchment should be considered an advantage or disadvantage. More specifically, researchers in the field of expert behavior have argued that applying highly entrenched expert schemas in new situations can be a sign of rigid thinking and impaired creativity. In linguistic research too, entrenchment is considered a mechanism of replication (i.e., activating and repeating what has already been heard or used before), yet it is sometimes also argued to be involved in processes of innovation (e.g., see De Smet, 2016, p. 95: “entrenchment crucially underlies not only what is replicated but also what is newly created”). This is, for instance, the case in research on language contact when speakers – for example, due to their high entrenchment of Dutch words and constructions – experience language transfer, resulting in innovative expressions in German such as **Hinternamen* or **Wecker setzen*. Similarly, this difference between replication and innovation plays an important role in our theorizing about large language models such as ChatGPT, which can produce rather innovative output based solely on what they have encountered before (e.g., see ChatGPT, 11.04.2023, on the question whether its language use is creative: “As an AI language model, I am not capable of creativity in the way that humans understand it. I don’t have emotions, experiences or the ability to come up with completely original ideas that haven’t been inputted into my programming. However, I am able to generate text that can be creative, such as writing poetry, stories, and even jokes.”). Inspired by the research on expert behavior, however, we can ask ourselves whether such language use should indeed be considered innovative or whether we should instead make a distinction between what seems to be innovative from the perspective of the language system (e.g., **Hinternamen* is a new, innovative word in standard

German) and what is actually produced in an innovative way from the perspective of the speaker. Insights from expert behavior might help us to answer these questions, thereby allowing us to disentangle the entrenchment effects of replication and innovation and as such fine-tune our linguistic models.

Taken together, these reflections clearly illustrate how both research fields can learn from each other. As such, I believe them to provide a nice illustration of the benefits of using the cognitive mechanisms – such as entrenchment and chunking – as starting point and then focusing on different behavior, such as language contact or expert behavior, as case studies to further explore these mechanisms. Each of these case studies (i.e., each of these behaviors) is able to provide a slightly different angle, thereby illuminating aspects of the cognitive mechanisms that might otherwise remain hidden. For example, taking a more general look at linguistic research and research on expert behavior, it seems that the two fields followed two different theoretical pathways, which I believe to be related to their different manifestations of individual variation. While every neurotypical child learns to speak a language, certainly not every child who starts to learn an instrument or play a sport eventually becomes an expert musician or sports player. As a result of these differences in variation, linguistic research – inspired by Noam Chomsky and his theory of Generative Grammar – focused a lot on how children are born with an innate language faculty, whereas research on expert behavior – inspired by Ericsson and his beliefs about deliberate practice – focused on how expertise is acquired instead. Over time, researchers in both fields developed new approaches to oppose these extreme views – such as the Multifactorial Gene-Environment Interaction Model in expertise research that assumes deliberate practice to be one of many factors that results in expert performance (see Figure 1) or Cognitive Linguistics that assumes children to be able to acquire a language through the combination of usage and domain-general cognitive mechanisms. As a result, research on expert behavior has developed a strong focus on innate factors, such as people's cognitive abilities and their personality traits, ultimately trying to show that expertise is not (only) learned. Cognitive Linguistics, in opposition to Generative Grammar, on the other hand, particularly focused on the effects of usage, ultimately trying to show that language is not (only) innate. These different pathways are exactly why the two research fields can learn so much from each other: as argued above, linguistic research can benefit from the more advanced insights of individual variation in the field of expert behavior, including individual variation due to innate factors, whereas research on expert behavior can benefit from the more advanced insights into how usage/experience/practice affects our mental (language) representations. Clearly, this represents a win-win situation, revealing new insights and exciting research directions for both research fields.

3.2 Potentials for theory testing

We can also think about the shared links across research fields as a way to test whether the cognitive mechanisms underlying our language use are domain-general and thus apply to behavior beyond language. As argued in the introduction, this is one of the most important assumptions in Cognitive Linguistics, but ultimately, it remains an assumption and we need to formulate falsifiable hypotheses to test it (see also Divjak and Milin, 2023, p. 10: “Another thing we need to get better at is generating testable predictions and then actually testing them.”).

This is actually more difficult than it sounds, which also became evident in my own research on Dutch-German language contact. As described in the previous sections, one of my main focus points was to investigate the cognitive mechanisms driving speakers’ language transfer. To do that, I used these mechanisms to formulate several hypotheses and I designed different experimental studies to test them. In most cases, however, my hypotheses were actually not confirmed. For example, based on the cognitive mechanism of entrenchment, I hypothesized that native German speakers living in the Netherlands would *over-use* the German complementizer *um* due to transfer from Dutch, in which the complementizer is used much more frequently. I expected this to be the case for both constructions in which the use is already possible in German and in new, innovative constructions (Barking et al., 2024; see also (3) for an example). While this was indeed the case for the innovative constructions, my participants were in fact *less* likely to use the complementizer in existing German constructions compared to a control group of German speakers not in contact with Dutch. Clearly, my hypothesis was thus rejected. However, even though I had based this hypothesis on entrenchment, one of the core mechanisms within Cognitive Linguistics, this rejection did not necessarily challenge the theory itself. Instead, I showed that social factors, which are explicitly included in many usage-based models (e.g., Backus, 2021; Dabrowska, 2020), could explain this finding, as speakers with negative attitudes towards transfer engaged in hypercorrection and intentionally overruled entrenchment-related processes. As such, this example illustrates how flexible Cognitive Linguistics can be and the range of linguistic phenomena that it is therefore able to explain. At the same time, this flexibility also means that it is really difficult to actually test the theory, that is, to find falsifiable hypotheses that – if rejected – would actually challenge Cognitive Linguistics itself.

Importantly, the shared links across research fields, for example the shared links between research on language contact and expert behavior, might present the perfect opportunity to solve this problem and provide starting points for hypotheses that directly test some of the core assumptions of Cognitive Linguistics, specifically the assumption that the cognitive mechanisms driving our language use

are domain-general. As already argued in the introduction, the reasoning here is simple: if these mechanisms are indeed domain-general, then findings regarding these mechanisms in other areas of human cognition, for example findings in the field of expert behavior, should hold in similar ways for our language use. One way of testing this is to take prominent studies in the field of cognitive psychology and to ‘translate’ them to linguistic research, for example as is done in the research study by Ibbotson et al. (2012) which conceptually replicated Franks and Bransford’s (1971) classic study on categorization (see section 1.0). Similarly, we can think about the research field of expert behavior and its studies on the underlying cognitive mechanisms of entrenchment and chunking. For example, we could test whether speakers are more likely to remember existing versus randomized chunks (conceptually replicating the study by Chase and Simon, 1973, on chess players) or whether the *Einstellung* (set) effect (Luchins, 1942) also occurs in regard to our language use (conceptually replicating the study by Bilalić et al., 2008a). In doing so, we can test whether findings regarding cognitive mechanisms – such as entrenchment and chunking – hold in similar ways across different domains of human cognition and as such test the assumption whether the cognitive mechanisms driving our language use are indeed domain-general.

Please note here that there is an important caveat to this set-up. As argued above, language – developed as a system for social interaction – is inherently social, which means that it is impossible to ever truly study (domain-general) cognitive mechanisms in isolation (Backus, 2021; Dąbrowska, 2016, 2020; Schmid, 2016b). This in turn raises the question as to how similar we should actually expect cognitive effects in language and other cognitive domains to be – even when the underlying mechanisms are domain-general –, precisely because language is so social and thereby potentially creates a very different ‘working environment’ for the cognitive mechanisms to operate in. A similar argument is raised by Titone and Tiv (2023) regarding the much-contested bilingual advantage, that is, the idea that bilingual speakers constantly have to suppress one of their languages and through that practice achieve advanced executive control in general. Research on this advantage has produced very mixed results, which Titone and Tiv (2023) argue should not surprise us. In particular, they reason that these findings might reflect that “language use really is socially-rooted, as certain cognitive strategies (e.g., proactive control) may be effective in responding to certain social-environmental demands, but certainly not all” (p. 12). Applying this reasoning to the comparison of cognitive effects across different domains, we too have to take into account the different social dynamics in these domains and how they affect what any cognitive effects might look like. Note for instance how the results in the study by Ibbotson et al. (2012) slightly differed from the conceptually replicated study by Franks and Bransford (1971). In particular, participants in the original shape study were more likely to believe that they

had seen prototypical shape combinations, which they had not seen previously, than less prototypical combinations that they had in fact seen during the training phase. Similarly, the participants by Ibbotson et al. (2012) often believed to have seen prototypical transitive sentences during the test phase, but *not* more so than less prototypical sentences that they had seen. Based on these findings, Ibbotson et al. (2012) conclude that the prototype effect might in fact be more pronounced for shapes than for language, illustrating the complexities involved in comparing cognitive effects across different domains. Clearly, more conceptual as well as empirical research is needed to further explore how to best test the core assumption that the cognitive mechanisms driving our language use are indeed domain-general, as such targeting the heart of Cognitive Linguistics and allowing us to directly test the theory itself.

4 Conclusion

From a usage-based perspective, we assume the cognitive mechanisms underlying our language use to be domain-general, that is, we assume them to apply to human behavior beyond language. Testing this core assumption, however, is often difficult, as it requires us to move beyond linguistic research and to actively look for links between our language use and other areas of human cognition. This paper is an illustration of what such links could look like, particularly focusing on links between research on language contact and expert behavior. In doing so, it shows (a) that there are a lot of shared links, for instance, regarding the cognitive mechanisms of entrenchment and chunking, and (b) how these shared links (as well as potential differences across the fields) might fruitfully be used for (linguistic) theory building and theory testing. Ultimately, the usage-based focus on the cognitive mechanisms – and the assumption that they are domain-general and thus apply to behavior beyond language – calls for a drastic reorganization of linguistics as a research discipline, challenging both strict divisions between traditional linguistic subfields (Backus, 2021) as well as between linguistics and other research disciplines focusing on human behavior, such as psychology, sociology, anthropology, and communication sciences. However, this is certainly not to say that linguistic research is no longer important. Instead, I agree with Ibbotson (2020, summary) who argues that for him, “language is special not because of some encapsulated module separate from the rest of cognition. It is special because of the forms it can take rather than the parts it is made of and because it could be nature’s finest example of cognitive recycling and reuse”, again illustrating how linguistic research can both benefit from and enrich other research disciplines.

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