Priming motion events in Italian heritage language speakers

Agents and mechanisms of language change

Ioli Baroncini, Anna Michelotti, and Helen Engemann
University of Mannheim

Language contact can lead to short-term effects like cross-linguistic influence but might also contribute to long-term processes such as contact-induced language change. Recent studies suggest that structural priming may serve as a cognitive mechanism linking synchronic and diachronic outcomes in contact-induced language change since it occurs across languages and persists over time. Heritage language speakers, immersed in extreme language contact situations and often presenting an innovative language use, provide a valuable testing ground of the possible agents that produce and transmit these changes. Moreover, age is also thought to influence speakers' tendencies to adopt innovative constructions with younger speakers being more accepting than older ones. In this study, we investigate whether priming serves as a mechanism underlying language change and its impact on speakers' long-lasting linguistic choices. We conducted within and across languages priming experiments on motion event constructions focusing on the differences in the distribution of framing patterns between Italian (verb-framed language) and German (satellite-framed language), testing younger and older Italian HLS living in Germany. Our findings contribute to understanding the mechanisms underlying cross-linguistic influence and its role within language change and identifying its agents, bridging the gap between historical linguistics and psycholinguistic research on bilingual populations.

Keywords: structural priming, motion events, heritage language speakers, language change, language contact

1. Introduction

When multiple languages come into contact within an individual, they can influence each other, resulting in changes in the speakers' linguistic output. These

https://doi.org/10.1075/lab.24048.bar | Published online: 23 May 2025
Linguistic Approaches to Bilingualism ISSN 1879-9264 | E-ISSN 1879-9272

changes can lead to short-term effects, such as cross-linguistic influence in bilingual processing (Kroll et al., 2006, 2012). Some studies have linked these short-term effects to longer-term processes, such as contact-induced language change (Heine & Kuteva, 2005; Thomason & Kaufman, 1988; Weinreich 1953). This implies that temporary processes resulting from language contact within individuals can lay the groundwork for long-term diachronic changes to emerge (Barking et al., 2024; Fernández et al., 2017; Kootstra & Muysken, 2017; 2019). If this is true, the cognitive mechanism underlying short-term cross-linguistic effects and long-term contact-induced language change should be the same.

Recent studies propose that structural priming could be the potential cognitive mechanism connecting synchronic processes with diachronic outcomes (Jäger & Rosenbach, 2008; Kootstra & Muysken, 2017; 2019; Pickering & Garrod, 2017). Structural priming — the tendency to re-use a structure that has been previously processed or produced — has been extensively observed both within (e.g., Bock, 1986) and across languages (e.g., Hartsuiker et al., 2004), in adults as well as in children (Unsworth, 2025; Vasilyeva et al., 2010). Priming mechanisms have been proposed to explain cross-linguistic effects in bilingual speakers, where exposure to a structure in one language prompts the production of the same structure in the other language, even when it is dispreferred or ungrammatical (Serratrice, 2016; 2022). Priming effects have also been shown to be cumulative and to persist over time, exerting a long-term influence on speakers' linguistic choices (Kaschak, 2007; Kootstra & Doedens, 2016). For these reasons, the mechanisms underlying priming across languages could lead to both the emergence of cross-linguistic influence in the speakers' output (Serratrice, 2022), as well as the spread of these innovations which could over time result in contact-induced language change.

Who drives language change by transmitting innovations within a community? Heritage language speakers (HLS) are an ideal population for exploring links between synchronic and diachronic changes in the linguistic output (Kupisch & Polinsky, 2022; Lohndal et al., 2019). Due to their "extreme language contact" situation and reliance on colloquial input (Kupisch & Polinsky, 2022), HLS often exhibit differential acquisition of their heritage language and innovative language use (Kupisch & Rothman, 2018). Moreover, sociolinguistic studies suggest that younger speakers, who typically accept and use more innovative forms than older speakers, may serve as drivers of language change (Cournane, 2017; Labov, 2007). Examining HLS of different ages can shed light on who transmits and spreads innovations. If younger speakers play a crucial role in transmitting innovations and priming is the mechanism underlying language change, we should expect them to be more susceptible to priming than older speakers.

This study investigates whether priming can serve as a mechanism for cross-linguistic influence, driving language change by promoting the diffusion of innovative structures through long-lasting changes in speakers' linguistic choices. To achieve this, we tested priming of motion event constructions in younger and older Italian HLS living in Germany. We focus on motion event constructions since their distribution differs between Italian — a verb-framed language — and German — a satellite-framed language (see Section 1.3 for more details), allowing us to investigate possible cross-linguistic influence, already attested in bilingual populations (Engemann, 2022; Montero-Melis et al., 2016). In the current study we conduct two priming experiments in different sessions (one within and one across languages) and two unprimed production tasks at the beginning of each session (one week apart). The priming experiments aim at investigating whether priming underlies both cross-linguistic influence and the spread of linguistic innovations, two prerequisites for contact-induced language change. If priming occurs not only within but also across languages, this suggests that it may underly cross-linguistic effects. Moreover, if priming drives the spread of linguistic innovations, it may also be involved in language change processes. The unprimed production tasks in Session 1 and Session 2 explore indeed whether priming effects are long-lasting influencing subsequent linguistic outputs. Notably, this is the first study investigating priming motion event constructions across languages. To summarise, in the present study we aim to determine whether: (i) priming of motion event constructions can occur both within (Italian-to-Italian) and across languages (German-to-Italian); (ii) priming effects are long-lasting (even after one week); (iii) younger speakers are more susceptible to priming effects.

1.1 Priming as a mechanism underlying language change

It has been shown that speakers constantly adapt their language comprehension and production to the language input they are exposed to. During dialogue, speakers tend to align their speech to their interlocutors' speech by re-using, for example, the same (syntactic) structure they have been exposed to (Levelt & Kelter, 1982). This mechanism has been identified as structural (or syntactic) priming (Bock, 1986; among others). Priming effects have been observed not only within a language but also across languages, providing evidence that the two languages spoken by bilingual individuals can influence each other (Hartsuiker et al., 2004; Loebell & Bock, 2003). Recently, language co-activation involved in across-language priming tasks has been suggested to explain the mechanisms underlying cross-linguistic influence (Serratrice 2016; 2022). In other words, cross-linguistic influence may result from priming across languages, whereby the activation of a structure in Language A can lead to the production of the same structure

in Language B, even if dispreferred or innovative in Language B. For example, Fernández et al. (2017) observed in two studies that bilinguals exhibited a higher tolerance for contact-induced linguistic innovations compared to monolinguals, a result that they attributed to the priming effect of innovations between languages. Hsin et al. (2013) also showed that English–Spanish bilingual children (4 to 5 years old) were more likely to produce an ungrammatical sequence (adjective–noun phrases) in Spanish after being exposed to the same — but grammatical sequence — in English. This suggests that language contact might be the mechanism underlying the acceptance/use of linguistic innovations. Interestingly, ungrammatical structures can also be primed within the same language. For example, Ivanova et al. (2012) demonstrated that adult monolingual speakers were more likely to produce ungrammatical double object structures in English with verbs that typically require only prepositional objects, such as *donate* (e.g., *The dancer donates the soldier the apple*), after exposure to similar ungrammatical sentences featuring the same verb (in this case, *donate*).

Priming effects can be observed not only as an immediate response to a stimulus — immediate priming — but also as a result of cumulative exposure to a given stimulus — cumulative priming or adaptation — (Jaeger & Snider, 2007; Kaan & Chun, 2018). Cumulative priming refers to the effect that repeated exposure to a given structure has on speakers' preferences during the course of a task, leading to changes in their linguistic choices as the task unfolds. These changes suggest that speakers consistently adapt their language processing preferences based on ongoing experiences (Jaeger & Snider, 2007; Kootstra & Doedens, 2016; Kutta et al., 2017). Interestingly, priming effects can persist beyond the task, resulting in long-lasting changes. Studies have shown that priming effects can persist across experimental sessions and in post-tests conducted after the initial priming experiment (Kaschak, 2007; Kootstra & Doedens, 2016), with effects lasting up to a month (Heyselaar & Segaert, 2022). For instance, Kootstra and Doedens (2016) found both cumulative priming effects as a function of trial number within a single task, and priming effects across experimental blocks, where the participants' linguistic choices in the first experimental block influenced subsequent linguistic choices in the second block. Given the cumulative and persistent nature of priming, it has been suggested to be a form of implicit learning, explained by an error-based learning account (Chang et al., 2006). Under this account, priming and learning occur when speakers' syntactic predictions do not match the sentence they encounter. Furthermore, a larger mismatch leads to a greater learning effect, making priming stronger for unexpected structures than for expected ones as a result of surprisal (Jaeger & Snider, 2007). Moreover, priming can lead to long-term changes in speakers' linguistic choices. Through speakers' alignment strategies during dialogue, these changes may spread at a community level result-

ing in lasting diachronic changes (e.g., Kootstra & Muysken, 2019). Thus, priming is suggested to be a potential psycholinguistic mechanism underlying language change (Jäger & Rosenbach, 2008; Kootstra & Muysken, 2017; 2019; Pickering & Garrod, 2017).

1.2 Heritage speakers and younger speakers as agents of change

Exploring diachronic changes in language can be achieved through the analysis of historical corpora, as well as by investigating language in synchrony, for example, by investigating child language acquisition (Lightfoot, 1999), microvariation across dialects (Cournane, 2010), or heritage speakers' processing and production of the heritage language (see recent approaches by Kupisch & Polinsky, 2022; Lohndal et al., 2019). HLS are speakers of a "language spoken at home or otherwise readily available to young children, and crucially this language is not a dominant language of the larger (national) society [...]" (Rothman, 2009, p.156). This population represents an example of "extreme language contact" (Kupisch & Polinsky, 2022), which often leads to quantitative and qualitative differences from monolingual speakers, presenting differential acquisition of their heritage language (Kupisch & Rothman, 2018). For this reason, they are thought to show accelerated change in the language, even visible from one generation to the next (Kupisch & Polinsky, 2022). HLS are suggested to "amplify" processes that are known to take place in language diachrony and are potentially already present in their HL (the societal language of their homeland). Changes in the homeland variety are often slowed down by standardization processes, such as those enforced by formal educational institutions. Consequently, these changes tend to manifest and spread very slowly. In contrast, HLS are frequently exposed to colloquial, non-standardised input in their heritage language, allowing changes to emerge and spread more quickly across generations (Kupisch & Polinsky, 2022).

Another important factor to consider is speakers' age. Sociolinguistic accounts of language change argue that younger speakers are possible agents of linguistic innovations within the community (Cournane, 2017; Labov, 2007; Tagliamonte & D'Arcy, 2009). This is because they exhibit more linguistic variation compared to older speakers, possibly due to identity formation and linguistic convergence within their specific peer groups (e.g., Cornips, 2008). Therefore, investigating HLS of different ages could provide further insights into who initiates and transmits linguistic innovations. Concerning the transmission of innovations, if younger speakers and HLS play an active role in this process and if priming is the mechanism spreading linguistic innovations, we should then expect younger HLS to exhibit stronger priming effects compared to older HLS. In the current study we will try to address this issue by testing HLS of different

ages, from young pre-adolescents to older adult speakers. Specifically, we focus on the production of motion event constructions in their HL (Italian).

1.3 Motion events

The expression of motion has been extensively researched in the past decades, particularly through Talmy's (2007) lexical typology of motion event expression. Talmy's typology assumes that motion can be decomposed into separate semantic elements such as 'Motion', 'Path', 'Figure' (the entity moving), 'Ground' (the entity with respect to which the Figure is moving), 'Manner', and 'Cause'. Moreover, it classifies languages based on which syntactic constituent expresses 'Path'. Languages where Path is encoded in the verb root are called 'verb-framed' (VF), while those where Path appears outside the verb root, in a satellite, are called 'satellite-framed' (SF). English and German are classified as SF languages, with Path typically encoded in the satellite (1).

(1) a. He is [running]$_{\text{MANNER}}$ [out]$_{\text{PATH}}$ of the house. English
b. Er [rennt]$_{\text{MANNER}}$ [aus]$_{\text{PATH}}$ dem Haus. German

On the other hand, Romance languages such as Italian are typically considered VF languages and as such encode Path in the verb root (2).

(2) [esce]$_{\text{PATH}}$ di casa [correndo.]$_{\text{MANNER}}$ Italian
'He exits the house running'.

Despite this framing preference, Italian allows SF constructions when no change of state, i.e., no boundary crossing, is involved. This is known as the boundary-crossing constraint (Slobin & Hoiting, 1994). For instance, in (3), the motion event starts and ends on the hill, therefore no boundary is crossed, and the use of a SF construction is licenced.

(3) La donna balla sulla collina.
'The woman dances on/up to the hill'.

On the other hand, when the figure undergoes a change of state, such as entering, exiting, or crossing, the use of SF constructions with a boundary-crossing reading is innovative (4).[1]

1. We will not explore the role of directionality of manner verbs within this study, although we acknowledge that the acceptability/use of SF constructions in Italian can vary according to the manner involved in the motion event, i.e., directional vs. non-directional manner of motion (Folli & Ramchand, 2005; Michelotti et al., 2025, among others).

(4) *La donna balla nella casa.
'The woman dances into the house'.

Notably, unlike German or English, SF constructions are not only rarely used in Italian but are also ambiguous between a locative and a boundary-crossing interpretation. With specific verbs, the locative interpretation is often the preferred one. Thus, in Italian, associating SF constructions with a boundary-crossing reading is not only unusual but also innovative.

1.4 Motion events in bilingual populations and priming of motion events

Given the variation in the way different languages encode motion events, several studies have investigated whether cross-linguistic influence can occur in the production of motion event constructions by bilingual speakers. Cross-linguistic influence from an SF language to a VF language has been found in the form of a higher amount of SF constructions produced compared to a control group (either monolingual or L2 with a different L1) both in simultaneous (Engemann, 2016) and sequential bilinguals (Anastasio, 2023; Larrañaga et al., 2012). For instance, Anastasio (2023) found that advanced English-speaking learners of Italian tend to produce more SF constructions in which Path is expressed in directional particles compared to French-speaking (VF language) learners of the same language.

Unlike the investigation of cross-linguistic influence in the expression of motion, the investigation of priming effects on motion event constructions has not received much attention yet. Few studies have investigated priming in the domain of motion events. Bunger et al. (2013) were the first to explore this in monolingual English speakers. The authors found that participants who were exposed to primes with path verbs expressed path of motion more frequently compared to a control group with no primes. Moreover, participants were primed in the distribution of path and manner components and their syntactic choices only when the path verb could be used to describe the target event, i.e., in the presence of lexical repetition. More recently, Montero-Melis and Jaeger (2020) investigated priming of motion events in Spanish native speakers and Swedish learners of L2 Spanish. In their study, participants were exposed to primes with either a path or manner main verb, with the manner or path always overlapping with the target event (lexical repetition). Native speakers were primed to produce more manner verbs when exposed to manner primes, but there was no significant priming effect for path verbs. L2 learners, however, were primed to produce more path verbs with path primes and more manner verbs with manner primes. These studies show that priming of motion events is possible, at least when prime and target show the same verb. However, no previous study has investigated if priming

of motion events across languages occurs and whether priming of specifically VF and SF constructions is possible.

1.5 The study

In the present study, we explore how younger and older Italian HLS living in Germany encode motion events, focusing on their framing preferences when encoding motion events with a boundary-crossing interpretation in Italian, their HL. We adopt priming techniques to investigate whether priming of motion events can occur both within the same language and across languages, with the latter possibly underpinning both cross-linguistic influence and the spread of linguistic innovations, two prerequisites for contact-induced language change. Additionally, we explore whether any priming effect persists over time, even one week after exposure to prime sentences. Finally, we investigate possible differences between HLS of different ages, from pre-adolescents to older adult speakers, to determine if younger speakers are more susceptible to priming effects than older speakers. Comparing the results from the priming experiments and the unprimed production tasks will allow us to answer the following research questions:

RQ1: Can priming within and across languages lead to the production of innovative SF constructions?

If priming is the mechanism underlying the emergence of linguistic innovations, we expect priming of innovative SF constructions to be possible. If priming is the mechanism underpinning cross-linguistic influence, we expect priming of these constructions to occur not only within languages (Italian to Italian), but also across languages (German to Italian). In particular, we expect to observe a higher production of SF constructions after SF primes compared to VF primes in Italian.

RQ2: Can priming lead to long-lasting changes on speakers' linguistic choices?

If priming is the mechanism underlying the spread of linguistic innovations, then we expect its effect to be long-lasting. In particular, we expect that the production of SF constructions increases in the unprimed production task in Session 2 compared to Session 1 as a result of exposure to the priming experiment.

RQ3: Are younger speakers more susceptible to priming and therefore more prone to transmit innovations?

If speakers' age plays a role in producing and replicating innovations, we expect younger speakers to be more susceptible to priming than older speakers.

2. Method

2.1 Participants

This study is based on 39 German–Italian bilingual speakers (24 females) living in Germany. The participants ranged in age from 11 to 58 years old ($M = 21$, $SD = 12.62$), see Figure A1.1 in Appendix 1 of the Supplementary Materials for participants' distribution according to age. The participants were either simultaneous bilinguals, being exposed to both languages from birth ($N = 27$), or early sequential bilinguals being exposed to their second language between 3 and 6 years old ($N = 9$ with an AoO of German between 3 and 6 years old and $N = 3$ with an AoO of Italian between 3 and 6 years old). The participants were either born in Germany ($N = 33$) or moved to Germany at an early age, before age six ($N = 6$).

2.2 Materials

2.2.1 *Proficiency score and background questionnaire*

Proficiency was measured by an un-speeded visual lexical decision task in German (LexTALE, Lemhöfer & Broersma, 2012) and in Italian (LexITA, Amenta et al., 2021) implemented and administrated online through Jatos (Lange et al., 2015). We also collected participants' background information by adapting an online version of the LEAP-Q questionnaire (Marian et al., 2007). The online questionnaire was generated using SoSci Survey (Leiner, 2021). From the questionnaire we derived the scores regarding participants' current language use in both languages (language currently used with family members, friends, teachers at school, and during different activities like reading, watching television, etc.), current input (current language exposure for Italian and German), and language acquisition (factors that have contributed to the acquisition of Italian and German). Then, we derived a unique dominance score for each participant from the combination of proficiency scores, current language use, current input, and language acquisition, that we used in an exploratory analysis (see Appendix 2 of the Supplementary Materials).

2.2.2 *Within- and across-language priming experiments*

The priming experiments were conducted as a video-description tasks: participants were instructed to describe a video after being exposed to a prime sentence. The experiment was designed and run in OpenSesame (version 3.3.14) (Mathôt et al., 2012). In each task participants were first presented with a prime sentence coupled with a video and were subsequently asked to describe a new target video in Italian. Overall, they were presented with 60 prime–target pairs. They had to

describe 60 target videos: 30 videos depicted a motion event and 30 were fillers. Prime sentences consisted of VF ($N=15$) and SF ($N=15$) constructions for our experimental items, and active ($N=15$) and passive ($N=15$) sentences for fillers. Primes were either presented in Italian (within-language task) or in German (across-language task).

The experimental videos consisted of 30 short black-and-white animations featuring cartoon characters engaged in motion events, all involving a boundary crossing. Five different manners were depicted in the videos and crossed with three paths: entering, exiting, and crossing. Prime and target videos always showed the same manner and path, but no lexical material was provided alongside the target video. The direction of movement, as well as the character's gender and the background differed between prime and target. All the videos were shown twice, once coupled with a VF prime and once with an SF prime (see OSF repository for the list of the stimuli used).

Between prime and target videos participants had to answer a memory question (e.g., *Il personaggio indossava una gonna?* 'Was the character wearing a skirt?') to conceal the experiment's objective and prevent direct identification between the target video and prime (Figure 1). The videos were presented in a pseudo-randomised order, always showing an experimental item first followed by a filler. The experiment began with three practice trials and lasted about 30 minutes.

2.2.3 *Unprimed production tasks in Session 1 and Session 2*

In each unprimed production task participants had to describe 30 videos in Italian: 15 depicting a motion event and 15 fillers. The videos used in the unprimed production tasks were the same and they were similar, but not identical, to those presented in the priming experiment. The manners depicted in the videos were different from those presented during the priming task and were crossed with the same three paths: entering, exiting, and crossing. The order of videos was pseudo-randomised such that participants were always presented with a filler followed by an experimental item. Each task also contained six memory questions that occurred at random intervals. The tasks always started with two practice items and lasted approximately ten minutes.

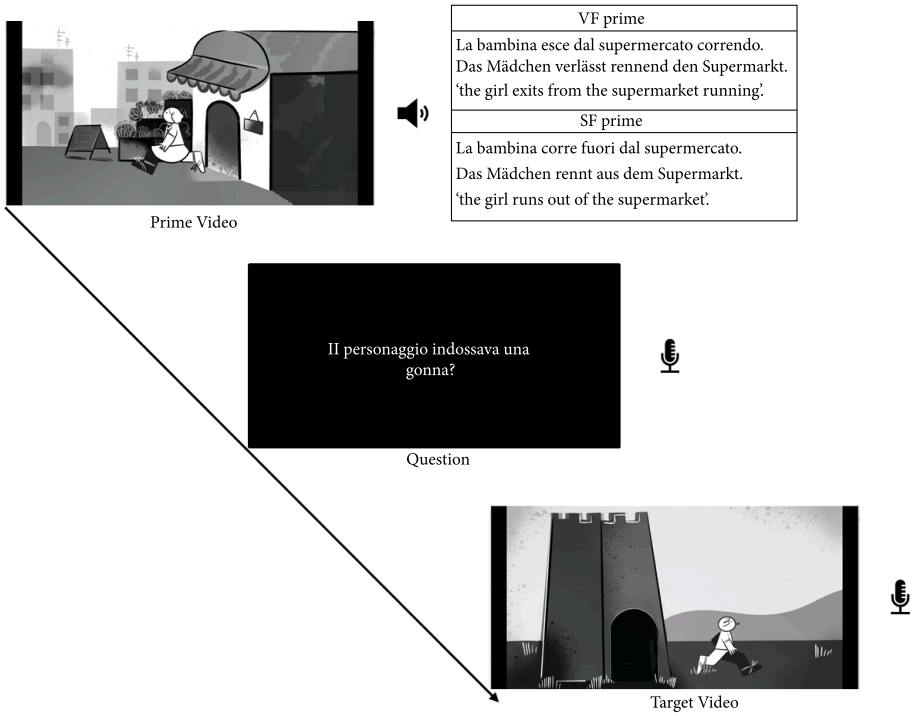

Figure 1. Example of trial item and VF and SF prime sentences in Italian and German used in the priming experiments

2.3 Procedure

Participants were recruited via online advertisements, flyers, schools, and personal contacts, and tested individually either online via a video call or in person. Participants or their parents (in the case of minors) provided written consent before the study. Participants completed the online questionnaire by the end of the study. Those tested online received an online gift voucher, while children tested in person at school received a book voucher.

Participants were tested in two separate sessions, spaced at least a week apart (mean of days between the two sessions = 9.10; *SD* = 8.38, range = 6–59). Each session started with an unprimed production task followed by one of the priming experiments (either the within- or the across-language priming task). At the end of each session, participants were administered the LexTale or LexIta proficiency tasks. The order of the sessions was counterbalanced across participants. Each session lasted around 45–50 minutes.

3. Data analyses

3.1 Analysis of the within- and across-language priming tasks

3.1.1 *Coding*

The target sentences produced in the priming task were audio-recorded and manually transcribed by native speakers of Italian (see Appendix 3 in the Supplementary Materials for coding procedure). Target sentences were coded for several variables: the type of main verb used (manner verb, path verb, both or neither of them); whether the sentence contained a satellite, a gerund or subordinate clause, whether it expressed a boundary crossing, manner and/or path of motion. Finally, all sentences were classified as either VF, SF or "other". We classified as VFs only those sentences that presented path in the main verb and manner in a gerundive, like in (5). SF constructions, on the other hand, consisted of sentences with manner encoded in the main verb and path in a satellite, more precisely in a PP, as in (6). The reason for adopting this strict coding was to identify and to analyse only those target sentences exhibiting similar structural and semantic framing as the primes. The remaining sentences were classified as "other", including instances such as double framing (e.g., enters into) or coordinate clauses (e.g., enters and dances), and were excluded from the analysis (see Table A3.1 in Appendix 3 for the occurrences and percentages of structures produced in the two tasks). Participants produced "other" structures in 18% of cases during the within-language task, compared to 34% in the across-language task, with a higher number of responses including only path or manner in a prepositional phrase (e.g., entering with the rollers).

(5) La bambina attraversa la strada ballando.
'The girl crosses the street dancing.'

(6) Il ragazzo corre fuori dal castello.
'The boy runs out from the castle.'

3.1.2 *Statistical analysis*

To analyse the priming experiments, we used R (version 4.4.0, R Core Team, 2024) along with lme4 (Bates et al., 2015) to run a generalised linear-mixed effects model. The model was tailored to examine the predictors of interest for addressing our research questions. In the model (*m1*) our dependent variable was the production of VF vs. SF constructions (coded as 0 and 1, respectively) produced in the priming experiments.[2] To answer our first research question (RQ1) the pre-

2. The final model was: m1= glmer(structure ~ 1 + prime * (task+age)+(1+prime+task|ID) + (1|item), data=priming, family=binomial(link="logit"), glmerControl(optimizer="bobyqa"))

dictor of interest of *m1* was: *type of prime* (VF vs. SF). We also added *type of task* (within-language vs. across-language) and the interaction between these two variables to control for differences in the magnitude of priming across tasks, although it was not our main objective. To answer our third research question (RQ3) we added the interaction between participants' *age* (continues variable) and *type of prime* (VF vs. SF) to investigate whether younger speakers were more susceptible to priming. In order to address potential variation among individual participants and items in the production of SF constructions, we integrated random intercepts for participants and items into the model. Additionally, we specified a by-participant random slope for the within-participants predictors of interest (*prime* and *task*) to account for individual differences in the participants' priming behaviour and differences across tasks.

In this model (*m1*), the categorical variables *type of prime*, and *type of task* were sum-coded to have a mean of 0 and a range of 1 (VF, −0.5 vs. SF, +0.5; across-language, −0.5 vs. within-language, +0.5) while *age* was scaled prior to the analysis. An additional exploratory model including *dominance score* (derived as shown in Appendix 2), *trial order* and *session* (session 1 vs. session 2) investigated whether these factors did confound the effects of our predictors of interest, the analysis can be found in the OSF repository and the results in Appendix 4 in the Supplementary Materials

3.2 Analysis of the unprimed production tasks

3.2.1 *Coding*

The coding for the unprimed production tasks was the same as that adopted in the priming experiments to ensure comparability across tasks. Structures that were neither a VF nor an SF construction were classified as "other" and were excluded from the analysis (69% in Session 1, and 43% in Session 2, see Table A3.2 in Appendix 3 for the occurrences and percentages of structures produced).

3.2.2 *Statistical analysis*

To analyse the unprimed production tasks, we fit a second model (*m2*) tailored to examine the predictors of interest for addressing our second research question (RQ2). Our dependent variable was the production of VF vs. SF constructions (coded as 0 and 1, respectively), while the predictor of interest was: *session* (Session 1 vs. Session 2). Our second model also included *age* and its interaction with *type of task*, to explore whether the production of SF varied across ages and whether long-lasting priming effects are more likely to occur among younger

speakers.[3] We integrated random intercepts for participants and items into the model, as well as random slopes for *session* by participant. The categorical variable *session* was sum-coded to have a mean of 0 and a range of 1 (Session 1, −0.5 vs. Session 2, +0.5). Finally, *age* was scaled prior to the analysis. In an additional exploratory model, we added the interaction between *type of priming* (across-language vs. within-language) and *session* (Session 1 vs. Session 2) to control for differences in Session 2 that could arise from exposure to German vs. Italian primes. This exploratory analysis included also *dominance score* and *trial order* to investigating whether these factors did confound the effects of our predictors of interest. The analysis can be found in the OSF repository, and the results are presented in Appendix 4 in the Supplementary Materials.

4. Results

4.1 Within- and across-language priming experiments

Overall, participants produced more VF constructions (74% of the data points included in the analysis) than SF constructions (26%), consistent with the expected typological pattern. Table 1 presents the proportions and *SD* for the produced SF and VF constructions across type of prime and type of task, on which we based our statistical analysis.

Table 1. *Proportions* and *SD of produced SF and VF target constructions across prime and tasks*

	Across-language priming task	**Within language priming task**
SF prime — SF target	0.30; *SD* = 0.46	0.56; *SD* = 0.50
SF prime — VF target	0.70; *SD* = 0.46	0.44; *SD* = 0.50
VF prime — VF target	0.89; *SD* = 0.32	0.93; *SD* = 0.26
VF prime — SF target	0.11; *SD* = 0.32	0.07; *SD* = 0.26

The first model (see footnote 2 for *m1* and Table 2 for the results) revealed a significant effect of *type of prime*, indicating that participants were more likely to produce an SF construction after exposure to an SF prime (RQ1), as can be seen in Figure 2 (for proportions without age see Figure A5.1 in Appendix 5 in Supplementary Materials). We also found a significant interaction between *type of prime*

3. The final model was: m2 = glmer(structure ~ 1 + session * age + (1+session|ID) + (1|item), data =unprimed_production, family=binomial(link="logit"), glmerControl(optimizer="bobyqa"))

and *type of task*, whereby the magnitude of priming varied between tasks, with a greater magnitude observed in the within-language task, as indicated by the positive estimate. However, no effect of *type of task* was observed, indicating that overall, the amount of SF constructions produced did not vary across tasks. The interaction between *type of prime* and *age* (RQ3), was not significant. Finally, the exploratory analysis regarding the main effect of *age* revealed that the effect was marginal, approaching but not reaching the threshold for statistical significance.

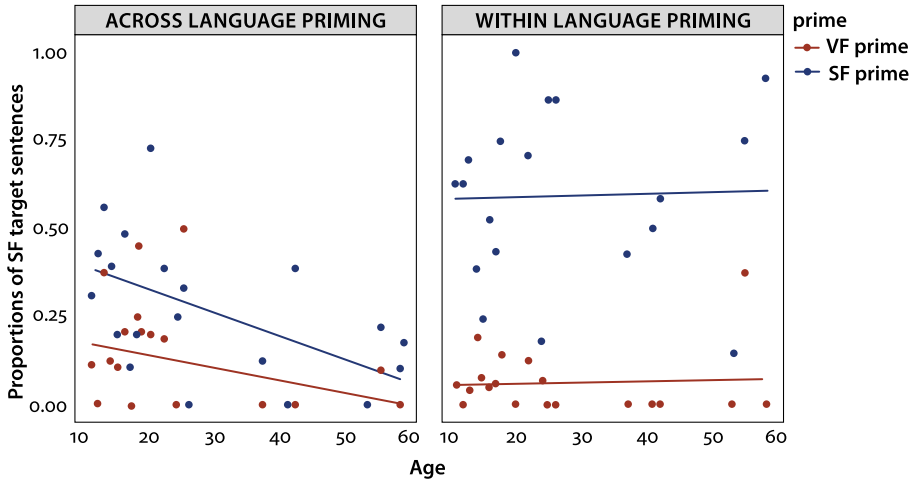

Figure 2. Proportion of produced SF constructions across age, primes and tasks

Table 2. Parameters of the generalised linear mixed-effects analysis (m1) of the likelihood of producing an SF construction as a function of type of prime type of task, and their interaction, as well as the interaction between age and type of prime

	Estimate	Std.Error	*z*-value	*p*-value
Intercept	−1.71	0.27	−6.27	< .001
Prime: VF vs. SF	2.58	0.26	9.95	< .001
Task: across- vs. within-language	0.42	0.31	1.33	.185
Age	−0.42	0.24	−1.79	.073
Task x Prime	2.30	0.37	6.17	< .001
Age x Prime	0.26	0.28	0.91	.365

An additional exploratory model including *dominance score*, *trial order* and *session* revealed a significant effect of *trial order* and *session* such that the production of SF constructions decreased as the task progressed, and that SF construc-

tions were produced significantly less frequently in the second session compared to the first session. Finally, speakers' *dominance score* did not prove to be significant (see Table A4.1 in Appendix 4 in the Supplementary Materials)

4.2 Unprimed production tasks

The results of the first unprimed production task reflects participants' unprimed preferences in expressing motion events. Overall, participants produced almost the same amount of VF constructions (55% of the data points included in the analysis) and SF constructions (45%). Table 3 presents the proportions and *SD* of both SF and VF constructions produced in Session 1 and Session 2, on which we based our statistical analysis.

Table 3. Proportions and SD of SF and VF sentences produced between session 1 and session 2

	Session 1	**Session 2**
SF produced	0.57; *SD* = 0.49	0.37; *SD* = 0.48
VF produced	0.42; *SD* = 0.49	0.62; *SD* = 0.48

As shown in Table 3 and visualised in Figure 3, participants showed a tendency of producing more SFs in Session 1, contrary to what would be expected on typological grounds and in contrast to previous findings on monolingual Italian speakers (Michelotti et al., 2025). Conversely, in Session 2 participants produced more VF than SF constructions. This suggests that although participants initially produced a higher number of SF constructions, their preference shifted towards the canonical VF construction in Italian after the priming task. This aligns with the results of the second model (see Table 2 for the results) which showed an effect of *session* (Session 1 vs. Session 2), whereby SF constructions were produced significantly less in Session 2 than in Session 1. The exploratory analysis regarding the main effect of *age*, revealed a significant negative effect, whereby as the age increased the production of SF constructions decreased (see Figure 4). We did not observe any interaction between *age* and *type of task*, whereby the effect of age did not vary across tasks. The additional exploratory model (see OSF repository and the results in Appendix 4 in Supplementary Materials), showed no significant interactions between *type of task* and *priming task*, no effect of *dominance score*, whereas *trial order* was significant indicating that the production of SF constructions decreased as the task progressed.

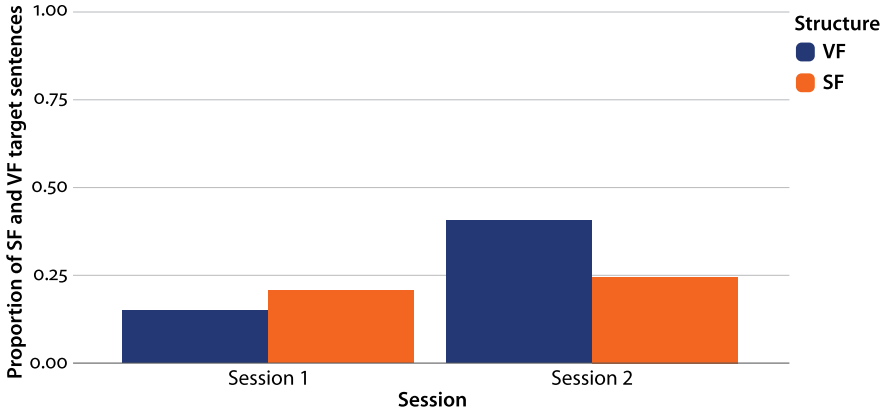

Figure 3. Proportion of produced SF and VF constructions across sessions

Table 4. Parameters of the generalised linear mixed-effects analysis (m2) of the likelihood of producing an SF construction as a function of session and the exploratory analysis of age

	Estimate	Std.Error	*z*-value	*p*-value
Intercept	−0.29	0.41	−0.72	.473
Session: 1 vs. 2	−1.11	0.32	−3.41	<.001
Age	−0.92	0.41	−2.25	.024
Session x Age	0.08	0.35	0.23	.815

5. Discussion

5.1 Priming motion event constructions within and across-languages

Two main findings concerning priming of motion events within and across languages emerge from the present study: (i) it is possible to prime motion event constructions both within and across languages; and (ii) the magnitude of priming is stronger in the within-language task than in the across-language task. We will discuss these two findings in the following paragraphs.

The first finding suggests that within-language priming can occur with complex form-function mappings such as those involved in motion events. This result is in line with previous studies that investigated whether it is possible to prime motion events within one language in native speakers (Bunger et al., 2013) and L2 learners (Montero-Melis & Jaeger, 2020). The current study shows that HLS can be primed within their heritage language (from Italian to Italian), whereby their

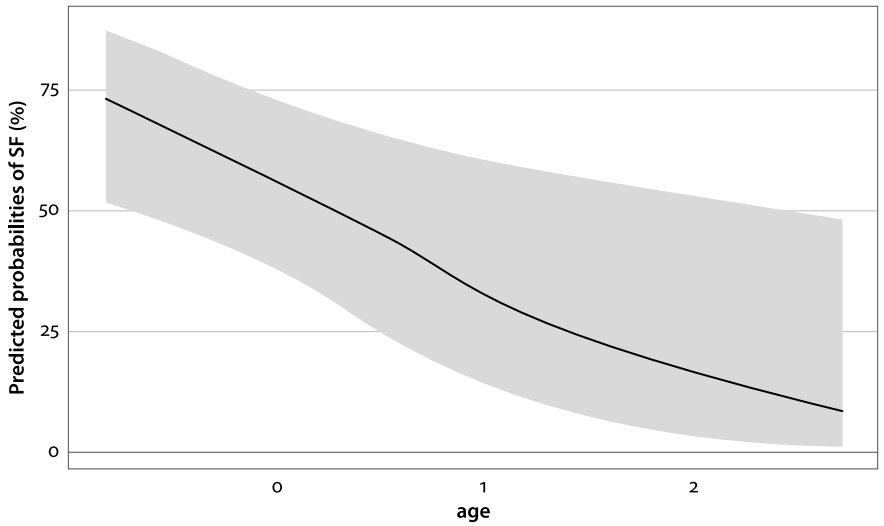

Figure 4. Predicted probabilities of producing SF constructions as a function of age. Shaded areas represent 95% confidence intervals. Predicted probabilities were derived using the ggpredict() function from the 'ggeffect' package (Lüdecke, 2018). Age values have been scaled

production of SF constructions increases after hearing an Italian SF prime. Interestingly, this increase in SF production occurs even if these are not the canonical constructions for expressing motion events with a boundary-crossing reading. In addition, we observe a priming effect also across languages, from German, an SF language, to Italian, a VF language. This is the first study that investigates and finds priming of motion event constructions across languages. The exposure to an SF construction in German leads HLS to produce SF constructions in Italian, even if it is not the canonical construction. This result could be interpreted as support for the idea that language contact leads to cross-linguistic effects, a prerequisite for the emergence of linguistic innovations. Cross-linguistic influence, which arises from the constant co-activation and interaction between languages, may lead to shifts in the frequency distributions of existing variations within a language or even to the emergence of new linguistic innovations (Serratrice, 2022). Regarding the spread of such innovations, our results suggest that priming may facilitate their replication, at least within the same task (or conversation). In this regard, we propose that when bilingual speakers are consistently primed across languages during real-life conversations, priming mechanisms could plausibly favour changes in speakers' linguistic choices, potentially contributing to language change processes (Fernández et al., 2017; Kootstra & Doedens, 2016; Kootstra & Şahin, 2018). However, although we observed the replication of inno-

vations within priming tasks, we found no direct evidence for long-lasting effects — at least in the use of innovations — in unprimed productions, as we will discuss in the next section.

The second result concerns the magnitude of priming across tasks. A strong priming effect was observed in both within- and across-language tasks, with the effect being stronger within languages. Several studies have reported similar findings (Bernolet et al., 2013; Cai et al., 2011; Khoe et al., 2023), while others found no difference (e.g., Schoonbaert et al., 2007). This difference has been attributed to speakers' proficiency levels, with higher proficiency leading to similar priming magnitudes across tasks (Bernolet et al., 2013). Alternatively, differences may arise from factors like lexical repetition, known as the lexical boost effect, where priming is stronger when prime and target share the same lexical items (Pickering & Branigan, 1998, for the repetition of verbs; Cleland & Pickering, 2003, for the repetition of nouns; among others). Although across-language priming studies using translation equivalents show mixed results (Bernolet et al., 2013; contra Schoonbaert et al., 2007), lexical repetition may explain the stronger priming in the within-language task found in the current study, where prime and target stimuli shared the same path and manner. Nonetheless, the priming effect remains robust in the across-language task, even without full lexical repetition.

5.2 Is the priming effect long-lasting?

The study reveals two key findings on the possible long-lasting effects of priming. Comparing unprimed tasks at least one week apart, SF production decreases while VF production increases from Session 1 to Session 2. Exploratory analyses further show cumulative priming effects, with SF usage declining and VF usage increasing across sessions and trials. Although, we observe some long-lasting priming effects across sessions, this effect is stronger for the canonical construction (VF) used in the experiment and not for the innovative one (SF). In what follows, we provide potential explanations for this result.

The first result shows that as SF production decreases, VF production increases following the priming intervention. Notably, participants were exposed equally to both SF and VF prime sentences, balancing canonical and innovative or rarer structures, depending on the language of the prime. After the priming intervention, speakers may still be influenced by the primes over time. Indeed, we observe that participants' shift of preference towards VF constructions in Italian from Session 1 to Session 2. A possible explanation might be that the priming intervention might have led to a learning effect in the participants, whereby as the study progresses, they learn that SF constructions are not the preferred constructions to describe a motion event with a boundary crossing. It has been

suggested that priming mechanisms can underpin error-based implicit learning mechanisms (Chang et al., 2006): speakers experience greater "surprisal" when primed with infrequent/dispreferred structures, leading to a mismatch between their predictions and the actual linguistic input. Interestingly, in our study we notice that what is learnt is not the innovative use of a structure, but on the contrary, a shift towards what is perceived as more canonical in the language is observed. This shift could have occurred unconsciously; alternatively, the constant exposure to the alternation of VF and SF primes during the priming experiment might have increased participants' awareness of the different distributions of these two constructions across the two languages. While priming is typically considered automatic and to occur without speakers' awareness (Koostra & Muysken, 2019), the current task might foster some metalinguistic awareness among participants. Such awareness through priming might then lead participants to produce more VFs in Session 2, seemingly "correcting" their productions by adopting what is perceived to be more canonical and standardised in Italian, i.e., VFs. This effect could be likened to the phenomenon of "cross-linguistic overcorrection" (CLO) proposed by Kupisch (2014), whereby bilingual speakers, in an effort to keep the two languages separate, use the non-identical alternative more than monolingual speakers would do (e.g., VFs in Italian vs. SFs in German) when performing a task that requires combining information from both languages. CLO would therefore result in an over-acceptance and overuse of a given structure, exaggerating the contrasts between languages (Kupisch, 2014). Therefore, the exposure to the priming experiment may have led to an increased adoption of the canonical structure via cross-linguistic overcorrection. Similar findings were observed by Kootstra and Şahin's (2018) study on Papiamento speakers in Aruba and in the Netherlands. They found that unprimed experiments reflected cross-linguistic influence, with participants in the Netherlands producing more PO structures in Papiamento — dispreferred in Papiamento but available in Dutch — compared to those in Aruba. While the priming task led to cross-linguistic overcorrection, showing the opposite pattern. However, note that the fact that we did not elicit German productions in this study prevents us from substantiating an interpretation in terms of CLO. Another explanation might be attributed to a surprisal effect caused by VF constructions in German, which tend to be relatively marked. While VFs can appear in formal German registers, they are rare in informal spoken contexts (*Das Mädchen verlässt rennend den Supermarkt* 'the girl exits running from the supermarket'). According to the literature on surprisal, we should expect an increased production of infrequent structures (such as VFs).

Additional evidence for long-lasting priming effects on canonical structures comes from the exploratory analysis including *trial order* and *session*. This revealed cumulative priming effects within tasks, whereby as the task progresses

the production of SF constructions decreases, and across sessions, whereby in Session 2, SF constructions are produced significantly less compared to Session 1. Similar effects were reported by Kootstra and Doedens (2016), showing variation in linguistic choices both within tasks and across sessions. Notably, self-priming may have influenced the priming experiment in Session 2, as VF/SF ratios were balanced in Session 1 but skewed in Session 2. Although, this might be a limitation of this study, we still observe that the effect of priming is significant in both sessions.[4]

These results may provide evidence on the long-lasting effects of priming at least for a canonical structure. However, this study does not find such effects for linguistic innovations. This suggests that if long-lasting effects cannot be observed for innovations, structural priming might not be the mechanism driving their spread. Further research is needed, potentially by manipulating the ratio of canonical to innovative primes within the task, to address this question.

5.3 Agents of linguistic innovations: Age-related tendencies in HL speakers

Finally, we explored the potential drivers and transmitters of linguistic innovations, focusing on speakers' age and whether it may play a role in language change processes. We observed its effect on the production of innovative structures during the two priming experiments (within and across languages) and the unprimed production tasks. The findings from an exploratory investigation are: (i) HLS produce a large amount of SF in the first unprimed production task; (ii) younger speakers tend to produce more SFs than older speakers; (ii) no significant effect of age on priming is observed. Notably, we acknowledge that the results related to age should be interpreted with caution, as they may also reflect generational differences between heritage speakers (e.g., second vs. third generation). Additionally, the lack of statistical power limits our ability to establish robust findings. To address these limitations, future studies should include larger and more diverse groups of speakers, for example with a broader range of older participants.

The fact that the production of SF constructions is, at least descriptively, higher in Session 1 than in Session 2 suggests that SF constructions are used by this group of Italian HLS, even before being exposed to primes. Furthermore, not only does this group of speakers frequently use SF constructions, but they produce them at least as frequently as VFs when describing motion events in the unprimed production task in Session 1. This tendency differs from recent findings on Italian monolinguals (Michelotti et al., 2025) who were found to produce mainly VFs in an unprimed elicited production task involving the same videos

4. We would like to thank an anonymous reviewer for bringing this point to our attention.

presented as in the current study. This finding could be interpreted as evidence in favour of HLS as potential agents of language change, producing a higher baseline rate of innovative constructions compared to monolingual speakers. However, a direct comparison between these two groups would be necessary to test this hypothesis.

Our results related to age reveal that there is a tendency for younger speakers to produce more SFs compared to older speakers. This effect is significant for the unprimed production tasks. Similarly, Kootstra and Şahin (2018) found an effect of age both in an unprimed production task as well as in the across-language priming task (but no interaction between age and priming was found). In their study, younger speakers were more likely to produce PO structures in Papiamento (which has a clear preference for DO structures) than older speakers. Their results, as well as ours are in line with sociolinguistic studies suggesting that age-related differences may be used as an operationalization of language change in progress (e.g., Labov, 2001) and arguing in favour of younger speakers being drivers of linguistic innovations (Labov, 2007; Tagliamonte & D'Arcy, 2009; among others).

Furthermore, Kootstra and Şahin (2018) found that this age effect was not general but concerned the speakers living in the Netherlands, therefore, related the speakers' higher degree of language contact in their daily lives, compared to the speakers in Aruba. The results from our study, on the other hand, align with the results obtained on Italian monolinguals (Michelotti et al., 2025). In this study, a significant effect of age for the interpretation of SF constructions with a boundary-crossing reading was found, whereby younger speakers tended to accept more SFs compared to older ones. A similar pattern, although not statistically significant, emerged from the production task in the same study. We could interpret these results as possible evidence of incipient language change, whereby HLS amplify tendencies that are already present in the homeland variety (Kupisch & Polinsky, 2022). Specifically, we find age-related differences in production among HLS, which are not yet present among monolingual speakers. As already mentioned, no systematic comparison between this group of HL speakers and Italian monolinguals has been conducted in the present contribution, highlighting the need for further analysis. Alternatively, these results could reflect differences in the types of registers used by the participants due to social factors rather than indicating evidence of incipient language change. In other words, it might be that as age increases, the production of SF constructions decreases, reflecting age-dependent social pressures to conform to the degree of prestige or normativity associated with a given form (Wagner, 2012). It would then be plausible to suggest that older speakers produce more VF constructions since they are

perceived as more canonical and possibly more correct in Italian compared to SF constructions.

6. Conclusions

In this study we explored whether priming may account for cross-linguistic influence and serve as potential mechanism underlying language change, focusing on who might drive linguistic innovations. Our findings contribute to the literature exploring how HLS' production serves as a testing ground for evidence of incipient language change and how contact with another language can influence these changes. Investigating synchronic processes can hold implications also for diachronic changes, shedding light on the possible mechanisms that drive language change in the present but also historically. By adopting psycholinguistic techniques such as the priming paradigm, we not only explore speakers' outcomes and linguistic choices but also delve into the cognitive mechanisms that underly these changes. This a tentative approach in order to bridge the gap between historical linguistics and psycholinguistic research on bilingual populations, offering possible tools and test grounds for a comprehensive understanding of language change across different time scales. Notably, the findings of our study cannot directly prove that structural priming drives contact-induced language change due to the challenge of linking mechanisms in controlled, individual-level environments with those observed in naturalistic, community-level, longitudinal settings. However, we argue that our findings suggest that structural priming likely underpins cross-linguistic influence, which is a necessary, though not sufficient, prerequisite for contact-induced language change.

Funding

The research presented in this study was funded by a grant of the German Research Foundation (DFG) awarded to the third author Helen Engemann for project P2 (project no. 437487447), *Priming in contact-setting bilinguals and monolinguals as a driver of language change*, as part of the research unit *Structuring the input in language processing, acquisition and change* (FOR 5157).

Acknowledgement

We would like to thank the European School Frankfurt for their support with data collection, and our student assistants Martina Gervasi, Corinne Gibilisco, and Anna Toews for their valu-

able help. We would also like to thank Alice Lipparini for designing the video stimuli and the reviewers for helping us improve the quality of our manuscript.

Data availability statement

The design and data presented in this study, as well as the Supplementary Materials, are openly available on the OSF platform at https://osf.io/zdfn4/?view_only=00d6af7c79324dc580a62719d8a12f8a

Ethics statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the University of Mannheim (EK Mannheim 28/2021, 25.05.2021). Informed consent was obtained from all participants — and from minors' legal guardians — involved in the study.

References

Amenta, S., Badan, L., & Brysbaert, M. (2021). LexITA: A quick and reliable assessment tool for Italian L2 receptive vocabulary size. *Applied Linguistics*, *42*(2), 292–314.

Anastasio, S. (2023). Motion event construal in L2 French and Italian: From acquisitional perspectives to pedagogical implications. *International Review of Applied Linguistics in Language Teaching*, *61*(1), 37–60.

Barking, M., Mos, M., & Backus, A. (2024). Individual variation in contact effects: Stability, convergence, and divergence. *Linguistic Approaches to Bilingualism*.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*, 1–48.

Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (2013). From language-specific to shared syntactic representations: The influence of second language proficiency on syntactic sharing in bilinguals. *Cognition*, *127*(3), 287–306.

Bock, K. (1986). Syntactic persistence in language processing. *Cognitive Psychology*, *18*, 355–387.

Bunger, A., Papafragou, A., & Trueswell, J. (2013). Event structure influences language production: Evidence from structural priming in motion event description. *Journal of Memory and Language*, *69*, 299–323.

Cai, Z. G., Pickering, M. J., Yan, H., & Branigan, H. P. (2011). Lexical and syntactic representations in closely related languages: Evidence from Cantonese–Mandarin bilinguals. *Journal of Memory and Language*, *65*(4), 431–445.

Chang, F., Dell, G. S., & Bock, K. (2006). Becoming syntactic. *Psychological Review*, *113*(2), 234–272.

Cleland, A.A., & Pickering, M.J. (2003). The use of lexical and syntactic information in language production: Evidence from the priming of noun-phrase structure. *Journal of Memory and Language*, *49*(2), 214–230.

Cornips, L. (2008). Loosing grammatical gender in Dutch: The result of bilingual acquisition and/or an act of identity? *International Journal of Bilingualism*, *12*, 105–124.

Cournane, A. (2010). Using synchronic microvariation to understand pathways of change: Subject clitic doubling in Romance dialects. In M. Heijl (ed.), *Proceedings of the 2010 Canadian Linguistics Association (CLA/ACL) Annual Meeting*. Concordia University, Montreal QC.

Cournane, A. (2017). In defence of the child innovator. In E. Mathieu, & R. Truswell (Eds.), *Micro-change and Macro-change in Diachronic Syntax* (pp. 10–24). Oxford University Press.

Engemann, H. (2016). Learning to think for speaking about space in child bilingualism. *Revue Française de Linguistique Appliquée*, *21*(2), 49–64.

Engemann, H. (2022). How (not) to cross a boundary: Crosslinguistic influence in simultaneous bilingual children's event construal. *Bilingualism: Language and Cognition*, *25*(*1*), 42–54.

Fernández, E.M., De Souza, R.A., & Carando, A. (2017). Bilingual innovations: Experimental evidence offers clues regarding the psycholinguistics of language change. *Bilingualism*, *20*(2), 251–268.

Folli, R. & Ramchand, G. (2005). Prepositions and results in Italian and English: An analysis from event decomposition. In H.J. Verkuyl, H. de Swart, & A. van Out (Eds.), *Perspectives on Aspect* (pp. 81–105). Springer.

Hartsuiker, R.J., Pickering, M.J., & Veltkamp, E. (2004). Is syntax separate or shared between languages? Cross-linguistic syntactic priming in Spanish–English bilinguals. *Psychological Science*, *15*(6), 409–414.

Heine, B., & Kuteva, T. (2005). *Language Contact and Grammatical Change*. Cambridge University Press.

Heyselaar, E., & Segaert, K. (2022). Structural priming persists for (at least) one month in young adults, but not in healthy older adults. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *48*, 1219–1234.

Hsin, L., Legendre, G., & Omaki, A. (2013). Priming cross-linguistic interference in Spanish–English bilingual children. In S. Baiz, N. Goldman, & R. Hawkes (Eds.), *Proceedings of the 37th Annual Boston University Conference on Language Development* (pp. 165–77). Cascadilla Press.

Ivanova, I., Pickering, M.J., McLean, J.F., Costa, A., & Branigan, H.P. (2012). How do people produce ungrammatical utterances? *Journal of Memory and Language*, *67*(3), 355–370.

Jäger, G., & Rosenbach, A. (2008). Priming and unidirectional language change. *Theoretical Linguistics*, *34*(2), 85–113.

Jaeger, T.F., & N. Snider. (2007). Implicit learning and syntactic persistence: Surprisal and cumulativity. In L. Wolter, & J. Thorson (Eds.), *University of Rochester Working Papers in the Language Sciences*, *3*(1), 26–44.

Kaan, E., & Chun, E. (2018). Priming and adaptation in native speakers and second-language learners. *Bilingualism: Language and Cognition*, *21*(2), 228–242.

Kaschak, M. P. (2007). Long-term structural priming affects subsequent patterns of language production. *Memory & Cognition 35*, 925–937.

Khoe, Y. H., Tsoukala, C., Kootstra, G. J., & Frank, S. L. (2023). Is structural priming between different languages a learning effect? Modelling priming as error-driven implicit learning. *Language, Cognition and Neuroscience*, *38*(4), 537–557.

Kootstra, G., & Doedens, W. (2016). How multiple sources of experience influence bilingual syntactic choice: Immediate and cumulative cross-language effects of structural priming, verb bias, and language dominance. *Bilingualism: Language and Cognition*, *19*, 710–732.

Kootstra, G., & Muysken, P. (2017). Cross-linguistic priming in bilinguals: Multidisciplinary perspectives on language processing, acquisition, and change. *Bilingualism: Language and Cognition*, *20*, 215–218.

Kootstra, G., & Muysken, P. (2019). Structural priming, levels of awareness, and agency in contact-induced language change. *Languages*, *4*, 65.

Kootstra, G. & Şahin, H. (2018). Cross-linguistic structural priming as a mechanism of contact-induced language change: Evidence from Papiamento–Dutch bilinguals in Aruba and the Netherlands. *Language*, *94*, 902–930.

Kroll, J., Bobb, S., & Wodniecka, Z. (2006). Language selectivity is the exception, not the rule: Arguments against a fixed locus of language selection in bilingual speech. *Bilingualism: Language and Cognition*, *9*, 119–35.

Kroll, J. F., Dussias, P. E., Bogulski, C. A., & Kroff, J. R. V. (2012). Juggling two languages in one mind: What bilinguals tell us about language processing and its consequences for cognition. In B. H. Ross (Ed.), *The Psychology of Learning and Motivation* (pp. 229–262). Elsevier Academic Press.

Kupisch, T. (2014). Adjective placement in simultaneous bilinguals (German–Italian) and the concept of cross-linguistic overcorrection. *Bilingualim: Language and Cognition*, *17*, 222–233.

Kupisch, T., & Polinsky, M. (2022). Language history on the fast forward: Innovations in heritage languages and diachronic change. *Bilingualism: Language and Cognition*, *25*, 1–12.

Kupisch, T., & Rothman, J. (2018). Terminology matters! Why difference is not incompleteness and how early child bilinguals are heritage speakers. *International Journal of Bilingualism*, *22*(5), 564–582.

Kutta, T., Kaschak, M., Porcellini, A., & Jones, J. (2017). Implicit and explicit memory factors in cumulative structural priming. *Collabora: Psychology*, *3*(*1*), 13.

Labov, W. (2001). *Principles of Linguistic Change, Vol. 2: Social Factors*. Blackwell.

Labov, W. (2007). Transmission and diffusion. *Language*, *83*, 344–387.

Lange, K., Kühn, S., Filevich, E. (2015). Correction: "Just Another Tool for Online Studies" (JATOS): An Easy Solution for Setup and Management of Web Servers Supporting Online Studies. *PLOS ONE 10*(7), e0134073.

Larrañaga, P., Treffers-Daller, J., Tidball, F., & Ortega, M. G. (2012). L1 transfer in the acquisition of manner and path in Spanish by native speakers of English. *International Journal of Bilingualism*, *16*(*1*), 117–138.

Leiner, D. J. (2021). *SoSci Survey* (Version 3.5.01) [Windows 10]. Available at https://www.soscisurvey.de

Lemhöfer, K., & Broersma, M. (2012). Introducing LexTALE: A quick and valid lexical test for advanced learners of English. *Behavior Research Methods*. *44*(2), 325–43.

Levelt, W. J. M., & Kelter, S. (1982). Surface form and memory in question answering. *Cognitive Psychology*, *14*, 78–106.

Lightfoot, D. W. (1999). *The Development of Language Acquisition*. Blackwell.

Loebell, H., & Bock, J. K. (2003). Structural priming across languages. *Linguistics*, *41*, 791–824.

Lohndal, T., Rothman, J., Kupisch, T., & Westergaard, M. (2019). Heritage language acquisition: What it reveals and why it is important for formal linguistic theories. *Language and Linguistics Compass*, *13*(*12*), e12357.

Lüdecke, D. (2018). ggeffects: Tidy data frames of marginal effects from regression models. *Journal of Open Source Software*, *3*(26), 772.

Marian, V., Blumenfeld, H. K., & Kaushanskaya, M. (2007). The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. *Journal of Speech, Language, and Hearing Research*, *50*, 940–967.

Mathôt, S., Schreij, D., & Theeuwes, J. (2012). OpenSesame: An open-source, graphical experiment builder for the social sciences. *Behavior Research Methods*, *44*(2), 314–324.

Michelotti, A., Baroncini, I., & Engemann, H. (2025). Linguistic variation in the interpretation and production of Italian motion event constructions in younger and older adults: Evidence for language change? *Language and Cognition*, *17*, e29.

Montero-Melis, G., & Jaeger, T. F. (2020). Changing expectations mediate adaptation in L2 production. *Bilingualism: Language and Cognition*, *23*(3), 602–617.

Montero-Melis, G., Jaeger, T. F., & Bylund, E. (2016). Thinking is modulated by recent linguistic experience: Second language priming affects perceived event similarity. *Language Learning*, *66*(3), 636–665.

Pickering, M. J., & Branigan, H. P. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language*, *39*, 633–651.

Pickering, M., & Garrod, S. (2017). Priming and language change. In M. Hundt, S. Mollin, & S. Pfenninger (Eds.). *The Changing English Language: Psycholinguistic Perspectives* (pp. 173–90). Cambridge University Press.

R Core Team (2024). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org

Rothman, J. (2009). Understanding the nature and outcomes of early bilingualism: Romance languages as heritage languages. *International Journal of Bilingualism*, *13*(2), 155–163.

Schoonbaert, S., Hartsuiker, R. J., & Pickering, M. J. (2007). The representation of lexical and syntactic information in bilinguals: Evidence from syntactic priming. *Journal of Memory and Language*, *56*, 153–171.

Serratrice, L. (2016). Cross-linguistic influence, cross-linguistic priming and the nature of shared syntactic structures. *Linguistic Approaches to Bilingualism*, *6*(6), 822–827.

Serratrice, L. (2022). What can syntactic priming tell us about crosslinguistic influence? In K. Messenger (Ed.), *Syntactic Priming in Language Acquisition: Representations, Mechanisms and Applications* (pp. 129–156). John Benjamins.

Slobin, D. I., & Hoiting, N. (1994). Reference to movement in spoken and signed languages: Typological considerations. *Annual Meeting of the Berkeley Linguistics Society*, 487–505.

Tagliamonte, S., & D'Arcy, A. (2009). Peaks beyond phonology: Adolescence, incrementation, and language change. *Language*, *85*, 58–108.

Talmy, L. (2007). Lexical typologies. In T. Shopen (Ed.), *Language Typology and Syntactic Description: Volume 3: Grammatical Categories and the Lexicon* (2nd ed., Vol. *3*, pp. 66–168). Cambridge University Press.

Thomason, S. G., & Kaufman, T. (1988). *Language Contact, Creolization and Genetic Linguistics*. University of California Press.

Unsworth, S. (2025). Shared syntax and cross-linguistic influence in bilingual children: Evidence from between- and within-language priming. *Linguistic Approaches to Bilingualism*, *15*(2), 117–151.

Vasilyeva, M., Waterfall, H., Gámez, P. B., Gómez, L. E., Bowers, E., & Shimpi, P. (2010). Cross-linguistic syntactic priming in bilingual children. *Journal of Child Language*, *37*(5), 1047–1064.

Wagner, S. E. (2012). Age Grading in Sociolinguistic Theory. *Language and Linguistics Compass*, *6*, 371–382.

Weinreich, U. (1953). *Languages in Contact: Findings and Problems*. Mouton.

Address for correspondence

Ioli Baroncini
Universität Mannheim
Anglistik I, B 6, 30–32
Mannheim 68159
Germany
ioli.baroncini@uni-mannheim.de
https://orcid.org/0000-0002-5048-6673

Co-author information

Anna Michelotti
Universität Mannheim
michelotti@uni-mannheim.de
https://orcid.org/0009-0002-3644-4909

Helen Engemann
Universität Mannheim
h.engemann@uni-mannheim.de
https://orcid.org/0000-0001-5937-2819

Publication history

Date received: 1 August 2024
Date accepted: 19 March 2025
Published online: 23 May 2025