ADAPTATION TO STRUCTURAL INNOVATIONS AS A WINDOW INTO CONTACT-INDUCED LANGUAGE CHANGE

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6. Januar 2026, Kaiserslautern

[Foteini Maria Karkaletsou]

To those who were by my side throughout this journey

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SF	satellite-framed, p. 18
NP	noun phrase, p. 22
DOM	differential object marking, p. 23
HSs	heritage speakers, p. 23
VSO	verb-subject-object, p. 30
SVO	subject-verb-object, p. 30
V2	verb-second, p. 35
AoA	age of acquisition, pp. 82–83

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This overview contains the three studies conducted for the purposes of the current thesis under the supervision of Prof. Dr. Shanley Allen at the Department of Social Sciences, RPTU University Kaiserslautern-Landau. All studies were completed within the Research Unit *Structuring the Input in Language Processing, Acquisition and Change* (SILPAC) funded by the German Research Foundation (FOR 5157).

In all papers listed, the author of this thesis (FK) is the first author and main contributor in conceptualization, methodology, data curation, and theoretical interpretation of the findings. Detailed author contributions are provided below each study.

Study 1

Karkaletsou, F., Kholodova, A., & Allen, S. E. M. (2024). Exploring bilingual adaptation to structural innovations: Evidence from Canadian French. *Languages, 9*(12), 375. https://doi.org/10.3390/languages9120375

Study 1 examines whether bilingual adult speakers of French and English in Canada adapt to different structural innovations in Canadian French. Building on prior evidence that bilinguals adapt to non-standard structures in production and processing, this study addresses the underexplored question of whether such adaptation extends to acceptability judgments. Using a timed acceptability judgment task, bilingual participants rated different innovative French sentences modeled on English (ditransitives, monotransitives, reciprocals) alongside their grammatical counterparts. Both acceptability ratings and response times were analyzed to assess overall performance and adaptation across trials. Results showed that innovations were

generally rated as less acceptable and processed more slowly than grammatical structures (but more acceptable than fully ungrammatical structures not modeled on English), with some variation across different innovation types. Crucially, adaptation at the group level emerged only in response times. Adaptation in ratings, however, was found only at the individual level, and inconsistently across different innovations and participants. Lastly, lower individual contact with French (assessed via a composite *French Score*) was associated with higher acceptance of innovations, but not with stronger adaptation. Taken together, these findings indicate that bilingual adaptation to structural innovations may manifest at an implicit performance level even when it is not consistently reflected in overt acceptability judgments, highlighting the importance of employing multiple measures to capture adaptation processes.

CRediT statement of author contributions as published in Karkaletsou et al. (2024):
Conceptualization: SA, **FK** and AK; methodology: **FK**, SA and AK; formal analysis: **FK**; investigation: **FK**; resources: SA; data curation: **FK**; writing—original draft preparation: **FK**; writing—review and editing: SA, **FK** and AK; visualization: **FK**; supervision: SA; project administration: **FK**; funding acquisition: SA. All authors have read and agreed to the published version of the manuscript.

Study 2

Karkaletsou, F., Jacob, G., & Allen, S. E. M. (2025a). Cross-linguistic structural priming of innovations in Canadian French: Evidence from a language contact situation. *Linguistic Approaches to Bilingualism*. https://doi.org/10.1075/lab.24100.kar

Study 2 explores the psycholinguistic mechanisms underlying contact-induced grammatical change, focusing on cross-linguistic structural priming and adaptation in bilinguals. Using a web-based self-paced reading experiment with production pre- and posttests, it investigates whether Canadian French-English bilinguals adapt to English-like innovative ditransitive and monotransitive structures in French after exposure to similar, grammatical English primes. While no priming effects were found for monotransitives, ditransitives indicated significantly faster reading times when preceded by structurally similar primes in English compared to when preceded by alternative primes, indicating cross-linguistic facilitation in online processing. However, production data revealed no overall increase in the use of structural innovations after priming. Individual variation with regards to the degree of contact with French (*French Score*) influenced overall production rates of innovations, but not adaptation. These findings suggest that, while cross-linguistic priming can facilitate adaptation to structural innovations in online processing, production might require more sustained exposure over longer periods of time, offering insight into how these processes may contribute to longer-term contact-induced language change.

CRediT statement of author contributions as published in Karkaletsou et al. (2025a):
Conceptualization: **FK**, GJ and SA; methodology: **FK**, GJ and SA; investigation: **FK**; resources: SA; software: **FK**; formal analysis: **FK**; data curation: **FK** and GJ; writing — original draft preparation: **FK** and GJ; writing — review and editing: **FK**, GJ, SA; visualization: **FK**; supervision: SA and GJ; project administration: **FK**; funding acquisition: SA and GJ. All authors have read and agreed to the published version of the manuscript.

Study 3

Karkaletsou, F., Jacob, G., & Allen, S. E. M. (2025b). *Cross-linguistic structural priming and grammatical language change: The case of reciprocal innovations in Canadian*

French-English bilinguals. [Manuscript submitted for publication]. Department of Social Sciences, RPTU University Kaiserslautern-Landau.

Building on Study 2, Study 3 investigates cross-linguistic priming and adaptation as mechanisms of language change by focusing on a different type of innovation in French, namely reciprocal constructions lacking the obligatory reflexive marker *se*. In a self-paced reading task combined with production pre- and posttests, participants read innovative French target sentences following English primes with either similar or control structures. Results revealed significant priming effects in early trials, with the French innovation being read faster after similar English primes. Cumulative adaptation across experimental blocks was also found, reflecting decreasing reading times, hence increased processing efficiency with repeated exposure. However, this adaptation did not extend to production, since participants did not produce significantly more innovative reciprocals post-priming compared to before priming. Individual language experience modulated overall production patterns, with lower individual French contact (i.e., lower *French Score*) leading to higher use of innovations. These results suggest that cross-linguistic priming may initiate early emergence and facilitation of innovative structures, while within-language adaptation rather supports their consolidation over time, together forming a potential pathway toward contact-induced language change.

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Chapter 1. General introduction

Language is a dynamic and adaptive system, continuously shaped and thus continuously changing based on language users' interactions, social environments, and cognitive mechanisms. Overall, language change is a rather complex phenomenon triggered by various factors, including internal motivations (e.g., language change across different generations of speakers), external motivations (e.g., language change due to direct influence from other languages), or a combination of both (see Dubois & Noetzel, 2005; Hickey, 2012). While acknowledging this complex picture, the present thesis lays focus on externally-motivated language change, specifically on change induced by *language contact*, hereafter referred to as *contact-induced language change*.

Language contact (i.e., the co-existence and interaction of two or more linguistic systems within individuals or communities) has been recognized historically as a primary source of change (Fernández et al., 2017; Heine & Kuteva, 2008; Kootstra & Doedens, 2016; Kootstra & Muysken, 2017, 2019; Kupisch & Polinsky, 2022; Torres Cacoullos & Travis, 2011). Particularly in bilingual language contact, speakers are systematically exposed to two distinct grammatical systems, constantly shifting between structural patterns and often transferring properties from one language into another. Such transfer, known as *cross-linguistic influence* (e.g., Serratrice et al., 2009; also Serratrice, 2022), can lead among others to the emergence of *structural innovations*. In this thesis, structural innovations (also *innovations*) are defined as non-canonical syntactic patterns in a language, ranging from infrequent or dispreferred to fully ungrammatical structures (e.g., see Baroncini et al., 2025; Doğruöz & Backus, 2009; Fernández et al., 2017). Structural innovations are particularly crucial to explore in the framework of contact-induced change, as they provide insights into the conditions and constraints of language change processes. Concretely, they are a testing ground for

investigating how cross-linguistic influence upon bilingual language contact can cause the emergence of such structures in the first place, and, further, how systematic contact and repeated exposure over time may establish some of these innovations in the speech of individual speakers and/or communities, potentially leading to longer-term language change (Doğruöz & Backus, 2009; Fernández et al., 2017; Heine & Kuteva, 2008; Kootstra & Şahin, 2018).

However, to better understand how language change processes occur and develop in contact situations, we need to investigate the psycholinguistic mechanisms underlying them. A mechanism that has been proposed to drive contact-induced change is *cross-linguistic structural priming* (e.g., Arslan et al., 2025; Baroncini et al., 2025; Fernández et al., 2017; Jacob et al., 2025; Kootstra & Muysken, 2017, 2019; Kootstra & Şahin, 2018). Cross-linguistic structural priming (or else *syntactic priming*) describes speakers' tendency to re-use syntactic structures in one language that have been recently encountered in another language (Bernolet et al., 2013; Hartsuiker et al., 2004; Loebell & Bock, 2003). When cross-linguistic priming occurs repeatedly and cumulatively, speakers gradually adapt to the structural input they receive (Kaan et al., 2019; Kaan & Chun, 2018). Such mechanisms of *adaptation* (or else *cumulative priming*) may induce longer-lasting changes to bilinguals' mental representations, leading to the incorporation of innovative structures in their individual grammar and, ultimately, fostering language change in the broader community. However, although there is a growing body of work supporting this account, only very few studies have been concerned with how cross-linguistic structural priming and adaptation mechanisms drive the emergence and/or persistence of structural innovations in bilingual settings, as well as how this is linked to language change.

To address this gap in the field, the present work mainly consists of three experimental studies investigating how bilingual speakers adapt to, and potentially propagate, structural

innovations. All studies test Canadian French-English bilinguals, a population situated in an officially bilingual, yet extremely diverse, environment where language contact has been a persistent historical reality. Each study focuses on a different stage or manifestation of adaptation – whether through changes in perception (acceptability judgments), in online processing, or in production – and together they provide a multidimensional picture of how structural innovations might enter and/or stabilize in bilingual grammars, setting the ground for language change processes.

Study 1 (Karkaletsou et al., 2024) examines whether Canadian bilingual adults adapt their perception (acceptability judgments) of various French structural innovations with repeated exposure. Study 2 (Karkaletsou et al., 2025a) employs cross-linguistic priming to test whether exposure to structurally similar input in English facilitates both the online processing and the production of two different types of structural innovations in Canadian French. Study 3 (Karkaletsou et al., 2025b) extends this inquiry (i.e., cross-linguistic structural priming in online processing and production) to a more radical structural innovation in French to further explore the limits of language adaptation and change in the Canadian bilingual population. On top of these three articles that build the main empirical core of the thesis, I also report preliminary findings from an additional experimental study that is associated to Study 1. This study investigates adaptation in the perception (acceptability judgments) of a different French structural innovation, this time testing French-English bilinguals both in Canada (overall higher-contact situation) and in France (overall lower-contact situation) (see Section 3.1). While the additional study is currently in preparation for publication, it is included here because it supports and further extends the results from Study 1. By integrating all findings, this thesis aims to shed light on how bilinguals' adaptation to various structural innovations functions both as a psycholinguistic process and as a potential pathway to language change.

In the following sections of this chapter, I provide a more detailed overview of accounts on language contact as a driver of change (Section 1.1), as well as of cross-linguistic priming and adaptation as psycholinguistic mechanisms underlying these processes (Section 1.2). In Section 1.3, I present the motivations and objectives of the current thesis.

1.1 Language contact as a driver of structural innovations and change

Research in historical linguistics and sociolinguistics has long recognized language contact as a primary factor underlying language change (see Heath, 1984; Heine & Kuteva, 2008; Hickey, 2020; Winford, 2008 among others). In bilingual contact situations specifically, speakers constantly navigate and shift between two grammatical systems, transferring structural patterns and adjusting to input from their interlocutors across various linguistic domains, including accent (e.g., Bradlow & Bent, 2008), vocabulary (e.g., Metzing & Brennan, 2003), and syntax (e.g., Bock, 1986; Kaan et al., 2019; Kaan & Chun, 2018; Loebell & Bock, 2003). This thesis focuses on adaptation in syntax, particularly on adaptation to structural innovations as an underlying factor of contact-induced language change.

Structural innovations were defined earlier as non-canonical syntactic structures that emerge through cross-linguistic influence in bilingual contact. Generally, innovations are not necessarily always a product of cross-linguistic influence and transfer processes in bi-/multilingual contexts (cf. Dubois & Noetzel, 2005; Mougeon et al., 2005). However, in the framework of the current thesis, I focus on structural innovations induced by cross-linguistic influence, specifically by the transfer of not-fully-shared structural properties across languages. Such structures can range from changes in the distribution of existing syntactic variants to the introduction of entirely novel variants in the grammar of an individual. For instance, bilinguals may start over-using or over-accepting a dispreferred or infrequent syntactic structure due to influence from a language where this is a highly preferred, standard pattern (e.g., prenominal

adjective-noun word order in Spanish or French due to English influence; see Cuza & Pérez-Tattam, 2016; Hsin et al., 2013; Nicoladis, 2006). Or, in more extreme cases, they may transfer entirely non-shared structural properties across languages, resulting in innovations that are fully ungrammatical structures in one language but fully grammatical in the other (e.g., omission of accusative markers in Spanish transitive constructions due to English influence; see Fernández et al., 2017). This thesis explores contact-induced language change through the lens of the latter type of innovations.

But how can such structural innovations drive processes of contact-induced language change in bilingual societies? Two theoretical concepts that have been shown to be relevant for language change and its trajectories are *entrenchment* and *conventionalization* (De Smet, 2017; Lantto, 2021; Schmid, 2015). Typically, at early stages, structural innovations occur among individual bilinguals, who serve as potential initial agents of change (Doğruöz & Backus, 2009; Fernández et al., 2017; Heine & Kuteva, 2008). Over time, repeated exposure to these structures can lead to their entrenchment at the individual level and, eventually, conventionalization at the community level. Entrenchment refers to the strengthening of the representation of an innovation through recurrent activation, which then makes the innovation easier to access, more robust, and more likely to be reused over time. Lantto (2021) refers to three kinds of individual entrenchment, namely ongoing (if an innovation was only recently encountered), passive (if an innovation is recognized by the speaker but not actively used) and active (if an innovation is already used in speech). Conventionalization occurs when such entrenched individual patterns become more shared across the community, reaching a stage where innovations are either perceived as standard options of the grammar or even as more marked structures associated with specific linguistic contexts or (groups of) speakers. Crucially, entrenchment and conventionalization can unfold even when innovations are

initially infrequent or marginal, as long as the contact environment provides recurrent opportunities for activation and reinforcement.

Empirical evidence has revealed that the degree of language contact shapes the processes of emergence, entrenchment, and potential conventionalization of structural innovations. Specifically, it has been shown that bilingual speakers in high(er)-contact situations are overall more susceptible to either using more structural innovations (Doğruöz & Backus, 2009; Fernández et al., 2017; Kootstra & Şahin, 2018; Mougeon et al., 2005; also see Treffers-Daller, 2012), processing them faster (Jacob et al., 2025), or accepting them more (e.g., Schirakowski, 2023) than bilingual speakers in low(er)-contact situations. Contact in these studies is primarily defined at a broader societal or community level, whereby high-contact situations are either communities of bilingual speakers within otherwise monolingual environments (e.g., Doğruöz & Backus, 2009; Fernández et al., 2017; Jacob et al., 2025; Kootstra & Şahin, 2018) or bilinguals living in overall higher-contact societies that are officially more bi-/multilingual than other societies, like Canada or Belgium (e.g., Mougeon et al., 2005; Schirakowski, 2023; Treffers-Daller, 2012). Hence, at a first glance, high language contact seems to be a boosting factor for such innovations to occur and/or stabilize in bilinguals' repertoire.

Crucially, however, societal/community contact alone does not guarantee that an innovation will emerge, entrench or become established in language. Hawkins & Filipović (2024) highlight that each contact setting exhibits its own sociolinguistic ecology, and that language change therefore unfolds unevenly depending on individual bilingual profiles. Specifically, they argue that the emergence and spread of innovations are shaped by several factors such as demographic composition, patterns of interaction, and tendencies towards convergence between the two languages involved. These factors influence speakers' exposure to different structures, the kinds of cross-linguistic influence that are tolerated or resisted, and

the degree of structural permeability between the two systems (also see Filipović & Hawkins, 2025). Thus, in some environments, these pressures may encourage the emergence and consolidation of more extreme innovations, while in others, clearer structural boundaries may be maintained.

In sum, relevant research suggests that high contact settings are a fruitful ground for structural innovations. However, the sociolinguistic characteristics of these environments condition how the emergence, entrenchment and potential conventionalization of such innovations are associated with longer-term changes in language. Section 1.2 turns to the psycholinguistic mechanisms – the ways in which bilinguals adapt to structural innovations in their input – that may contribute to language change processes.

1.2 Psycholinguistic mechanisms of language change

Although language contact has long been investigated as a source of grammatical innovation and change, the psycholinguistic mechanisms underlying these processes are still not fully understood. Particularly regarding the present thesis, it is not yet clear how structural innovations emerge, entrench and possibly conventionalize over time in the grammar of bilingual individuals, and how this contributes to longer-term language change. Therefore, psycholinguistic research should offer a more concrete way to uncover and understand these mechanisms, and provide experimentally testable links between bilingual processing mechanisms and language change accounts.

On this basis, cross-linguistic structural priming is a suitable psycholinguistic mechanism that has been often proposed to drive contact-induced language change (Arslan et al., 2025; Baroncini et al., 2025; Fernández et al., 2017; Jaeger & Rosenbach, 2008; Kootstra & Muysken, 2017, 2019; Kootstra & Şahin, 2018). Generally, structural (or syntactic) priming describes the phenomenon in which recent exposure to a particular syntactic structure in the

input (prime) facilitates the subsequent production or comprehension of the same structure (target) (e.g., Bock, 1986; Hartsuiker & Pickering, 2008). In bilinguals, priming often operates cross-linguistically, whereby speakers tend to produce or comprehend syntactic structures in one language easier after encountering similar structures in the other language (e.g., Bernolet et al., 2013; Hartsuiker et al., 2004; Loebell & Bock, 2003). Structural priming effects can be *immediate* if they occur as response to a single structure that has just been encountered, and *cumulative* if they occur as response to a structure that has been repeatedly encountered in the input (Kaan et al., 2019; Kaan & Chun, 2018). Cumulative priming, also known as (cumulative) adaptation, is typically longer-lasting than immediate priming, and may thus cause more permanent changes to speakers' structural representations (Hartsuiker et al., 2008; Kaschak, 2007; Kaschak et al., 2011; Kaschak et al., 2014).

Overall, there are two basic mechanisms proposed to underlie structural priming, depending on whether its effects are short-lived or longer-term. The first mechanism is the *Residual Activation* account (Pickering & Branigan, 1998), which suggests that exposure to a prime activates both the lexical information and the structural information associated with it. For instance, encountering the English ditransitive prime *The man gives the dog a bone* leads to the activation of the verb lemma (*give*) together with the structural representation for a double object (DO) structure (*the dog a bone*). The lexical and structural information remain temporarily activated, which facilitates the subsequent use of a DO structure in the target, leading to a priming effect. Priming is expected to be stronger if the target is produced (almost) immediately after the prime (Hartsuiker et al., 2008), and if prime and target share lexical items (e.g., verb). The latter is known as the *lexical boost effect* (Cleland & Pickering, 2003; Pickering & Branigan, 1998), and has been shown to also occur cross-linguistically *(translation-equivalence boost effect*; Schoonbaert et al., 2007). Taken together, this model accounts for immediate priming effects that are shorter-term and lexically-dependent, since

they are driven by the residual, transient activation of specific lexical and structural representations. However, it fails to explain longer lasting cumulative effects in priming (adaptation), which are crucial for language change processes.

The second mechanism is the *implicit* (or *error-based*) *learning* model (Chang et al., 2006; also see Bock & Griffin, 2000; Chang, 2008). According to this account, language users constantly predict upcoming information based on their input. If their predictions are erroneous, the knowledge is updated and learning takes place. In the context of priming, speakers make syntactic predictions about the structure that they will encounter in the prime. For instance, hearing *The man gives…* might lead them to predict an upcoming DO structure (*…the dog a bone*). If they instead encounter a prepositional object (PO) structure in the prime (*…a bone to the dog*), they learn from the input and are primed to produce a PO structure in the target. Typically, larger prediction errors lead to stronger learning effects and, consequently, to stronger priming effects. On this basis, priming should be stronger for unexpected, surprising structures than for expected ones; this is known as *surprisal effect* (Bernolet & Hartsuiker, 2010; Jaeger & Snider, 2013). Unlike the Residual Activation model, priming as a result of implicit learning operates on the level of abstract syntactic representations (i.e., is not lexically-dependent), is longer-lasting (Bock & Griffin, 2000) and accumulates with repeated exposure (Kaschak, 2007; Kaschak et al., 2011; Kaschak et al., 2014). Thus, implicit learning supports both immediate priming effects and (cumulative) adaptation effects, which makes it a relevant mechanism for language change "[…] because it suggests that the usage patterns of adults can also yield long-term changes in others, and this mechanism can cause a pattern to spread across the language." (Chang, 2008, p. 118).

Furthermore, there are accounts that combine these two approaches, mainly due to the fact that neither of these models can explain all types of priming effects that have been reported in the literature (e.g., the lexical boost effect cannot be explained by implicit learning processes,

while adaptation cannot by explained by residual activation). One such account is the ACT-R computational model (Reitter et al., 2011), which presents structural priming both as a short-term, lexically-driven mechanism and as an implicit learning mechanism leading to long-term adaptation (also see Hartsuiker et al., 2008; Tooley & Traxler, 2010). Similarly, a later, updated version of the implicit learning account (Chang et al., 2012) also proposes that priming is driven both by residual activation of specific lexical and structural representations (short-term priming) and by implicit learning of abstract syntactic representations (long-term adaptation). In any case, for structural priming to function as a mechanism underlying language change, it must entail the implicit learning component that accounts for adaptation effects.

Taken together, cross-linguistic structural priming (based on implicit learning) constitutes a suitable psycholinguistic mechanism to examine in relation to language change, since it highlights the routes through which structural innovations may enter and then persist in the grammar of bilingual individuals. To date, most research has reported cross-linguistic structural priming effects for structures that are shared across languages (e.g., Bernolet et al., 2013; Hartsuiker et al., 2004; Jacob et al., 2017; Kootstra & Doedens, 2016; Loebell & Bock, 2003; Schoonbaert et al., 2007; Travis et al., 2017; also see Van Gompel & Arai, 2018 for a review). Thus, no structural innovations are primed in these cases. However, some studies have shown that cross-linguistic priming also takes place for structures that are not (fully) shared across languages, specifically for structures that are grammatical in the prime language but innovative (i.e., highly dispreferred or ungrammatical) in the target language (Baroncini et al., 2025; Fernández et al., 2017; Hsin et al., 2013; Jacob et al., 2025; Kootstra & Şahin, 2018; van Dijk & Unsworth, 2023). Such findings provide a plausible starting point for understanding how structural innovations may arise and probably persist over longer periods of time through cross-linguistic priming: When bilinguals encounter a grammatical structure in one language (i.e., prime), the cross-linguistic activation of that structure may make innovative mappings in

the other language (i.e., target) temporarily more available. Over time and with cumulative exposure, speakers gradually show adaptation to the structural innovation, which might then lead to more stable changes in their mental representations (corresponding to entrenchment) and possibly to a wider establishment of these innovations among speakers (corresponding to conventionalization), ultimately fostering contact-induced language change.

Within the broader landscape of adaptation as a form of cross-linguistic cumulative priming, there is a related phenomenon in the literature known as *syntactic satiation*. Syntactic satiation has primarily been studied in the context of acceptability judgments and refers to increases in the acceptability ratings of a repeatedly encountered ungrammatical structure, even when its grammatical status does not change (Snyder, 2000, 2022). Given that, syntactic satiation points to a more perceptual manifestation of adaptation, showing how cumulative within-language exposure can improve speakers' judgment of innovative syntactic structures. Although this concept does not explain how structural innovations emerge in the first place in bilingual grammars, it provides complementary evidence that cumulative exposure influences multiple facets of linguistic behavior. In this way, it can be seen as a narrower, judgment-focused type of adaptation that parallels and links to the mechanisms revealed by cross-linguistic structural priming (Do et al., 2016; Do & Kaiser, 2017).

In sum, cross-linguistic structural priming and adaptation provide a promising framework for understanding how repeated exposure to structural innovations can incrementally influence bilinguals' structural representations, offering experimentally testable pathways through which innovative syntactic patterns may become integrated into a speaker's grammar over time. Complementary phenomena such as syntactic satiation highlight that adaptation operates across multiple dimensions of linguistic performance, influencing even more explicit processes like acceptability judgments. Together, such accounts can provide

insights into how contact-induced innovations might emerge, entrench and potentially spread and stabilize within a community.

1.3 Motivation and aims of this dissertation

In the previous section, I presented cross-linguistic structural priming and adaptation, as well as syntactic satiation as potential mechanisms underlying contact-induced language change. Although some research has already been conducted on the contribution of each one of these mechanisms, there are still open questions regarding the conditions under which bilingual adults in contact situations adapt to structural innovations, and how such adaptation paves the way to language change.

1.3.1 Open questions and motivation

Prior research has shown that bilinguals can be primed cross-linguistically to either produce or process faster structural innovations that carry the syntax of their translation equivalents, especially in high-contact settings (e.g., Baroncini et al., 2025; Fernández et al., 2017; Jacob et al., 2025; Kootstra & Şahin, 2018). However, several crucial open questions persist, which the present thesis addresses.

First, most studies have targeted priming and adaptation in the production of structural innovations, probably because production is a clear(er) showcase that such structures either are already or are becoming a part of individual speakers' repertoire. However, this methodological decision has led to partially inconclusive results, since speakers often hesitate to produce structures that they might consider ungrammatical (see Fernández et al., 2017; Hopp & Jackson, 2023). Consequently, this leaves open whether, in these cases, adaptation takes place on other levels of linguistic performance, such as online processing or perception (acceptability judgments). This is a crucial question for language change because it can reveal whether

bilinguals still adapt to innovations by showing processing facilitation (e.g., Arslan et al., 2025; Fraundorf & Jaeger, 2016; Jacob et al., 2025; Kaschak & Glenberg, 2004) or higher acceptance over time (Snyder, 2000, 2022), which might capture early-stage processes associated with adaptation in production (cf. Tooley, 2023; Tooley & Traxler, 2010), and hence with longer-term language change. On this ground, the studies included in this thesis explore adaptation across several domains, including perception in the form of acceptability judgments (Study 1 and additional study in Section 3.1), online processing (Study 2 and 3) and offline production (Study 2 and 3).

Second, most cross-linguistic priming studies on structural innovations examine bilingual groups or communities within otherwise officially monolingual societies (e.g., see Arslan et al., 2025 for early Romani bilinguals in Romania and Serbia; Fernández et al., 2017 for Spanish heritage speakers in the US; Hopp & Jackson, 2023 for late L2 English speakers in Germany; Jacob et al., 2025 for Turkish heritage speakers in Germany; Kootstra & Şahin, 2018 for early Papiamento speakers in the Netherlands). This raises the question whether contact-induced language change follows similar trajectories in officially bilingual societies, where language contact typically operationalizes on multiple levels (i.e., broader societal, community-based, individual) that constantly interact with each other. At the same time, it is unclear how individual differences in language experience (e.g., language dominance, exposure, use, proficiency etc.) are linked to adaptation. This is another crucial point to investigate since, alongside societal/community contact, individual differences are expected to significantly influence the emergence, entrenchment and/or conventionalization of structural innovations, typically marking the starting point of language change. Combining these two aspects, what is missing from the current research is a more systematic study of different forms of individual bilingualism within – and not across – high-contact situations, with the purpose to provide more insights into the conditions and constraints of contact-induced language

change (cf. Filipović & Hawkins, 2025; Hawkins & Filipović, 2024). On this basis, Studies 1, 2 and 3 investigate adaptation to structural innovations in Canadian bilinguals while considering individual differences in contact (assessed via a composite contact score).

Third, only a limited number of structural innovations have been investigated across different priming studies, with the majority testing one structure at a time (e.g., Baroncini et al., 2025 for motion constructions; Hsin et al., 2013 and van Dijk & Unsworth, 2023 for adjective placement; Jacob et al., 2025 for comparatives; Hopp & Jackson, 2023 for verb placement; Kootstra & Şahin, 2018 for datives). To my best knowledge, only one study has compared more than one structure type (Fernández et al., 2017), which makes it hard to generalize findings across structures and contact situations, or to trace a potential structural continuum relevant to language change. Another point concerns not the amount, but the type of structures in each study, since there is no consistency in terms of the grammatical phenomena tested (e.g., omissions of different markers in the argument structures of verbs, word order, comparative formation etc.). However, there seems to be some common consensus in the literature that argument structure phenomena are overall more susceptible to cross-linguistic influence due to the considerable variation they exhibit across languages (Levin & Rappaport Hovav, 2005; also see Fernández et al., 2017). Hence, they are more suitable for exploring contact-induced language change. Moreover, one should also consider potential differences across various argument structure phenomena. For instance, Fernández and colleagues (2017) found that not all English-like innovations in Spanish were produced to a similar extent upon priming from English, showing that different argument structures are unequally susceptible to innovation and change (cf. Montrul et al., 2015; Montrul & Bowles, 2009 for similar results from acceptability judgments of different innovations). This might be related to how well a structural innovation is supported within the target language, or even to its syntactic and/or pragmatic complexity. In any case, this requires further exploration. Therefore, Studies 1 and

2 test and compare more than one structural innovation within the same experimental paradigm. Study 3 extends the paradigm used in Study 2 to a more complex innovation case, with the purpose to better determine the limits of structural susceptibility to change. The additional study in Section 3.1 employs the same task as Study 1 with a different type of innovative structure which is not tested in any of the three main studies. Taken together, various structural innovations are tested within and across the studies of this thesis, thus enriching our understanding of the role of structure type in adaptation and language change processes.

1.3.2 The present thesis

Considering all gaps discussed in the previous section, this thesis aims to provide insights into the processes of contact-induced language change by investigating bilingual adaptation to different types of structural innovations and on multiple levels of linguistic performance (perception, online processing, production) within a single contact setting, namely Canada. All structural innovations under investigation are in French and result from direct structural transfer from English.

The Canadian context was selected because it is an officially bilingual setting where contact between French and English has been a persistent, widespread reality for centuries. At the same time, despite the overall higher language contact, there is great variability in terms of language dominance, input and use, not only across different bilingual speakers but also across different provinces and communities. On this basis, French in Canada comprises several regional and social varieties that differ substantially with respect to their degree of contact with English, ranging from largely monolingual French-speaking environments to strongly bilingual and minority-language contexts (Statistics Canada, 2021 Census). Concretely, while French has majority status and strong institutional support in the province of Quebec, it functions as a minority language in most other provinces, where it is subject to particularly intense and

asymmetrical contact with English, as well as to ongoing processes of change (e.g., King, 2000; Mougeon et al., 2005).

Overall, Canada provides precisely this diversity nested within an otherwise high-contact situation that allows us to identify and explore the drivers and constraints of contact-induced language change by looking "more systematically at bilingualism rather than contact per se" (Hawkins & Filipović, 2024, p. 2). On this basis, the Canadian bilinguals recruited in the studies of this thesis are a highly diverse group that is spread over a continuum of individual contact. Individual contact here is operationalized through *French Score*, which is a novel composite measure that was developed for the purposes of the current thesis via factor analysis. It integrates the following variables: (i) difference between age of onset of acquisition of French and English (as a proxy of across-time exposure to the target language French over English), (ii) current exposure to French, (iii) current use of French and (iv) proficiency in French. *French Score* was designed to identify gradual, more nuanced effects of bilingual contact, therefore providing a more ecologically precise representation of within-community variation and avoiding the limitations of dividing bilinguals into categorical groups (e.g., see Baum & Titone, 2014; De Bruin, 2019; Marian & Hayakawa, 2021). Figure 1 shows the distribution of participants from Studies 2 and 3 across the *French Score* continuum, with higher *French Scores* indicating lower contact between French and English due to higher French-only dominance.

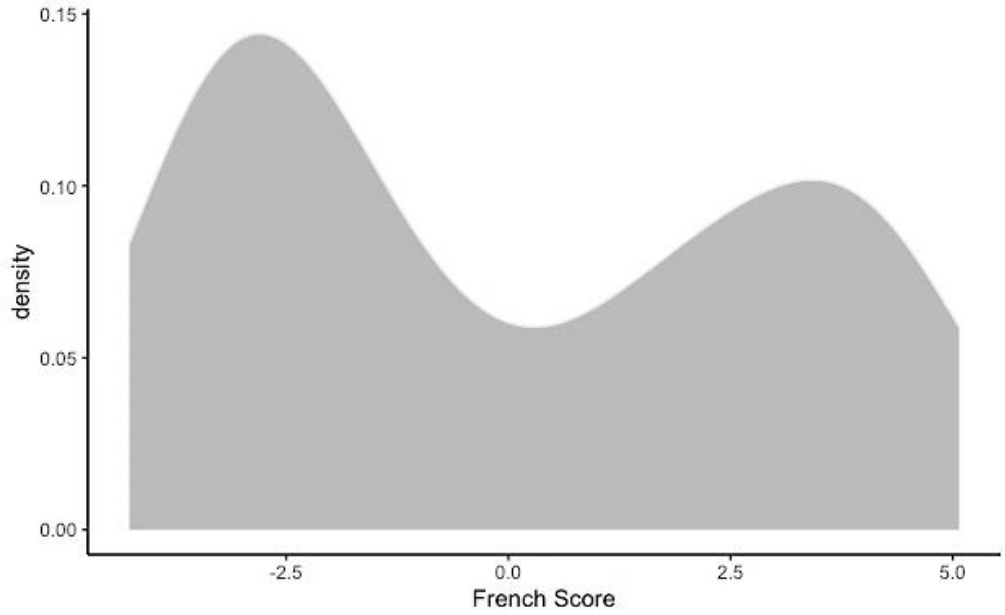

Figure 1. Distribution of Canadian participants from Studies 2 and 3 across *French Score*.

Within this framework, the three main studies of the thesis (Study 1, 2 and 3) investigate three types of structural innovations in Canadian French, all of them being argument structure phenomena modeled on English syntax. The first structure is ditransitives. In standard French, only PO structures with the dative marker *à* are grammatical (*L'homme donne un cadeau à la femme*), whereas English allows both PO (*The man gives a present to the woman*) and DO structures (*The man gives the woman a present*). French DO-like structures without the dative marker *à* (**L'homme donne la femme un cadeau*) are innovations. The second structure involves monotransitive verbs that require the prepositions *à* or *de* on their object in French (*Le garçon obéit à la femme* / *s'approche de la femme*), but not in English (*The boy obeys the woman* / *approaches the woman*). Omitting the preposition in French (**Le garçon obéit la femme* / *s'approche la femme*) is likewise an innovation. The third structure is reciprocals, which in the standard French grammar require the reflexive marker *se* on the verb to yield reciprocity (*Ils se rencontrent* 'They meet-RECIPROCAL), while this is not the case in

English (*They meet*). Again, when the *se*-marker is omitted (**Ils rencontrent* 'They meet'), it is an innovation in the context of reciprocity.

All three structure types were selected in analogy to Fernández et al. (2017), who investigated similar innovations in another Romance-Germanic contact situation (early Spanish-English bilinguals in the US). In the Canadian context, innovative monotransitives have been attested to some extent in the speech of Francophone adolescents in Ontario (Mougeon et al., 2005), while innovative ditransitives and reciprocals lack reported evidence. For the latter two, it is not clear whether these innovations do not exist at all in current Canadian French, or whether they exist but are rare and have not yet been reported. In any case, we test three types of innovative structures that seem to be at different stages of change in Canadian French. Moreover, monotransitives and ditransitives are innovative in that certain obligatory markers are missing, but the underlying argument structure is preserved (i.e., verb with one or two objects respectively). This is not the case for reciprocals, where omission of the reflexive marker alters the underlying argument structure more strongly (e.g., not clear whether the verb is reciprocal or transitive), which can also lead to impeded comprehension. This might make reciprocals a more radical case of structural innovation from a syntactic and – possibly also – pragmatic viewpoint, and hence a harder one to emerge and adapt to in the first place.

The additional study reported in Section 3.1 focuses on a different kind of structural innovation that is not omission-induced, namely double framing (DF) motion constructions in French. Typically, motion structures in French are verb-framed (VF), meaning that the Path of motion is encoded in the verb only (e.g., *descendre* 'to go down'). In English, however, motion structures are satellite-framed (SF), with the Path being encoded in a satellite accompanying the verb (e.g., *down* in *go down*) (Talmy, 2000). DF emerges when these two typologies mix and, consequently, Path is encoded both in the verb and in the satellite (**descendre bas* 'to go down down'). Limited evidence for such structures has been reported in high(er)-contact

situations like Canada (King, 2000) and Belgium (Treffers-Daller, 2012), suggesting that they might be established to some extent, at least within more restricted contexts and communities.

To sum up, across all studies in this thesis, the tested structures are placed on a continuum of susceptibility to change, as well as on a continuum of syntactic (and potentially also pragmatic) extremity. This gradience allows us to explore which structural innovations are more prone to adaptation than others while assessing how adaptation manifests in different domains of linguistic performance, and how individual differences in language contact shape the trajectories and limits of language change within an otherwise high-contact situation like Canada.

1.3.3 Overarching research questions

Building on this foundation, the present thesis is guided by the following overarching research questions:

RQ1: Do bilinguals adapt to structural innovations with repeated exposure? If yes, do they do so across different domains, including perception (acceptability judgments), online processing and production?

RQ2: To what extent are adaptation mechanisms modulated by structure type and individual differences in contact (assessed via a composite contact score)?

RQ3: What does psycholinguistic adaptation to structural innovations in bilinguals reveal about the mechanisms and trajectories of contact-induced language change?

These questions are addressed across all studies included in this thesis. Study 1 (Karkaletsou et al., 2024) explores how Canadian adult bilinguals adapt to French structural innovations in their acceptability judgments. Although this study does not directly employ

cross-linguistic priming, it tests how different types of English-like structural innovations in Canadian French (ditransitives, monotransitives, reciprocals) are perceived, and whether repeated exposure within French throughout the task increases acceptability, indicating adaptation (or more specifically syntactic satiation). It also explores how individual differences in language contact (*French Score*) modulate these processes. On a similar basis, the additional study in Section 3.1 investigates how French-English bilinguals in Canada (high contact) and in France (low contact) adapt their perception of DF structures in French with repeated within-language exposure. Study 2 (Karkaletsou et al., 2025a) tests whether cross-linguistic structural priming from English can facilitate the (i) online processing (reading speed) and (ii) subsequent unprimed production of ditransitive and monotransitive innovations in Canadian French. These are two innovations that contain omissions, but their underlying argument structure is overall preserved. To further explore the limits of language change, Study 3 (Karkaletsou et al., 2025b) extends Study 2 to a more complex case of omission-induced structural innovation in French where the argument structure changes more strongly, namely English-like reciprocals without the reflexive marker. Unlike previous work, both priming studies also explore the role of individual contact in priming and adaptation. Together, all studies provide a systematic investigation of whether bilinguals adapt their perception, online processing and production of structural innovations in a high-contact setting, offering new insights into the interface between psycholinguistic adaptation and contact-induced language change.

Chapter 2. Literature review

In this chapter, I provide a more detailed overview of research on adaptation to structural innovations, broadly divided into two strands. The first comprises studies that have examined monolingual and bilingual adaptation to innovative structures without direct priming manipulation, laying a special focus on acceptability judgments (corresponding to Study 1 and the additional study in Section 3.1). Within this strand, I present studies that highlight the role of structure type in overall and adapted acceptability (Section 2.1), as well as the contribution of individual differences in language experience as a factor shaping general acceptability of structural innovations in bilinguals (Section 2.2). The second strand presents cross-linguistic structural priming and adaptation to structural innovations as psycholinguistic mechanisms underlying language change (corresponding to Studies 2 and 3). In this framework, I present research on cross-linguistic priming of structural innovations in production and processing, highlighting the contribution of structure type and individual differences (Section 2.3).

2.1 Adaptation to structural innovations in non-priming research

In the non-priming research, adaptation to innovative structural patterns has been explored using various methods. For instance, Kaschak and Glenberg (2004) investigated how monolingual English speakers adapt to an unfamiliar English dialectal structure (*The meal needs cooked*) in online processing (reading). They found that participants who repeatedly encountered the construction processed it more quickly than those who were exposed to it only once, indicating adaptation through repeated exposure in the recent input (also see Fraundorf & Jaeger, 2016 for similar findings with the same structure).

Alongside online processing, some research has also been conducted on adaptation in the acceptance of innovations. One of the foundational studies in this area is Snyder (2000), who examined whether repeated exposure influences L1 English speakers' acceptability

judgments of various ungrammatical constructions. His findings showed that some structures, such as *whether*-island violations (**Who does John wonder whether Mary likes?*) and complex noun-phrase (NP) violations (**Who does Mary believe the claim that John likes?*), became cumulatively more acceptable over the course of the task. However, other structures, such as left-branch violations (**How many did John buy books?*) and *that*-trace configurations (**Who does Mary think that likes John?*), did not show improvement. On this basis, Snyder proposed the syntactic satiation hypothesis (also see Section 1.2), which argues that certain, initially unacceptable, constructions can become more acceptable with repeated presentations (also see Do & Kaiser, 2017; Snyder, 2022; Zervakis & Mazuka, 2013).

Regarding bilinguals, this area of research is significantly less explored. To my best knowledge, the only existing study is by Do et al. (2016), who tested late L2 learners of English with Spanish as their first language. Participants rated the acceptability of two types of innovative English subject-verb inversion structures (among other structures) on a five-point scale (1 = completely unacceptable, 5 = completely acceptable). One of the innovations had a grammatical equivalent in Spanish (**I wonder what will John buy at the store*, Sp. *Me pregunto qué comprará Juan en la tienda*), while the other did not (**What John will buy at the store?*, Sp. **¿Qué Juan comprará en la tienda?*). The authors predicted that, if bilingual speakers map these English structures onto the equivalent Spanish structures, they should adapt by showing syntactic satiation only for the English sentences that are also ungrammatical in Spanish, while no syntactic satiation is expected for the English sentences with a grammatical Spanish equivalent. Results revealed that, across the two halves of the experiment, participants indeed adapted by cumulatively increasing their acceptability ratings only for the English innovation without a Spanish counterpart. These findings indicate that syntactic satiation in bilinguals seems to be modulated by structural mapping across the two languages, such that

only structural innovations lacking a grammatical counterpart in the other language are susceptible to adaptation.

Further insight on the role of structure type in the acceptability of innovations comes from studies that examined overall acceptability, but not syntactic satiation/adaptation. An important study in this area is Montrul and Bowles (2009), who investigated the acceptability of two types of syntactic innovations in Spanish that mirror English patterns. The first involved the omission of the differential object marking (DOM) marker *a* with animate direct objects (e.g., **Maria conoce (a) mi hermana* 'Maria knows my sister'), and the second concerned the omission of *a* with indirect objects in ditransitive constructions (e.g., **Maria dio (a) Pedro un regalo* 'Maria gives (to) Pedro a present'). Using a written acceptability judgment task, they demonstrated that Spanish heritage speakers (HSs)[1] with US English as their majority language consistently found DOM innovations more acceptable than ditransitive innovations, probably because DOM innovations are attested in the speech of Spanish HSs and are therefore likely to be more familiar structures (Montrul, 2010; also see Fernández et al., 2017; Regulez & Montrul, 2023). This was not the case for the monolingual Spanish-speaking participants, who rejected both innovations equally.

These findings were expanded cross-linguistically in Montrul and colleagues (2015), who examined DOM innovations in Spanish, Hindi, and Romanian as heritage languages in contact with US English. The study employed an acceptability judgment task that included both grammatical and innovative sentences. Participants were bilinguals living in the US (including first-generation immigrants and HSs), as well as monolingual comparison groups living in the countries of origin (Mexico, India, and Romania respectively). In all three languages, the presence versus omission of the respective DOM markers was manipulated: Spanish *a*, Hindi -

[1] Heritage speakers (HSs) 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).

ko, and Romanian *pe*. In addition to DOM, omission of the same markers in other syntactic structures were also tested: ditransitives in all three languages (e.g., Spanish: *Juan le dio (a) su padre dinero* 'Juan gave (to) his father money'), dative experiencers in Spanish and Hindi (e.g., Hindi: *John(-ko) paise ki aavashyaktaa hai* 'John needs money'), and locatives in Romanian only (e.g., *Cartea este (pe) masa* 'The book is on the table'). The results revealed that HSs in all three groups were significantly more accepting of all innovations than their monolingual peers. For Spanish, this increased acceptability also extended to first-generation immigrants, but only in the case of innovative DOM structures. Crucially, bilinguals rated omissions in DOM contexts consistently higher than omissions in ditransitives, dative experiencers, or locatives, reinforcing the idea that not all innovations are equally acceptable in bilingual grammars (in line with Montrul & Bowles, 2009).

To sum up, research on syntactic satiation suggests that both monolingual (Snyder, 2000, 2022) and bilingual speakers (Do et al., 2016) adapt to structural innovations by increasing their acceptability judgments with repeated exposure. Particularly for bilinguals, this process seems to depend on whether structural innovations have a grammatical equivalent structure in the other language or not. At the same time, findings from studies on overall acceptability indicate that bilingual speakers, particularly HSs (considered as an example of "extreme language contact" in Kupisch & Polinsky, 2022), generally show higher acceptance for innovations induced by cross-linguistic influence than monolingual speakers. Crucially, both lines of research converge in showing that overall or trial-by-trial acceptability is not uniform across different structures. Rather, systematic asymmetries emerge, with certain structural innovations being consistently more acceptable across languages and bilingual populations. This suggests that some innovations may be more prone to contact-induced change than others.

2.2 Individual differences in the acceptability of structural innovations

In addition to structural factors, a growing body of work has emphasized the role of individual differences in shaping bilinguals' acceptance of structural innovations. Variables such as proficiency, age of onset of bilingualism, and amount of language exposure have repeatedly been shown to modulate speakers' judgments. In Montrul and Bowles (2009), proficiency emerged as a significant predictor of performance in the case of ditransitive innovations, which were overall less accepted than DOM innovations. While HSs as a group rated these structures higher than their monolingual peers, advanced HSs behaved more monolingual-like and were thus significantly less accepting than less proficient (low and intermediate) HSs. This aligns with subsequent findings reported in Montrul (2010), but contradicts results in Regulez and Montrul (2023) showing no effect of proficiency. Interestingly, this pattern was not replicated for DOM innovations, where advanced HSs showed higher acceptability than monolinguals.

Individual differences were further explored in the multilingual study by Montrul et al. (2015), where age of onset of bilingualism played a crucial role, particularly in the Hindi and Romanian groups. For both languages, first-generation immigrants exhibited significantly more monolingual-like behavior than HSs. Moreover, among Romanian HSs, a distinction emerged between simultaneous and sequential bilinguals: simultaneous HSs judged DOM omissions as significantly more acceptable than sequential HSs, presumably due to longer and more sustained exposure to English across the lifespan (contra Montrul, 2010). The study also documented that HSs across all three language groups displayed significantly lower proficiency in their heritage language than both monolinguals and first-generation immigrants, a factor that has likely contributed to their higher acceptance of innovations.

Age of onset of bilingualism was also examined in Higby (2016), who compared early and late Spanish-English bilinguals in their judgments of innovative Spanish causative

constructions modeled on English syntax (e.g., **Los maestros trotaron a los niños alrededor del patio* 'The teacher jogged the kids around the playground'). To ensure that higher ratings could be attributed to English influence rather than general tolerance for innovations, the study included entirely novel structures in both languages as a control condition. The results showed that bilinguals found causative innovations somewhat acceptable, but still judged them significantly higher than the entirely novel items. No significant differences were observed between early and late bilinguals, thus converging with Montrul (2010) and diverging from the age-of-onset effects reported for Hindi and Romanian in Montrul et al. (2015). Nevertheless, proficiency again emerged as a significant predictor. Participants with higher proficiency in Spanish rated the innovative causatives significantly lower, mirroring the results obtained for DOM and ditransitive innovations in earlier work.

Individual variation was also investigated in Kupisch (2012), who manipulated and examined the interaction between age of onset and language dominance. The study tested German-Italian simultaneous bilinguals (2L1 speakers) who were either German-dominant or Italian-dominant, as well as German L2 learners of Italian, in their acceptability of innovative bare subject NPs in Italian (e.g., **Donne guidano meglio* 'Women drive better'). The innovation was implemented in two different contexts, namely specific and generic. Bare NPs in specific contexts are ungrammatical in both Italian and German, while the same structure in generic contexts is ungrammatical only in Italian. Participants were asked to judge whether the sentences sound good or bad, and to correct those judged as bad. The results showed that both German-dominant 2L1 speakers and L2 learners corrected bare NPs significantly less in generic contexts compared to specific ones, while Italian-dominant 2L1 speakers corrected more across the board (also Montrul & Ionin, 2010). Moreover, German-dominant 2L1 speakers made significantly fewer corrections than both L2 learners and Italian-dominant 2L1 speakers (see Kupisch, 2014; contra Kupisch et al., 2014). Crucially, Kupisch (2012) argues

that these effects cannot be explained based on age of onset alone. Instead, the length and intensity of language exposure across the lifespan are significant predictors. Specifically, Italian-dominant 2L1 speakers, who had spent most of their lives in Italy, behaved as the most target-like group, while L2 learners who had accumulated more years of residence in Italy corrected more than German-dominant bilinguals, whose exposure to Italian was more limited (see also Serratrice et al., 2009).

Another study examining the role of individual differences in the judgment of structural innovations is Jacob et al. (2025), who compared HSs of Turkish in Germany to monolingually-raised L1 German speakers without any Turkish knowledge in their grammaticality judgments of innovative analytic comparatives in German (**mehr angenehm* 'more comfortable'). While analytic comparatives are the canonical variant in Turkish (*daha konforlu* 'more comfortable'), German comparatives are mostly synthetic (*angenehmer*). On this basis, HSs should rate German analytic comparatives higher due to frequent exposure to Turkish analytic comparative structures in their daily life. Results revealed that, although innovative comparatives in German were overall rated low by both groups, HSs indicated significantly higher grammaticality ratings than L1 speakers, showing that cumulative exposure to similar structural input in Turkish over time eventually led to an improved perception of this innovation in German.

In sum, while bilinguals are overall more accepting of structural innovations than monolinguals, this tendency is systematically modulated by factors related to individual differences, including proficiency, age of onset of acquisition, dominance, and cumulative exposure. Such factors appear to play a role in speakers' perception of innovations, even for populations that are generally assumed to exhibit higher contact than others, like HSs (Kupisch & Polinsky, 2022).

Considering the studies presented in Sections 2.1 and 2.2, existing research provides some initial evidence that bilingual speakers adapt to structural innovations in their acceptability judgments by cumulatively increasing their ratings as a function of within-language repeated exposure (syntactic satiation). However, this finding was obtained for structural innovations that are ungrammatical in both languages involved (Do et al., 2016). This leaves open whether innovations like the ones investigated in the studies in Section 2.2 and – cruially – in this thesis (i.e., ungrammatical structures with a grammatical structural equivalent in the other language) can be subject to syntactic satiation in bilinguals. Another question concerns whether adaptation in the acceptability of structural innovations with a grammatical counterpart also occurs differentially depending on structure type, given that similar tendencies have been shown for the overall acceptability of such innovations across different bilingual populations and language pairs (Montrul et al., 2015; Montrul & Bowles, 2009). This issue becomes more relevant if we consider that, in these studies, it is unclear whether the observed structural asymmetry reflects differences in adaptation across experimental trials, or whether some innovations are generally more acceptable than others independently of adaptation (cf. Do et al., 2016). Furthermore, considering the significant role of individual differences in the overall acceptability of various innovations, even within higher-contact bilingual populations (e.g., HSs), another emerging question is whether language experience (e.g., age of onset of acquisition, input, language use, proficiency etc.) modulates also potential adaptation processes in the acceptance of innovations. On this basis, Study 1 in the thesis (Karkaletsou et al., 2024) directly addressed these points using a timed acceptability judgment task with Canadian French-English bilinguals. By combining offline (ratings) and online (response times) metrics, this study examines how bilinguals' perception of various structural innovations in Canadian French (ditransitives, monotransitives, reciprocals) evolves trial-by-trial, and how individual differences related to the degree of contact with French (as a result of age of onset of

bilingualism, exposure, use and proficiency) shape overall acceptance and adaptation in speakers' judgments. Building on Study 1, the additional study presented in Section 3.1 also investigates overall and trial-by-trial acceptability ratings of French DF innovations, this time testing French-English bilinguals in two different settings, namely Canada (high contact) and France (low contact).

2.3 Cross-linguistic priming of structural innovations

A second line of research investigates adaptation to structural innovations in bilinguals through the lens of cross-linguistic structural priming, exploring mostly production and, to a much lesser extent, online processing. Below, I present studies that show cross-linguistic innovation priming in bilingual children (Section 2.3.1) and in bilingual adolescents and adults (Section 2.3.2).

2.3.1 Cross-linguistic priming of structural innovations in children

One of the first studies to investigate innovation priming was Hsin et al. (2013), who tested 4- and 5-year-old Spanish-English bilingual children in their production of adjective placement in Spanish. All children were attending immersion schools in the US, with one third of them reporting Spanish as their home language. The priming task was divided into two blocks, in which they were prompted to describe pictures in Spanish after they heard English primes produced by the experimenter. In the first block, participants were presented with neutral primes (*That apple was green*), while in the second they were presented with prenominal adjective-noun primes (*It was a green apple*), an order that is grammatical in English but ungrammatical in Spanish. Results show that children produced more ungrammatical prenominal adjective-noun structures in Spanish (e.g., **un verde libro* 'a green book' instead of *un libro verde* 'a book green') after being primed with the same structure in

English than after being primed with neutral structures. Further, Hsin and colleagues investigated whether cross-linguistic priming was modulated by language dominance (defined as the difference between English and Spanish proficiency score), but no significant effect was found.

Cross-linguistic priming in the production of adjective placement was also studied in van Dijk & Unsworth (2023), this time with Spanish-Dutch bilingual children aged 5-8 and French-Dutch bilingual children aged 4-8 in the Netherlands. The vast majority had acquired Spanish/French and Dutch from birth and was exposed to both languages at home (mostly in a one-parent-one-language situation). In a production priming task set up as a card game, children were exposed to Spanish/French prime sentences with the postnominal adjective-noun order and were then prompted to describe a card by using specific adjectives and nouns in Dutch. Results reveal that they were primed across languages to produce ungrammatical postnominal adjectives in Dutch (instead of the grammatical prenominal order) after hearing the same structure in Spanish/French. Moreover, priming was shown to be stronger with lower proficiency in the target language Dutch, which was attributed to the potentially weaker representation of the Dutch prenominal adjective-noun order.

In another study targeting word order, Baroncini & Torregrossa (2025) tested Italian-Greek bilingual children aged 7-11 in their production of verb-subject-object (VSO) structures in Italian. VSO structures are grammatical in Greek, but infelicitous in Italian. All children were attending an Italian immersion school in Greece, and most of them reported to have acquired both languages early in life (either simultaneously or sequentially). Two priming tasks, one within-language (Italian-to-Italian) and one across languages (Greek-to-Italian), were implemented in two separate sessions. Participants were presented with Italian or Greek prime sentences that were either VSO structures (e.g., Greek: *Piani o vatrachos ti miga* 'Catches the frog the fly') or subject-verb-object (SVO) structures (e.g., Greek: *To koritsi forai*

tin korona 'The girl wears the crown') and were then asked to describe pictures in Italian. It was found that, with cumulative exposure across trials, bilingual children produced overall more VSOs in Italian across both tasks, with this effect being stronger in the cross-linguistic priming task. However, no immediate priming effects were detected, although the proportion of Italian VSOs was larger after VSO primes than after SVO primes in both priming tasks, with this tendency being again stronger in the Greek-to-Italian context. The authors also explored the effect of language dominance (defined on the basis of participants' home language history and current language use in different social contexts), revealing that more Greek-dominant children were more prone to producing VSOs in the within-language task (cf. Hsin et al., 2013).

Overall, bilingual children seem to be prone to adapting to innovations, especially when these are reinforced cross-linguistically. Findings on the contribution of individual differences in language experience are mixed, but the general tendency is that proficiency and dominance may modulate the strength of cross-linguistic innovation priming in children.

2.3.2 Cross-linguistic priming of structural innovations in adolescents and adults

Although innovation priming might be expected to be stronger in bilingual children, since their representations may be less stabilized and inhibitory control is still developing (cf. Hsin et al., 2013), there is also some evidence for such priming effects in bilingual adults.

One such study is Fernández et al. (2017), who tested Spanish-English bilingual adults in their production of three alternations in Spanish: (i) voice alternation (*La bailarina empuja al portero* 'The dancer pushes the janitor' vs. *El portero es empujado por la bailarina* 'The janitor is pushed by the dancer'), (ii) reciprocal alternation (*La cocinera y el policía se abrazan* 'The chef and the policeman hug' vs. *La cocinera abraza al policía* 'The chef hugs the policeman'), and (iii) dative alternation (*La científica le da una maleta al ángel* 'The scientist gives a suitcase to the angel' vs. *La científica le da al ángel una maleta* 'The scientist gives the

angel a suitcase'). Participants were early bilinguals in New York City, US (contact group, English-dominant) and L1 Spanish-L2 English bilinguals in Córdoba, Argentina (non-contact group, Spanish-dominant). They completed two priming tasks, one within-language (Spanish primes, Spanish targets) and one cross-linguistic (English primes, Spanish targets); in both tasks, they were primed with either variant of each alternation and were then asked to describe a target picture in Spanish. Results showed that bilinguals produced English-like innovations in Spanish across all three alternations. In particular, contact bilinguals produced target sentences without the necessary accusative marker *a* in transitive constructions (**La bailarina empuja el portero*), some without the reciprocal marker *se* (**La cocinera y el policía abrazan*), and some without the clitic *le* in datives (**La científica da una maleta al ángel*). This tendency was overall stronger when they were primed from English compared to Spanish. Similar patterns were observed for non-contact bilinguals, but to a much lesser degree, suggesting that cross-linguistic priming in contact seems to facilitate the emergence of structural innovations.

Moreover, Fernández and colleagues showed that different innovations were produced unequally frequently. For instance, innovative reciprocals were the most produced structure among contact bilinguals, followed by innovative transitives and, last, datives. This is attributed to the fact that the reciprocal and transitive innovations have a similar structure available in Spanish (i.e., reciprocal verbs not requiring *se* and transitive constructions with inanimate objects not requiring *a*), while this is not the case for datives. On this basis, the authors conclude that it is not only cross-linguistic priming, but also within-language structural support that may modulate the extent to which syntactic structures are susceptible to innovation and, hence, change. To my best knowledge, this is the only cross-linguistic innovation priming study investigating various types of innovations, while the rest of the studies presented in this section explore one type at a time. It is also the only study exploring innovations that are fully ungrammatical in the target language, but grammatical in the prime language. The following

studies focus on innovations that are rather infelicitous or highly dispreferred structures with a grammatical structural equivalent in the other language.

First, Kootstra and Şahin (2018) tested bilingual speakers of Dutch and Papiamento (a Creole language spoken on Caribbean islands) in a priming study targeting production of datives in Papiamento after exposure to Dutch. Datives were selected because they behave differently across the two languages: while Dutch uses both PO structures (*Obi geeft het boek aan Pieter* 'Obi gives the book to Pieter') and DO structures (*Obi geeft Pieter het boek* 'Obi gives Pieter the book') to a similar extent, Papiamento shows a clear preference for DOs (*Obi ta duna Pieter e buki*); POs (?*Obi ta duna e buki na Pieter*) are highly dispreferred, thus innovative. To explore the effect of contact in priming, bilinguals were recruited in two different locations, namely in the Netherlands (high contact)[2] and in Aruba (low contact)[3]. First, they completed an unprimed video description task that tested their baseline production in Papiamento. Although there was a preference for DOs across both groups, bilinguals in the Netherlands produced more PO structures in Papiamento than bilinguals in Aruba, probably due to their higher contact with Dutch. In the cross-linguistic priming task, participants heard either PO or DO Dutch primes and were then asked to describe target videos in Papiamento. Results show a significant priming effect, with PO Dutch primes leading to higher production of PO Papiamento targets than DO Dutch primes for both groups. Although no direct effect of contact was revealed in priming, additional analyses including age as a predictor indicated that younger bilinguals in the Netherlands (but not in Aruba) were more prone to producing POs in Papiamento than older bilinguals regardless of whether they were primed from Dutch. This is

[2] Bilinguals in the Netherlands (high-contact group) are speakers who were born in Aruba or Curaçao, acquired Papiamento from birth and Dutch sequentially (Mean age of acquisition = 5.63, SD = 2.38), and moved to the Netherlands later in life (Mean age of arrival in years = 19.11, SD = 8.6).

[3] Bilinguals in Aruba (low-contact group) are speakers who were born and living in Aruba at the time of testing; they acquired Papiamento from birth and Dutch sequentially (Mean age of acquisition = 5.95, SD = 0.52). The authors note that, although Dutch is an official language is Aruba, it is not used daily in communication.

most likely due to younger Papiamento speakers' more intense contact with Dutch in their daily life. Overall, findings from Kootstra and Şahin suggest that language contact seems to drive language change in Papiamento, and that cross-linguistic priming from Dutch specifically might be a mechanism underlying this process.

Second, in a more recent study, Baroncini and colleagues (2025) also investigated cross-linguistic structural priming as a mechanism driving contact-induced language change in a different bilingual population, namely HSs of Italian in Germany (cf. Kupisch & Polinsky, 2022). The phenomenon tested was motion events with a boundary crossing reading. Within this context, German allows for structures like *Das Mädchen rennt aus dem Supermarkt* 'The girl runs out of the supermarket', where Path of motion is encoded in a satellite (*aus* 'out') outside the verb root (*rennt* 'runs') (i.e., is SF). However, Italian mostly prefers structures such as *La bambina esce dal supermercato correndo* 'The girl exits from the supermarket running', where Path is encoded in the verb root (*esce* 'exits') (i.e., is VF). A German-like SF structure in Italian in the context of boundary crossing (e.g., *La bambina corre fuori dal supermercato*) is therefore considered infelicitous, hence innovative. All participants were HSs of Italian in Germany, either simultaneous or early sequential bilinguals aged 11-58. They took part in two priming tasks (at least a week apart), where they had to describe target videos in Italian after they heard primes in Italian (within-language priming task) or in German (cross-linguistic priming task). Their results show that HSs were more likely to produce SF targets in Italian after encountering SF primes in either Italian or German, with the priming magnitude being larger in the within-language task. Although Italian SF structures were primed successfully both within-Italian and cross-linguistically from German, their production decreased post-priming, indicating absence of longer-lasting priming effects for the innovation. Moreover, a significant effect of age was found, with younger speakers producing overall more SF structures than older speakers in the unprimed tasks, but not during priming (partially in line

with Kootstra & Şahin, 2018). Language dominance, administered as an individual composite score including proficiency, current language use, current input and language acquisition, was not shown to have a significant effect in either of the tasks. In sum, these findings reveal that structural priming and cross-linguistic influence in HSs might lay the ground for innovations to spread, even temporarily, thus preparing the ground for language change to take place.

Taken together, these two studies indicate that bilingual adults and adolescents can be primed cross-linguistically to produce structural innovations in the target language, especially in contexts that are considered high(er)-contact situations. However, not all studies investigating cross-linguistic priming of innovations in bilinguals find significant effects. For instance, Hopp and Jackson (2023) tested whether L1 German-L2 English adolescents in the 7th and 8th grade in Germany (all German-dominant) would produce ungrammatical verb-second (V2) word orders in English, such as **On Sunday drinks the father in the pub*, after being primed with the same V2 structure in German. Their task was to first listen to German prime sentences, repeat them and then produce target sentences in English by putting given words in the correct order. The priming task was preceded by a pretest assessing participants' baseline productions in English and was followed by a posttest assessing whether priming affected their productions longer-term. Results reveal that, although participants produced ungrammatical English V2 structures in the baseline, priming from German did not boost this tendency. More specifically, the authors found that the amount of ungrammatical V2 sentences in English decreased in the cross-linguistic priming task and in the posttest. These findings do not fully align with Meisel's proposal (2024) that L2 learners are especially likely to trigger syntactic change. However, they may reflect the particular innovation tested rather than a general absence of susceptibility to change.

Crucially, most existing studies on cross-linguistic priming of innovations have employed production measures. Given that speakers may be reluctant to produce structures

considered as ungrammatical, even if repeated exposure has boosted their activation, this emphasis on production could be partially responsible for the inconsistent results (also see Jacob et al., 2025). Focusing on processing instead can be extremely insightful (cf. Arslan et al., 2025), especially for innovations that are not yet produced or produced rarely. In these cases, adaptation in processing can reveal processes that could lead to adaptation in production (see Tooley, 2023; Tooley & Traxler, 2010), hence it is as relevant for accounts of language change. Supporting this view, Jacob and colleagues (2025) investigated cross-linguistic innovation priming in online processing with adult HSs of Turkish in Germany (aged 19-27). All participants were either early simultaneous or sequential bilingual speakers indicating higher use of Turkish with family, but higher use of German at work (or university) and with friends. The structure tested was innovative comparatives in German bearing the analytic formation, such as **mehr angenehm* 'more comfortable', instead of the grammatical synthetic formation *angenehmer*. Such structures were presented as targets in a self-paced reading task, where participants were primed either with grammatical Turkish sentences bearing the same structure (*daha konforlu* 'more comfortable') or with control Turkish sentences bearing indicative structures (*konforlu* 'comfortable'). Turkish primes and German targets were presented segment-by-segment, and participants had to press the spacebar to read the entire sentences. Results demonstrated that HSs read the innovative segment in German targets (i.e., containing the analytic comparative) faster after structurally similar Turkish primes than after control primes. In addition, they found effects of adaptation, with participants reading the innovative segment in the target cumulatively faster across trials. These findings suggest that cross-linguistic priming and adaptation can arise in online processing even when the structure is ungrammatical in the target language.

Overall, research on cross-linguistic priming of structural innovations in adults (and adolescents) presents a rather incomplete picture. Existing studies often test production and

focus on a single structure, thus providing insufficient evidence to determine which types of innovations speakers are more likely to adapt to. An exception to this is the study by Fernández and colleagues (2017), who observed that specific innovations were produced more than others in priming, potentially due to a combination of cross-linguistic facilitation and within-language structural support. Hence, although limited, there is some evidence suggesting that bilingual speakers do not adapt to all structural innovations similarly in a cross-linguistic priming setting. Finally, it remains unclear which bilinguals are most likely to adapt to innovations. Existing studies either test one bilingual group within a single environment (e.g., Baroncini et al., 2025; Hopp & Jackson, 2023; Jacob et al., 2025) or compare different bilingual groups living in different contact environments (Fernández et al., 2017; Kootstra & Şahin, 2018). None, however, investigate how individual differences in bilingual experience and contact within the same environment modulate cross-linguistic priming and adaptation to structural innovations (cf. Filipović & Hawkins, 2025; Hawkins & Filipović, 2024).

Building on these open questions, Studies 2 and 3 in this thesis examine how different adult bilinguals in a single contact setting adapt their online processing and production of various structural innovations under controlled priming conditions. Concretely, Study 2 (Karkaletsou et al., 2025a) tests whether exposure to structurally parallel English primes facilitates both the online processing and the subsequent (unprimed) production of English-like ditransitive and monotransitive innovations in French (i.e., without the ditransitive and accusative markers respectively), thereby assessing whether different argument-structure phenomena vary in their susceptibility to adaptation and change. Study 3 (Karkaletsou et al., 2025b) extends this investigation to a more radical type of innovation, examining whether English-like reciprocal structures without the reflexive marker *se* in Canadian French can be primed from English. Critically, both studies move beyond previous work by systematically incorporating individual differences in bilingual contact (assessed via the composite *French*

Score) as a predictor for priming and adaptation. Together, they provide a systematic examination of how Canadian French-English bilingual adults adapt to structural innovations across various modalities (processing, production) and structure types upon receiving structurally similar input in English.

Chapter 3. Included articles

This chapter includes the full articles of this thesis in the order that they were presented at the beginning. Between Study 1 and the other two papers I also present the additional study that is related to Study 1 but could not be included as a full manuscript (Section 3.1).

Study 1 - Karkaletsou et al. (2024)

languages

MDPI

Article

Exploring Bilingual Adaptation to Structural Innovations: Evidence from Canadian French

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Abstract: Bilinguals have been shown to adapt to syntactic innovations (i.e., structures that deviate from the standard grammar) either by producing such structures more or by processing them faster after repeated exposure. However, research on whether they adapt by increasing their acceptability ratings for innovations is limited. We consider this to be a crucial gap in the literature, since it could provide insights into how speakers adapt their perception for innovations that they might otherwise not adapt to in their production and/or processing. On this basis, the present study investigates overall acceptability and trial-by-trial acceptability (adaptation) for different types of innovations in Canadian French with grammatical structural equivalents in English. Structure type and individual differences in language experience (dominance, proficiency, exposure, etc.) are considered as factors that influence these processes, as previous research has shown that they play a role in the acceptability of innovations in bilinguals. For this purpose, we employed a timed acceptability judgment task (TAJT), where adult bilingual speakers of French and English in Canada were asked to rate innovative sentences in French and their standard (grammatical) counterparts as fast and spontaneously as possible. Both acceptability ratings (offline measure) and response times (RTs) (online measure) across trials were measured to test whether speakers show adaptation on both levels. Results revealed that innovations were rated lower and for most structure types slower than their standard counterparts, with the different types of innovations showing differences. Crucially, adaptation on a group level was reflected only in response times and not in acceptability ratings. On an individual level, though, some participants adapted their ratings, but not consistently across all innovation types. Moreover, ratings and RTs were influenced by individual language experience, with participants with a higher contact with French (higher French Score) being faster and less accepting of innovative sentences compared to participants with a lower contact with French.

Keywords: structural innovations; acceptability; adaptation; bilingualism; Canadian French

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1. Introduction

Speakers tend to quickly adapt to the properties of the language input they receive, including aspects such as the accent (Bradlow and Bent 2008) or the vocabulary of their interlocutors (Metzing and Brennan 2003), as well as the syntactic structures used (Bock 1986; Loebell and Bock 2003). Overall, adaptation is an important concept to investigate because it reflects how language changes over time as a result of interaction and communication between individual speakers or communities of speakers (Kaan and Chun 2018b).

For the purposes of this paper, we focus on syntactic adaptation, which is the adjustment of speakers to structures that they repeatedly encounter in their recent input. In the literature, it has been typically shown to occur in three different ways, namely in production, processing, and acceptability judgments. In production, speakers are more likely to use particular structures after they have been repeatedly exposed to them (Bock 1986; Loebell and Bock 2003; Hartsuiker and Pickering 2008; Kaan and Chun 2018a). In processing, they comprehend such structures easier and faster over time (Fine et al. 2013;

Farmer et al. 2014; Kaan et al. 2019). As for acceptability judgments, they tend to rate these structures as gradually more acceptable over the course of a task (Luka and Barsalou 2005). Crucially, these aspects of adaptation do not necessarily coincide. For instance, speakers might adapt to a structure by processing it faster, but this does not necessarily lead to higher production or acceptability for this structure (cf. Regulez and Montrul 2023). Similarly, speakers might accept a structure more over time, but never or only rarely start producing it. It is, therefore, crucial to study adaptation from various perspectives in order to shed light on the different ways in which it can occur, as well as how these ways contribute to language change per se. In addition, it is also crucial to explore what syntactic structures speakers adapt to. To date, most studies have focused on structures that have alternative realizations with different frequencies (e.g., dative alternation in English in Bock (1986) and Kaan and Chun (2018a)) or on structures that elicit ambiguous readings (e.g., reduced relative clauses in Farmer et al. (2014); *wh*-clauses in Kaan et al. (2019)). However, in these cases, the structures always follow the syntactic rules of the respective language (i.e., are grammatical). Fewer studies have focused on structures that are innovative, in that they deviate from the standard grammar[1] (e.g., *The meal needs cooked*; *The soldier donates the church the money*).

Evidence for adaptation to innovations are provided both in L1 and in L2 research. For instance, monolinguals have been shown to either use more innovations after repeated exposure (Ivanova et al. 2012) or process them faster (Kaschak and Glenberg 2004). L1 adaptation has also been found in the form of increasing acceptability ratings for such structures across experimental trials (Snyder 2000, 2022). Similarly, in bilinguals, adaptation to innovations has been reported in production (Carando 2015; Fernández et al. 2017; Kootstra and Şahin (2018) for bilingual adults; Hsin et al. (2013) and Van Dijk and Unsworth (2023) for bilingual children) and in processing (Phillips 2018; Ilen et al. 2023). However, in terms of acceptability, we are aware of only one study that tested how bilinguals change their acceptability ratings for particular innovations across trials (Do et al. 2016). We consider this to be a crucial gap in the literature, since adaptation in acceptability judgments can provide insights into the perception of innovations that (a) might otherwise not be produced after repeated exposure (Hopp and Jackson 2023), or be produced to a limited extent (Fernández et al. 2017), and (b) might be processed faster over time (Phillips 2018) but not become more acceptable. At the same time, it expands our understanding on how bilingual speakers rate such innovative structures in the first place, as it reveals whether overall acceptability patterns are a result of adaptation across trials or not (cf. Do et al. 2016).

To address this gap in the literature, we designed and implemented a timed acceptability judgment task (TAJT) with the aim to investigate the overall and across-trial acceptability (adaptation) of innovations in bilingual speakers. Unlike previous studies that tested adaptation in acceptability only via offline measures (ratings; see Snyder (2000, 2022) and Luka and Barsalou (2005) for L1; Do et al. (2016) for L2), this study employs both offline (ratings) and online measures (response times: RTs) to explore whether overall acceptability patterns and adaptation are reflected on both levels (cf. Kaschak and Glenberg 2004 for adaptation in reading times). We investigate this by testing different types of innovations in Canadian French with a grammatical structural equivalent in English, since previous studies have shown that different structures yield different results both in acceptability (cf. Montrul and Bowles 2009; Montrul et al. 2015) and in adaptation in acceptability (cf. Snyder (2000, 2022) for L1, and Do et al. (2022) for L2). Moreover, we explore the contribution of individual differences in these processes, as they have been found to be a determining factor for bilinguals in their acceptability of innovations (cf. Montrul and Bowles 2009; Kupisch 2012; Kupisch et al. 2014; Montrul et al. 2015; Higby 2016), but it is unclear whether and how they would influence adaptation in acceptability.

In the following sub-sections of the introduction, we provide a more thorough insight into the studies that have been raised here and that motivate this work. First, we present studies on adaptation to innovations in L1 and L2 research (Section 1.1), followed by studies

on the bilingual acceptability of innovations that take other factors such as structure type and individual differences into account (Section 1.2).

1.1. Adaptation to Structural Innovations in L1 and L2 Research

Adaptation to innovative structural input has been investigated both in monolingual and in bilingual research by means of different methodologies. One of the earliest studies was conducted by Snyder (2000), who tested adaptation in the acceptability of various types of novel structures in monolingual English speakers. The results showed that acceptability ratings increased across experimental trials, but not for all structures tested. For example, ratings increased for *whether*-islands (*Who does John wonder whether Mary likes?*) and complex NP violations (*Who does Mary believe the claim that John likes?*), but not for left-branch violations (*How many did John buy books?*) and *that*-trace violations (*Who does Mary think that likes John?*). On this basis, Snyder formed the syntactic satiation hypothesis, according to which structures that have been initially judged as unacceptable tend to become more acceptable with multiple presentations. However, syntactic satiation is not an across-the-board-phenomenon, since only some structure types seem to undergo this process (Snyder 2022; also see Francom 2009; Zervakis and Mazuka 2013). Similar results on adaptation in acceptability upon repeated exposure (structural facilitation) were obtained by Luka and Barsalou (2005) for structures that were initially rated as moderately grammatical in English,[2] but not as entirely novel (e.g., *I miss having time to do anything/It's uncertain he'll arrive until after midnight*).

Monolingual adaptation to innovations has been studied not only through the lens of acceptability, but also via structural priming. Structural priming shows how a recently encountered syntactic structure (prime) can unconsciously influence the production and/or comprehension of a subsequent syntactic structure of the same type (target). In Ivanova et al. (2012), L1 English speakers produced novel dative target sentences (*The dancer donates the soldier the apple*) after being exposed to similar prime sentences. However, the authors note that it is not clear whether this structure is fully novel or just dispreferred with specific verbs (cf. Zervakis and Mazuka 2013 and references therein). Other studies have focused on adaptation effects in online processing. Kaschak and Glenberg (2004), for instance, conducted a series of reading time tasks to assess the comprehension of a dialectal construction in English that was unfamiliar to their participants (*The meal needs cooked*). They showed that participants who were repeatedly exposed to the new structure learned to process it faster than participants who encountered it for the first time (see Fraundorf and Jaeger 2016 for a replication). According to the authors, this "can be seen as another demonstration of structural priming in language processing" (p. 464).

In bilingual research, studies on adaptation have mostly focused on innovative structures in one language with grammatical structural equivalents in the other language. Bilingual adaptation to such structures has so far been investigated primarily via cross-linguistic structural priming, whereby a fully grammatical prime in language A can facilitate the production or comprehension of a structurally equivalent innovative target in language B. A relevant study by Fernández et al. (2017) showed that Spanish–English bilingual speakers in New York City, US, and in Córdoba, Argentina, produced various types of Spanish innovations that bear English-like syntax (see Hsin et al. (2013) and Van Dijk and Unsworth (2023) for similar findings in bilingual children). For example, they produced reciprocal structures without the obligatory reflexive *se* (*El turista y la novia (se) abrazaron* 'The tourist and the bride hugged') and transitive structures without the obligatory accusative marker *a* (*La científica saluda (a) la cantante* 'The scientist greets the singer'), in analogy to English. Crucially, they were more prone to do so after they were exposed to English primes compared to Spanish primes (Carando 2015), and the New York City bilinguals, overall, exhibited a higher number of innovative productions. In another study, Kootstra and Şahin (2018) found that Papiamento–Dutch bilingual speakers in two different environments (the Netherlands and Aruba) produced prepositional object datives in Papiamento (*Obi ta duna e buki na Pieter* 'Obi gives a book to Pieter'), which is a

highly dispreferred structure, after they heard structurally equivalent grammatical primes in Dutch.[3] In line with Fernández et al. (2017), bilinguals in the Netherlands produced more Dutch-like innovations in Papiamento than bilinguals in Aruba.

Similar effects on bilingual adaptation have also been reported in comprehension priming. The findings of Phillips (2018) suggest that heritage speakers of Spanish in the US were facilitated by grammatical English primes in the online processing of structurally parallel novel Spanish targets containing a stranded preposition within the relative clause (*Esta es la tienda que Gonzalo compró el pollo en* 'This is the store that Gonzalo bought the chicken in.'). In a more recent study, Ilen et al. (2023) obtained similar results in a self-paced reading task where early Turkish–German bilinguals read German target sentences with innovative analytic comparatives (*mehr schön* 'more beautiful') faster after grammatical Turkish prime sentences containing an analytic comparative structure (*daha güzel* 'more beautiful') than after Turkish prime sentences containing an indicative structure (*güzel* 'beautiful').

As for bilingual adaptation in acceptability, research is extremely limited. To our knowledge, there is only one study by Do et al. (2016), which tested late L2 speakers of English with Spanish as their L1 in an acceptability judgment task. Participants were asked to rate two different types of innovations in English involving subject–verb inversion (SVI) on a scale from 1—completely unacceptable to 5—completely acceptable. One type of innovation had a grammatical equivalent in Spanish (*I wonder what will John buy at the store*. sp. 'Me pregunto qué comprará Juan en la tienda'), while the other type of innovation did not (*What John will buy at the store?* sp. '¿Qué Juan comprará en la tienda?'). The across-trial analysis showed that bilinguals adapted by improving their ratings only for the second innovative structure, but not for the first one. These results contradict previous findings on bilingual adaptation in production and processing for innovations with grammatical structural equivalents, since the structure with a grammatical equivalent did not show adaptation.

Overall, adaptation to innovations has been reported both for monolingual and for bilingual speakers in various studies employing different methodologies. Regarding adaptation in acceptability specifically, which is the focus of the present work, research suggests that L1 and L2 speakers tend to increase their acceptability ratings with repeated exposure across trials for specific types of innovations only, however (cf. Snyder 2000, 2022, and Do et al. 2016, respectively).

1.2. Acceptability of Structural Innovations in Bilinguals (No Adaptation)

In this section, we present a body of studies on the bilingual acceptability of innovations across different populations and language pairs, mostly in Romance–Germanic contact. These studies present results from overall acceptability rather than adaptation in acceptability across trials. Some of them test multiple structure types (e.g., Montrul and Bowles 2009; Montrul et al. 2015), while others focus on one structure type only (e.g., Kupisch 2012; Higby 2016). However, all of them consider individual differences as a factor that affects overall acceptability patterns in bilinguals.

In a written acceptability judgment task, Montrul and Bowles (2009) tested two types of structural innovations in Spanish that carry English syntax: (i) omission of the *a*-marker in Differential Object Marking (DOM) structures with animate objects (*Maria conoce (a) mi hermana* 'Maria knows my sister') and (ii) omission of the *a*-marker on the indirect object in ditransitive structures (*Maria dio (a) Pedro un regalo* 'Maria gives Pedro a present/a present to Pedro'). They found that Spanish heritage speakers (HSs) with majority US English, overall, rated both DOM and ditransitive innovations significantly higher than their monolingual Spanish-speaking peers (see Montrul 2010 for DOM innovations in Spanish as a heritage language).[4] It is worth noting that innovative DOMs were, overall, more acceptable than ditransitives, probably due to the fact that HSs produce them and, hence, are more familiar with them (cf. Carando 2015; Fernández et al. 2017). Moreover, proficiency was found to modulate performance in ditransitive innovations, with advanced

HSs behaving monolingual-like as opposed to their low- and intermediate-proficiency peers (in line with Montrul (2010, 2019); Guijarro-Fuentes and Marinis (2007) for L2 and Higby (2007) for 2L1 and L2, contradicting Regulez and Montrul (2023)).

Innovative DOM structures were further tested in a later study with Spanish, Hindi, and Romanian as heritage languages in contact with US English (Montrul et al. 2015). An acceptability judgment task with grammatical and innovative sentences was performed in all three languages. Both bilinguals in the US (first-generation immigrants[5] and HSs[6]) and monolingual speakers in the countries of origin (Mexico, India, Romania) took part. Across languages, the presence of the Spanish marker *a*, the Hindi suffix marker *-ko*, and the Romanian marker *pe*, respectively, was manipulated in DOM structures. Furthermore, the omission of these markers was tested in ditransitives for Spanish, Hindi, and Romanian (e.g., Spanish: *Juan le dio (a) su padre dinero* 'Juan gave (to) his father money'), in dative experiencers for Spanish and Hindi (e.g., Hindi: *John(-ko) paise ki aavashyaktaa hai* 'John needs money') and in locatives for Romanian only (e.g., *Cartea este (pe) masa* 'The book is on the table'). The results showed that HSs across groups were, overall, more accepting of these innovations than monolinguals, and for the Spanish group this was extended to the first-generation immigrants for innovative DOMs only. Similarly to Montrul and Bowles (2009), omissions in the DOM context were more acceptable than in the other structures. Moreover, for the Hindi and Romanian groups, the age of onset of bilingualism was found to be a significant predictor: (1) the first generation performed more monolingual-like and differed significantly from the HSs and (2) simultaneous Romanian HSs showed a higher acceptability of DOM omissions than sequential HSs, presumably due to longer exposure to English over the years (cf. Montrul 2010). Moreover, HSs across groups were shown to have significantly lower proficiency in their heritage language compared to the first-generation immigrants and the monolinguals, which might have contributed as well.

The age of onset of bilingualism was also investigated in Higby (2016), who compared early and late Spanish–English bilinguals[7] in a task with one innovative structure, namely Spanish causatives carrying English syntax (*Los maestros trotaron a los niños alrededor del patio* 'The teacher jogged the kids around the playground'). As one of the control conditions, they used structures that are entirely novel in both languages to establish whether possible higher ratings for causatives are attributed to the English influence.[8] The results revealed that bilinguals rated causative innovations as somewhat acceptable, but still significantly higher than the entirely novel control items. As for the two bilingual groups, no significant differences were detected (in line with Montrul 2010; contradicts Montrul et al. 2015 for Hindi and Romanian). However, proficiency was shown to play an important role, as participants with higher Spanish proficiency rated causative innovations significantly lower (in line with Montrul and Bowles 2009; Montrul 2010).

Kupisch (2012) manipulated not only the age of onset but also language by testing German–Italian simultaneous bilinguals (2L1ers) who were either German- or Italian-dominant, as well as German L2 learners of Italian,[9] in their acceptability of novel bare subject NPs in specific and generic contexts in Italian (**Donne guidano meglio* 'Women drive better'). Bare NPs in specific use are impossible in both Italian and German, while bare NPs in generic use are possible only in German. Participants were asked to rate these innovative sentences as good- or bad-sounding and correct the bad-sounding ones. It was found that both German-dominant 2L1ers and L2ers corrected bare NPs significantly less (i.e., accepted more) in generic contexts than in specific contexts, while Italian-dominant 2L1ers corrected regardless of context (in line with Montrul and Ionin 2010 for Spanish HSs). Moreover, German-dominant 2L1ers made significantly fewer corrections than both L2ers and Italian-dominant 2L1ers (contra Kupisch et al. 2014 for French–German bilinguals; cf. Kupisch 2014 for acceptability of innovative adjective placement in simultaneous German–Italian bilinguals); the two other groups also differed significantly. Kupisch points out that, unlike the age of onset, the length of language exposure seems to matter for the phenomenon tested: Italian-dominant 2L1ers who spent most of their life in Italy corrected across the board, and L2ers who had spent more years in Italy corrected more than German-

dominant bilinguals who were, overall, less exposed to Italian (also see Serratrice et al. 2009 for the importance of exposure in bilinguals).

To summarize, the studies in this section highlight the importance of structure type and prior linguistic experience (age of acquisition, input, language exposure across the years, proficiency, etc.) in the acceptability of innovations. However, they do not consider recent linguistic experience, i.e., exposure during the task itself. In Montrul and Bowles (2009) and Montrul et al. (2015), for instance, innovative ditransitives were rated lower than DOMs, but still higher in HSs than in monolinguals. It is possible that this is a product of adaptation due to repeated exposure across trials. Moreover, the structures investigated in these studies are limited (one structure type or the omission of one marker across structure types in specific language pairs), so it is not clear which structures are potentially more dynamic, i.e., more susceptible to adaptation.

1.3. The Present Study

Based on the previous research presented in Sections 1.1 and 1.2, bilinguals tend to adapt their production and processing for innovations in one language whose structural equivalent in the other language is grammatical. However, whether they adapt their acceptability judgments for such structures is still unclear. On this basis, we conducted a timed acceptability judgment task (TAJT) with the aim to explore overall acceptability and adaptation across trials for different types of innovations by means of two measures, namely acceptability ratings (offline) and response times (RTs) (online). To our knowledge, this is the first study to combine both measures in order to investigate adaptation to innovations in the context of acceptability, since previous studies have only employed acceptability ratings (cf. Snyder 2000, 2022; Luka and Barsalou 2005; Do et al. 2016).

As for the structures tested here, they are different types of innovations in Canadian French with grammatical structural equivalents in English. By including different structure types, we investigate whether this affects overall and trial-by-trial acceptability, as has been the case in previous studies on acceptability in other language pairs (e.g., Montrul and Bowles 2009; Montrul et al. 2015) and in studies on adaptation in acceptability (Snyder 2000, 2022 for L1, Do et al. 2016 for L2). The choice of Canadian French was mainly motivated by previous work testing L2 adaptation to innovations in environments where the two languages of interest are either in high or low contact (e.g., Spanish–English in New York City and Córdoba in Fernández et al. (2017), Papiamento–Dutch the Netherlands and Aruba in Kootstra and Şahin 2018). The findings show that bilinguals in high-contact situations adapted to innovations in their production more than bilinguals in low-contact situations. This creates the motivation from our side to study adaptation in another relatively high-contact situation that has not been explored from that perspective yet, namely French–English in Canada. It is worth mentioning, however, that, unlike adaptation, innovations in Canadian French have been studied extensively in the speech of bilingual Francophones (see Nicoladis 2002, 2003, 2006 for bilingual children, and Mougeon et al. 2005 for bilingual adolescents).

Alongside structure type, we are also interested in the effect of individual differences in the processes of acceptability and adaptation. Canada is an interesting setting to explore this due to the variability in the degree of contact between French and English across the country. According to the 2021 Canadian census, for instance, bilinguals in the provinces of Quebec and New Brunswick represent about 46% and 34% of the local population, respectively, while bilinguals in Ontario represent only about 10%.[10] On this basis, we recruited bilinguals from different parts of Canada that varied in terms of their current and across-the-lifespan experience with the two languages.

1.3.1. Our Structures

We tested four types of constructions that have different argument structure realization across French and English (Montrul 2001; White 2003). The structures were selected based on (1) research on innovations that have emerged in varieties of Canadian French

(Mougeon et al. 2005) and (2) research on innovations that have emerged in other language pairs with a Romance and a Germanic language in contact (see Fernández et al. 2017).

The first structure is ditransitives. In English, both prepositional object (PO) (1a) and double object (DO) (1b) constructions are allowed when indirect objects (recipients) are full noun phrases (NPs). In French, only POs are allowed in that case, and the indirect object is marked via the preposition *à* (2a-b).

(1)	a.	The	man$_{AGENT}$	gives	a	present$_{THEME}$	to	the	woman$_{RECIPIENT}$	(PO)
	b.	The	man$_{AGENT}$	gives	the	woman$_{RECIPIENT}$	a	present$_{THEME}$		(DO)

(2)	a.	L'	homme$_{AGENT}$	donne	un	cadeau$_{THEME}$	à	la	femme$_{RECIPIENT}$	(PO canonical word order)
		the	man	gives	a	present	to	the	woman	
		'The man gives a present to the woman.'								
	b.	L'	homme$_{AGENT}$	donne	à	la	femme$_{RECIPIENT}$	un	cadeau$_{THEME}$	(PO scrambled word order)
		the	man	gives	to	the	woman	a	present	
		'The man gives a present to the woman.'								

For ditransitive innovations with two NP objects, our knowledge is very limited. Thibault (2022) briefly refers to DO-equivalent productions in some varieties of Sub-Saharan African French (*montrer l'enfant* instead of *montrer à l'enfant* 'to show (to) the child'). In Canada, Mougeon et al. (2005) present a special case of innovative syntax in ditransitive structures with pronouns as indirect objects (instead of NPs). Typically, the pronoun would be placed before the verb (*Elle nous dit* 'She tells us'), but they report evidence of post-verbal placement accompanied by the use of the dative marker *à* (*Il dit à nous* 'She says to us'). Although Mougeon and colleagues refer to the case as an "intra-systemic variation" in language rather than contact-induced change (cf. Gadet and Jones 2008), Neumann-Holzschuh (2009) leans towards the latter.

Then, we examine monotransitive verbs that bear an unmarked direct object in English (3a–b), but is obligatorily marked in French via the prepositions *à* or *de* (4a–b).

(3)	a.	The	boy	obeys	the	teacher.	
	b.	The	girl	plays	the	guitar.	

(4)	a.	Le	garçon	obéit	à	la	professeure.
		the	boy	obeys	PREP	the	teacher
		'The boy obeys the teacher.'					
	b.	La	fille	joue	de	la	guitare.
		the	girl	plays	PREP	the	guitar
		'The girl plays the guitar.'					

Mougeon et al. report instances of the omission of *à* with the verb *jouer* (to play sports) in the speech of French-speaking adolescents in Ontario (i.e., *Il joue le hockey* instead of *Il joue au hockey*). Interestingly, this structure has not been found in the speech of Francophones in Quebec. Note that this novel structure is not an exact replication of the English syntax, which would be *Il joue hockey* 'He plays hockey'. However, in this study, we include this structure as it occurs in the spontaneous speech of Ontario bilinguals.

(5)	The	two	friends	hug.	

(6)	Les	deux	amis	s'	embrassent
	the	two	friends	REFL	hug
	'The two friends hug.'				

The third phenomenon we test is reciprocal structures. In English, reciprocity is typically expressed via *each other*. However, some verbs convey reciprocity in active form

without any complementation, like *hug*, *kiss*, *meet*, etc. (5). In French, the reflexive *se* is required in this context (6).

For reciprocals, we did not find any studies on the omission of the reflexive *se* in Canadian French (or any other variety of French). However, it is a common omission in the Spanish of Spanish–English bilinguals in the US (Fernández et al. 2017). We included this structure to test whether this applies across contact contexts for languages that behave similarly, like Spanish and French.

The fourth structure is object clitics in finite clauses. In English, object pronouns and clitics are placed after the verb (7). In French, there is a distinction between atonic and tonic pronouns, whereby the former are typically placed pre-verbally and the latter post-verbally. Here, we focus on the pre-verbal ones in the context of declarative finite sentences (8).

(7)	He	puts	them	on	the	table.
(8)	Il	les	met	sur	la	table.
	he	them	puts	on	the	table
	'He puts them on the table.'					

According to Mougeon et al. (2005), there is no evidence of post-verbal clitic placement in Ontario or Quebec French. However, such instances have been spotted in the speech of some speakers of French in Massachusetts, US (cf. Fox 2004 as cited in Mougeon et al. 2005).

1.3.2. Research Questions and Hypotheses

The research questions and hypotheses of the study are the following.

Research Question 1: How do Canadian bilingual speakers of French and English accept structural innovations in French compared to the standard (grammatical) variants? Are acceptability patterns different for the different types of innovations?

Hypothesis 1. *Overall, we expect structural innovations to yield lower ratings and slower RTs than the standard variants (see studies in Section 1.2). On the basis of previous studies that found differences in the acceptability of different structures in other languages (Montrul and Bowles 2009; Montrul et al. 2015), we also expect to find differences among the different structure types in acceptability ratings for the innovations. In Mougeon et al. (2005), most French innovations that were attested in the speech of Canadian bilinguals involved either the addition or omission of prepositions in the argument structure of verbs, while the only innovation that involved inversion was not found in corpora. On this basis, we hypothesize that bilinguals might be more prone to omit (or add) than to invert when they produce an innovation. If familiarity with an innovation in the input indeed yields higher acceptability ratings (cf. Montrul and Bowles 2009), then we expect that ditransitive, monotransitive, and reciprocal innovations (omissions) might be rated closer to—but still lower than—the standard variant compared to object clitics (inversion).*

Research Question 2: Do bilingual speakers show adaptation to innovations over the course of the task? Is adaptation different for the different types of innovations?

Hypothesis 2. *We assume that adaptation is expressed both in ratings and in RTs. If participants accept innovative sentences from the beginning of the task, no or little further adaptation is expected. However, if they provide relatively low ratings initially, adaptation is expected (cf. Snyder 2000, 2022). Upon the absence of an effect in ratings, an effect in RTs is predicted (cf. Kaschak and Glenberg 2004). Moreover, we expect to find differences between the different innovation types, with participants adapting more to ditransitive, monotransitive, and reciprocal innovations compared to object clitics due to potentially less familiarity with the latter (see RQ1).*

Research Question 3: What is the role of individual differences (age of acquisition (AoA) of French and English, amount of current exposure and use of each language, proficiency) in the acceptability of and adaptation to innovations?

Hypothesis 3. *A later AoA of French and/or reduced French exposure and use (Montrul et al. 2015; Kupisch 2012) and/or lower proficiency in French (Montrul and Bowles 2009) are expected to lead to the higher and faster acceptability of innovations, both overall and across trials (adaptation).*

2. Methodology

2.1. Participants

Recruitment took place primarily via Prolific (https://www.prolific.co/, accessed on 31 July 2023), where we set specific prescreening criteria to recruit bilingual adult speakers of French and English. Seven participants were recruited through personal contacts and received the study link via email. We ended up with a heterogeneous sample both in terms of acquisition patterns and current language experience. Information on the linguistic background of participants was gathered via the LEAP-Q (Marian et al. 2007).

Initially, 68 bilingual speakers took part in the study. We excluded six participants due to early acquisition of languages other than French and English, including Spanish, Portuguese, Kabyle (Berber language in Algeria), Arabic, Japanese, and Haitian Creole. The final sample consisted of 62 bilingual speakers of French and English (mean age = 26.8, SD = 4.2) born, raised, and living in Canada at the time of testing. In total, 26 of the 62 participants (41.9%) were early bilinguals of French and English (started acquiring both languages before the age of 5): 2 simultaneous (from birth), 7 sequential French–English (French from birth; mean $AoA_{English}$ = 3.9, SD = 1.2), and 17 sequential English–French (English from birth; mean AoA_{French} = 4.3, SD = 0.7). A total of 19 of the 62 (30.7%) were late[11] L1 English–L2 French bilinguals (English from birth; mean AoA_{French} = 9.8, SD = 5.5). Finally, the sample also contained 17 (27.4%) late L1 French–L2 English bilinguals (French from birth; mean $AoA_{English}$ = 8.2, SD = 1.9). Twenty-one participants (33.9%) reported having a third language besides English and French including Spanish, Italian, Romanian, German, Swedish, and Japanese. For all of them, it was acquired after the age of 10 (Mean AoA = 16.1, SD = 4.2) and was not a family language. Their self-reported proficiency was, overall, low (mean = 3.6 on a 10-point scale, SD = 0.7).

On average, participants reported using their L1 81.9% of the time (SD = 22.1), and their L2 17.5% of the time (SD = 22.8). For simultaneous bilinguals, L1 and L2 were determined based on the order of report in the LEAP-Q as Language 1 and Language 2, respectively. Participants with an L3 reported using it 1.6% of the time daily (SD = 5.7). All participants took the LexTALE proficiency test both for French (Brysbaert 2013) and for English (Lemhöfer and Broersma 2012). The mean scores per bilingual group are presented in Table 1. No participant was excluded based on their performance in the tests.

Table 1. Mean percentage of correct responses in French and English LexTALE per bilingual group. The distinction between early and late bilinguals is followed here for descriptive purposes and will not be retained in the analysis.

Group	Mean % Correct in French LexTALE (SD)	Mean % Correct in English LexTALE (SD)
Early bilinguals (n = 26)	63.1 (10.9)	91.9 (10.9)
L1 English–L2 French (n = 19)	58.1 (10.1)	97.4 (3.1)
L1 French–L2 English (n = 17)	85.5 (6.6)	90.2 (7.6)

Moreover, 3 participants reported having ADHD. Since we were not certain whether ADHD could be of relevance for our study, we ran separate analyses with and without these participants. The results were, overall, similar (see analyses on OSF), so we decided to include them.

French Score: Canadian Bilinguals on a Continuum of Contact with French

In Table 1, we split our bilinguals into three distinct groups according to their AoA of French and English. However, grouping based on this one variable only results in a less nuanced description of their individual linguistic experience (cf. Kupisch 2012), especially given the diversity in our sample: these bilinguals live in a relatively high-contact environment (Canada), but the current amount of individual contact with each language varies a lot regardless of AoA. In our study, we expect that both AoA (Montrul et al. 2015) and current individual exposure and use of the two languages will shape participants' performance (Serratrice et al. 2009; Kupisch 2012). Moreover, proficiency (assessed through LexTALE) is another variable that is likely to play a role, since it could—at least to some extent—predict familiarity with the structures we tested (Montrul and Bowles 2009; Montrul 2010, 2019).

Since we could not use all these variables in the analysis due to their high correlation, we merged them into one composite individual variable named French Score. To decide whether this was possible in the first place, we performed a factor analysis via the *factanal*() function in the *nFactors* package (Raiche and Magis 2022) in RStudio (R Core Team 2023) using the following individual measures: AoA (difference between French and English AoA as reported in LEAP-Q), amount of current French exposure (proportion, reported as percentage in LEAP-Q), amount of current French use (proportion, reported as percentage in LEAP-Q), and French proficiency score (percentage score in LexTALE). The output of the function provided us with (1) the information that these variables can indeed be merged in a single variable and (2) the weights that correspond to each variable when merging them. The outcome variable is a score corresponding to each individual participant and is interpreted as follows: the higher the French Score, the higher the contact with French.

2.2. Items

Participants performed a timed acceptability judgment task (TAJT) where they rated French grammatical and innovative sentences of various structure types. They were instructed to provide a rating as fast and intuitively as possible based on how natural the sentences sounded to them on a scale from 1 'completely unnatural' to 5 'completely natural'. It was specified that a sentence is considered 'natural' when they would expect to hear it in their environment or use it themselves.[12]

Stimuli sentences were created and matched for length (number of words) across structure types. For each structure, six verbs were selected. For ditransitives, we used *donner* 'to give', *montrer* 'to show', *lancer* 'to throw', *vendre* 'to sell', *envoyer* 'to send', and *apporter* 'to bring'. In total, 48 sentences were created and distributed across four conditions, resulting in 12 items per condition (Table 2).

Table 2. Set of conditions for ditransitive items with an example stimulus.

Standard (Grammatical) Variants in French		**Innovations**	
PO with canonical word order (PO_Can)	PO with scrambled word order (PO_Scr)	DO with English word order (DO_Engl)	DO with novel word order (DO_Nov)
Il donne un cadeau à la femme. 'He gives a present to the woman.'	Il donne à la femme un cadeau. 'He gives to the woman a present.'	Il donne la femme un cadeau. 'He gives the woman a present.'	Il donne un cadeau la femme. 'He gives a present the woman.'

Across conditions, the form and the syntactic position of the indirect object (*femme* 'woman') were manipulated. In the two standard (grammatical) conditions, it was expressed as an *à*-marked prepositional object (PO) that either followed the direct object (*cadeau* 'present') in canonical word order (PO_Can) or preceded the direct object in scrambled word order (PO_Scr). In the two innovative conditions, the dative marker *à* was omitted and the indirect object either preceded the direct object as an analogy to the English DO (DO_Engl) or followed it (DO_Nov), resulting in a structure that was novel in both

languages. With this set of conditions, we were able to create a structural continuum across French and English: PO_Can is grammatical in both languages, PO_Scr is grammatical only in French, DO_Engl is innovative only in French, and DO_Nov is innovative in both languages (cf. Kupisch 2012; Higby 2016 and Do et al. 2016 for similar manipulation).

For the monotransitive stimuli, the following six verbs were used: *jouer à* 'to play sports/game', *assister à* 'to attend something', *ressembler à* 'to resemble someone/something', *obéir à* 'to obey someone/something', *jouer de* 'to play an instrument', and *se tromper de* 'to get something wrong'. These are all verbs that obligatorily mark their direct object in French, but not in English. For reciprocals, we selected *s'embrasser* 'to kiss/hug', *se rencontrer* 'to meet', *s'entendre* 'to get along', *se disputer* 'to argue', *se parler* 'to talk', and *s'écrire* 'to text'. These are all verbs that require a reciprocal in French but not in English. Finally, for the object clitic sentences, we used the transitive verbs *suivre* 'to follow', *regarder* 'to watch', *acheter* 'to buy', *mettre* 'to put', *trouver* 'to find', and *écouter* 'to listen'. These structures require the (clitic) pronoun to precede the verb in French, but to follow the verb in English. Twenty-four items were constructed for each of these three structures and, unlike ditransitives, distributed across two conditions only, a standard/grammatical (Standard_Fr) and an innovative (Innov_Engl) one (Table 3). In the Innov_Engl condition, the prepositions *à/de* were omitted for monotransitives, the reflexive *se* was omitted for reciprocals, and the clitic was placed post-verbally for object clitics.

Table 3. Set of conditions for monotransitive, reciprocal, and object clitic items with an example stimulus for each.

Structure	Standard_Fr	Innov_Engl
Monotransitives with *à/de*-marked direct objects	Le garçon obéit a la professeure 'The boy obeys PREP the teacher.'	Le garçon obéit la professeure. 'The boy obeys the teacher.'
Reciprocals	Les deux amis s'embrassent. 'The two friends REFL hug.'	Les deux amis embrassent. 'The two friends hug.'
Object clitics	Il les met sur la table. 'He them puts on the table.'	Il met les sur la table. 'He puts them on the table.'

2.3. Design

We constructed four different presentation lists across which the ditransitive items were distributed on the basis of a Latin square design. Each list consisted of 48 ditransitive sentences, 12 from each of the four conditions. The other structures were also distributed across two lists on the basis of a Latin square design. Each of the ditransitive lists was combined with each of the lists for the other structures, resulting in a total of eight presentation lists (4×2). Participants were assigned randomly to one of the eight lists that consisted of 120 items in total (48 ditransitives, 24 transitives, 24 reciprocals, 24 object clitics), 50% of which were innovations. We did not use any filler sentences due to the large number of test sentences and to the fact that the study was conducted online. Items corresponding to one structure could be taken as fillers for another structure (cf. Kupisch et al. 2014).

2.4. Procedure

This study was implemented in Gorilla (Anwyl-Irvine et al. 2020). At the beginning, participants were asked to choose the language they felt most comfortable to receive task instructions in. They first completed the TAJT, followed by the LexTALE test for English and French, and, finally, the LEAP-Q that was provided either in Canadian English or in Canadian French (based on the preferred instruction language). For the LexTALE tests, we used the instructions provided in Lemhöfer and Broersma (2012). The total duration was approximately 30 min. At the end of the study, Prolific participants were redirected to the platform for their compensation. The external participants contacted the researcher with a completion code to pursue their Amazon voucher.

2.5. Predictions

The standard (grammatical) conditions PO_Can (PO with canonical word order) in ditransitives and Standard_Fr in monotransitives, reciprocals, and object clitics are predicted to yield the highest ratings (4–5) and the fastest RTs across all participants. Due to ceiling performance, no further adaptation in ratings is expected. However, RTs are predicted to decrease across trials because repeated exposure throughout the task might lead to adaptation.

The innovative conditions DO_Engl in ditransitives and Innov_Engl in monotransitives, reciprocals, and object clitics are predicted to yield, overall, lower ratings (1–3) and slower RTs compared to their standard counterparts. However, acceptability is expected to be modulated by individual differences in language experience, whereby higher French Scores in participants (i.e., higher contact with French) should result in lower ratings and faster RTs compared to lower French Scores. Moreover, acceptability in these conditions might be modulated by Trial Number: an Increasing Trial Number, i.e., increasing exposure to innovations, is expected to lead to increasing ratings and decreasing RTs. This effect is expected to be stronger for participants with a lower French Score, since their tolerance towards innovations in French (either due to lower French experience or due to CLI from English) should be higher.

For the two conditions that are specific to ditransitives, namely PO_Scr (PO with scrambled word order) and DO_Nov (DO with novel word order), we make the following predictions: PO_Scr is a condition that behaves differently cross-linguistically but, unlike DO_Engl, is fully grammatical here. We expect, overall, high ratings and fast RTs, but still slightly lower (3–4) and slower compared to the PO_Can condition (PO with canonical word order) due to the word order that might be less preferred out of context; some adaptation in ratings and RTs is also expected. However, since this structure is highly dispreferred and rare in English, it is expected that participants with lower French Scores will give lower ratings—even below 3—and will show slower RTs. Finally, the DO_Nov condition is predicted to yield the lowest ratings (1–2) across participants regardless of their French Score, but also low RTs (fast rejection). Adaptation is not expected on the basis of ratings. However, RTs are predicted to become even lower across trials due to potential facilitation from repeated exposure.

2.6. Data Preprocessing and Analysis

Ratings (ordered dependent variable) were analyzed via the *clmm*() function for cumulative link mixed-effects models in the *ordinal* package (Christensen 2023) in RStudio (R Core Team 2023). The four structures were analyzed via four separate models, one for each structure. As fixed effects in the model for ditransitives, we included Condition (factor with four levels: PO_Can, PO_Scr, DO_Engl, DO_Nov), French Score (continuous, scaled, and centered), Trial Number (continuous, scaled, and centered), and all their interactions. As fixed effects in the models for monotransitives, reciprocals, and object clitics, we included Condition (factor with two levels: Standard_Fr, Innov_Engl), French Score (continuous, scaled, and centered), Trial Number (continuous, scaled, and centered), and all their interactions.[13] Condition was treatment-coded with PO_Can and Standard_Fr, respectively, as reference levels. Pairwise comparisons between all condition levels in the ditransitives model were obtained via the *emmeans*() function in the *emmeans* package (Lenth et al. 2018) and *p*-values were adjusted using the Holm method. As random effects, Participant and Item were implemented in a maximal structure that converged (Barr et al. 2013) and was gradually simplified, whereby the model with the lowest AIC was chosen as the final model. The fixed effects' structure was not simplified because we are interested in all interactions involved.

Response times (RTs) (continuous dependent variable) were analyzed via the *lmer*() function for linear mixed-effects models in the *lme4* package (Bates et al. 2015) in RStudio. In our study, RT measures response latency, i.e., the total time in milliseconds from the presentation of a stimulus to when a response (rating) is submitted by the participant. Prior

to the analysis, raw RTs were trimmed in two steps: (1) extreme values as indicated in the Q-Q plot were removed and (2) outliers +1 SD away from the overall mean per structure were removed. We decided to use this threshold due to the large SD across structures after removing the extreme values. We did not apply trimming for −1SD, as this would be a negative threshold. The trimming process resulted in removing approx. 5% of the initial/untrimmed dataset that included all structures. In order to reduce skewness, RTs were log-transformed for the analysis (Baayen and Milin 2010). We used the same fixed effects structure as in the ordinal analyses, and the same procedures regarding simplification on the random effects structure and model selection were followed.

3. Results

The anonymized data, R scripts, and full model outputs in HTML format are freely available at the Open Science Framework (OSF) under the following link (also provided at the end of the manuscript):

https://osf.io/zusxq/?view_only=cf3d5262f07a4002ba9e0c11921c6bc5.

3.1. Ditransitives

3.1.1. Ratings

Ratings in ditransitive items were analyzed using the ordinal model in (1):

(1) Rating ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Condition + Trial Number | Participant) + (1 | Item)

Figure 1 shows the distribution of individual ratings across the four conditions. Our analysis revealed that PO_Can sentences (*L'homme donne un cadeau á la femme* 'The man gives a present to the woman'), overall, yielded significantly higher ratings than PO_Scr sentences (*L'homme donne á la femme un cadeau* 'The man gives to the woman a present') ($\beta = -2.09$, $SE = 0.22$, $z = -9.72$, $p_{adj} < 0.0001$), DO_Engl sentences (*L'homme donne la femme un cadeau* 'The man gives the woman a present') ($\beta = -4.11$, $SE = 0.34$, $z = -12.08$, $p_{adj} < 0.0001$), and DO_Nov sentences (*L'homme donne un cadeau la femme* 'The man gives a present the woman') ($\beta = -6.67$, $SE = 0.39$, $z = -16.7$, $p_{adj} < 0.0001$). As for the rest of the pairwise comparisons,[14] it was found that participants rated the PO_Scr condition significantly higher than both innovations: DO_Engl ($\beta = -2.02$, $SE = 0.29$, $z = -6.97$, $p_{adj} < 0.0001$) and DO_Nov ($\beta = -4.59$, $SE = 0.37$, $z = -12.31$, $p_{adj} < 0.0001$). Crucially, DO_Engl sentences were accepted more than DO_Nov sentences ($\beta = -2.56$, $SE = 0.35$, $z = -7.38$, $p_{adj} < 0.0001$).

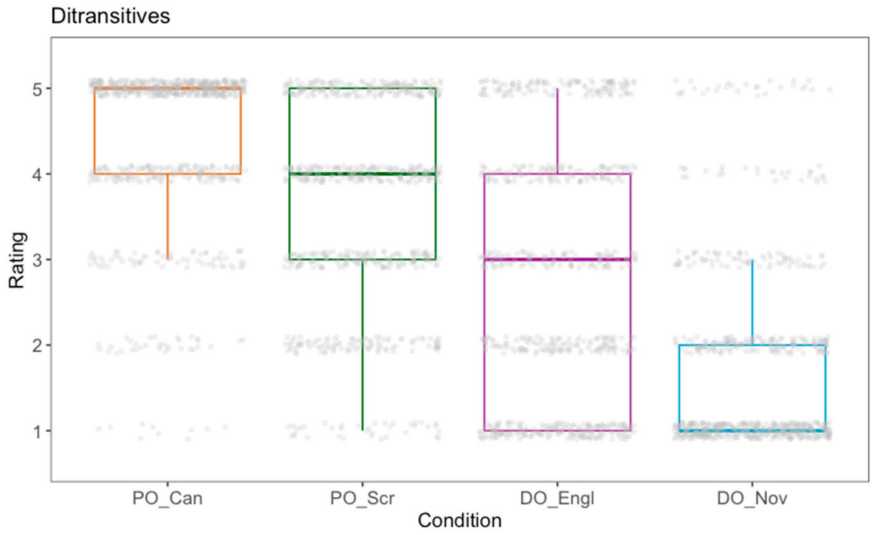

Figure 1. Distribution of individual ratings (gray dots) within the four conditions. The bold horizontal line in each box is the median rating per condition.

An increasing Trial Number (Figure 2) was found to significantly increase ratings in the PO_Can condition ($\beta = 0.26$, $SE = 0.11$, $z = 2.29$, $p = 0.02$). The interactions between Trial Number and Condition showed that, compared to PO_Can, the effect of the Trial Number was not significantly different in the conditions PO_Scr ($\beta = -0.15$, $SE = 0.12$, $z = -1.22$, $p = 0.2$), DO_Engl ($\beta = -0.19$, $SE = 0.14$, $z = -1.42$, $p = 0.2$), or DO_Nov ($\beta = -0.22$, $SE = 0.14$, $z = -1.52$, $p = 0.1$).

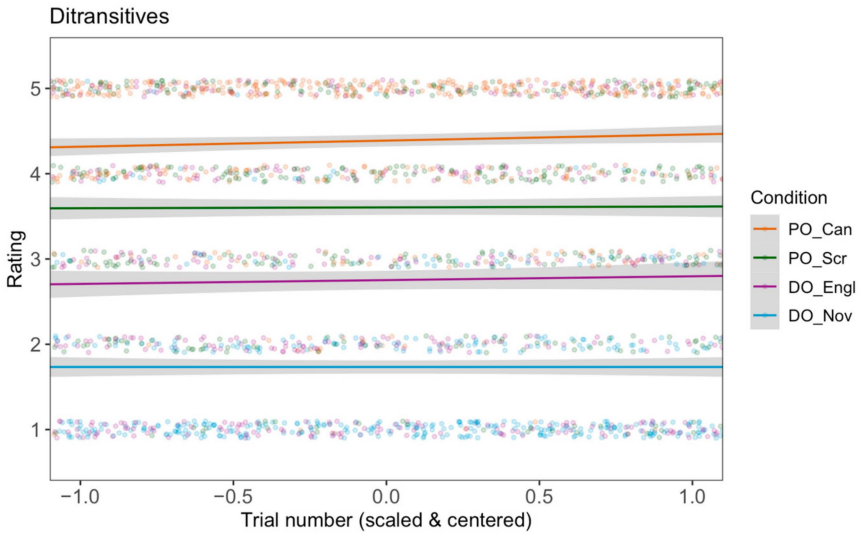

Figure 2. Effect of Trial Number on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the four conditions.

The contribution of French Score on ratings per condition is depicted in Figure 3. In the PO_Can condition, increasing French Score in participants led to a significant increase in ratings ($\beta = 1.17$, $SE = 0.2$, $z = 5.73$, $p < 0.0001$). The predictor's interactions with Condition indicated that, compared to PO_Can, the effect of French Score was significantly more negative for PO_Scr sentences ($\beta = -0.56$, $SE = 0.22$, $z = -2.56$, $p = 0.01$), DO_Engl sentences ($\beta = -3.29$, $SE = 0.35$, $z = -9.51$, $p < 0.0001$), and DO_Nov sentences ($\beta = -1.83$, $SE = 0.38$, $z = -4.78$, $p < 0.0001$). Because these interactions were significant, we releveled the model to obtain the exact effect of French Score in the other conditions. *P*-values were adjusted with the Holm method via the *p.adjust*() function to avoid an increase in Type I error due to multiple releveling. The results show that increasing French Score in participants led to a significant increase in acceptance for the PO_Scr items ($\beta = 0.61$, $SE = 0.2$, $z = 3.03$, $p_{adj} = 0.005$). Crucially, it was less strong compared to the PO_Can condition. For DO_Engl items, the higher the French Score was, the lower the acceptability ratings were ($\beta = -2.13$, $SE = 0.29$, $z = -7.13$, $p_{adj} < 0.0001$); the same tendency was found for the DO_Nov items but to a lesser degree ($\beta = -0.67$, $SE = 0.32$, $z = -2.1$, $p_{adj} = 0.04$).

In addition, no significant interaction was found between French Score and Trial Number for PO_Can sentences ($\beta = 0.08$, $SE = 0.12$, $z = 0.62$, $p = 0.5$), showing that ratings remained stable across trials in this condition regardless of participants' French Score. Compared to PO_Can, the effect of this interaction was not found to be significantly different in the conditions PO_Scr ($\beta = -0.18$, $SE = 0.13$, $z = -1.38$, $p = 0.2$), DO_Engl ($\beta = -0.1$, $SE = 0.15$, $z = -0.68$, $p = 0.5$), and DO_Nov ($\beta = -0.005$, $SE = 0.15$, $z = -0.04$, $p = 0.9$).

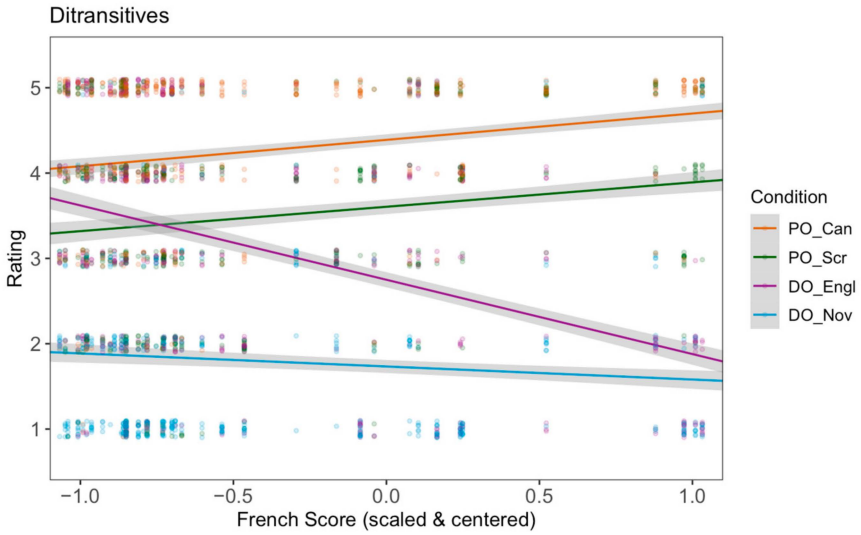

Figure 3. Effect of French Score on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the four conditions.

3.1.2. Response Times

Log-transformed response times (RTs) in ditransitive items were analyzed using the linear mixed model in (2):

(2) Log RT ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Condition + Trial Number | Participant) + (1 | Item)

The distribution of individual RTs per condition is shown in Figure 4. Overall, participants were faster in the PO_Can condition than in the PO_Scr condition ($\beta = 0.07$, $SE = 0.02$, $t = 4.11$, $p_{adj} = 0.001$). However, no significant differences were obtained between PO_Can and DO_Engl ($\beta = 0.04$, $SE = 0.02$, $t = 1.73$, $p_{adj} = 0.3$), and PO_Can and DO_Nov ($\beta = 0.01$, $SE = 0.02$, $t = 0.26$, $p_{adj} = 0.8$). Moreover, it was shown that participants responded slower to PO_Scr sentences compared to DO_Nov sentences ($\beta = -0.07$, $SE = 0.02$, $t = -3.27$, $p_{adj} = 0.01$), but not compared to DO_Engl sentences ($\beta = -0.03$, $SE = 0.02$, $t = -1.69$, $p_{adj} = 0.3$). The difference between DO_Engl and DO_Nov was also not significant ($\beta = -0.03$, $SE = 0.02$, $t = -1.98$, $p_{adj} = 0.2$).[15]

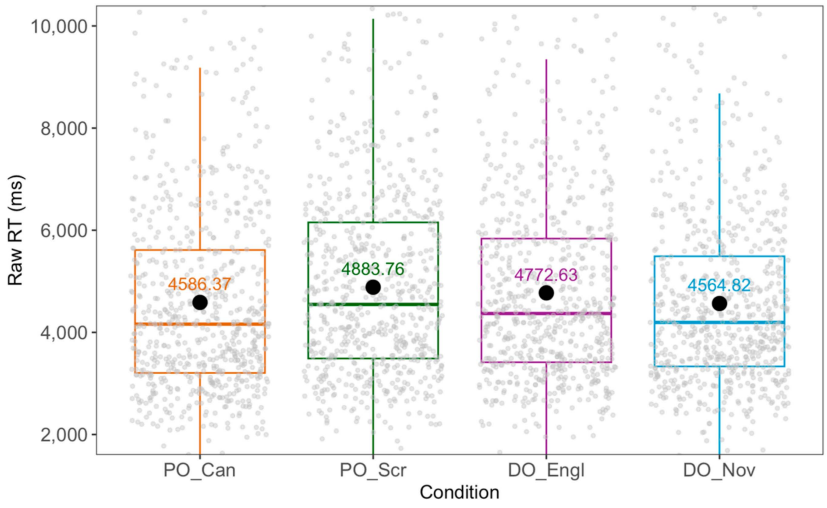

Figure 4. Distribution of individual raw RTs (gray dots) within the four conditions. The bold horizontal line in each box is the median RT per condition. The black dot is the mean RT (indicated as text).

The effect of Trial Number (Figure 5) reached significance in the PO_Can condition, showing that participants became faster at providing a rating as the task proceeded ($\beta = -0.04$, $SE = 0.02$, $t = -2.75$, $p = 0.001$). The interactions between Trial Number and Condition showed that, compared to the baseline PO_Can, the effect of Trial Number was not significantly different in the conditions PO_Scr ($\beta = -0.03$, $SE = 0.02$, $z = -1.79$, $p = 0.07$), DO_Engl ($\beta = -0.03$, $SE = 0.02$, $z = -1.8$, $p = 0.07$), or DO_Nov ($\beta = -0.02$, $SE = 0.02$, $z = -1.04$, $p = 0.3$).

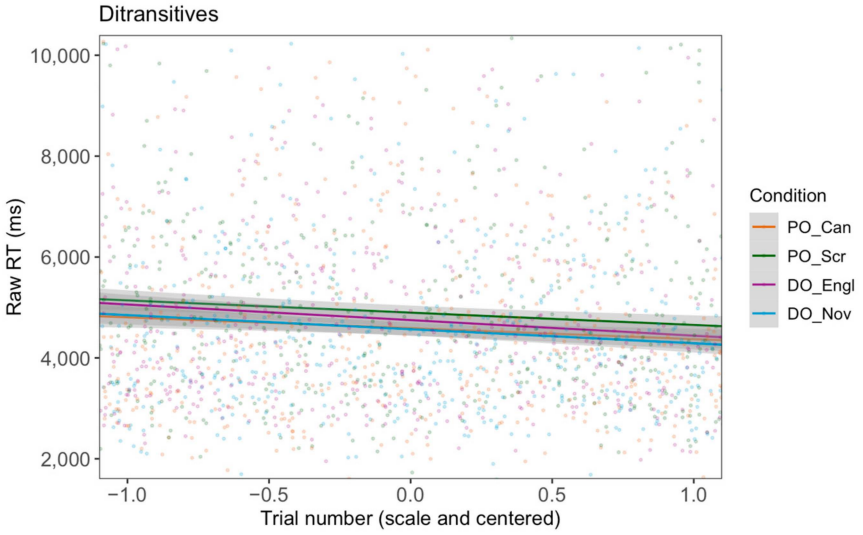

Figure 5. Effect of Trial Number on raw RTs per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the four conditions.

Figure 6 illustrates the relationship between RTs and French Score across conditions. The analysis revealed that increasing French Score in participants resulted in a significant decrease in RTs for PO_Can items ($\beta = -0.13$, $SE = 0.04$, $t = -3.38$, $p = 0.001$). The interactions between French Score and Condition showed that, compared to PO_Can, the effect of French Score did not change significantly for DO_Engl items ($\beta = 0.03$, $SE = 0.02$, $t = 1.26$, $p = 0.2$) and DO_Nov items ($\beta = -0.003$, $SE = 0.02$, $t = -0.15$, $p = 0.9$). However, it became less negative for PO_Scr items ($\beta = 0.04$, $SE = 0.02$, $t = 2.49$, $p = 0.02$). To obtain the exact effect of French Score in the PO_Scr condition, the model was releveled, and p-values were adjusted. The results show that increasing French Score significantly decreased participants' RTs in this condition ($\beta = -0.08$, $SE = 0.04$, $t = -2.23$, $p_{adj} = 0.03$), but this decrease was less strong compared to the PO_Can condition. The releveled model also revealed a significant change in the effect of French Score between PO_Scr and DO_Nov conditions ($\beta = -0.05$, $SE = 0.02$, $t = -2.31$, $p = 0.02$). Again, we releveled to DO_Nov, where a higher French Score in participants was found to lead to significantly lower RTs ($\beta = -0.13$, $SE = 0.04$, $t = -3.67$, $p_{adj} = 0.002$).

Additionally, no significant interaction was found between French Score and Trial Number for PO_Can sentences ($\beta = 0.02$, $SE = 0.02$, $t = 1.36$, $p = 0.2$), revealing that ratings remained stable across trials in this condition regardless of participants' French Score. Compared to PO_Can, the effect of this interaction did not change significantly for the other three conditions: PO_Scr ($\beta = -0.03$, $SE = 0.02$, $t = -1.73$, $p = 0.1$), DO_Engl ($\beta = -0.004$, $SE = 0.02$, $t = -0.27$, $p = 0.8$), and DO_Nov ($\beta = -0.02$, $SE = 0.02$, $t = -1.13$, $p = 0.3$).

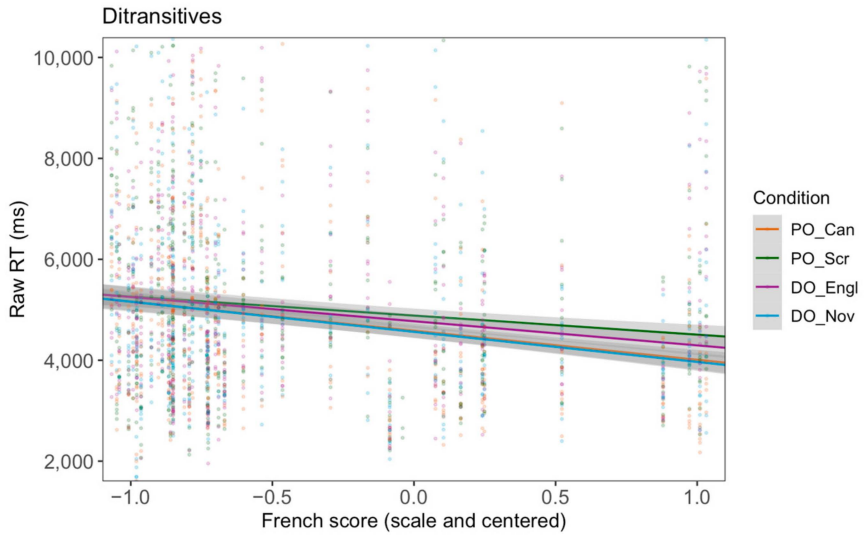

Figure 6. Effect of French Score on raw RTs per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the four conditions.

3.2. Monotransitives

3.2.1. Ratings

Ratings in monotransitive items were analyzed using the ordinal model in (3):

(3) Rating ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Condition | Participant) + (1 + French Score | Item)

The results show that participants rated Standard_Fr sentences (*Le garçon obéit au professeur* 'The boy obeys PREP the teacher') significantly higher than Innov_Engl sentences (*Le garçon obéit le professeur*) ($\beta = -2.41$, $SE = 0.2$, $z = 12.13$, $p < 0.0001$) (Figure 7).

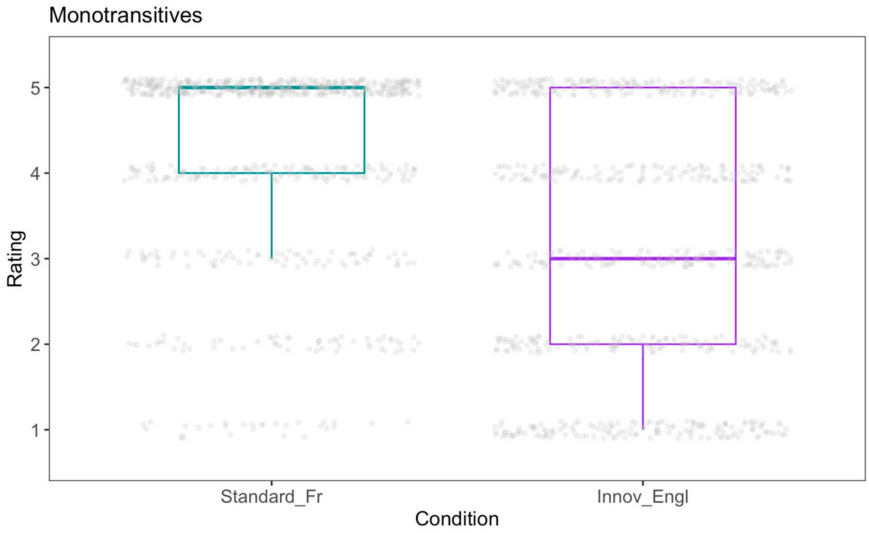

Figure 7. Distribution of individual ratings (gray dots) within the two conditions. The bold horizontal line in each box is the median rating per condition.

The Trial Number (Figure 8) increased participants' ratings significantly in the Standard_Fr condition ($\beta = 0.19$, $SE = 0.09$, $z = 2.01$, $p = 0.04$). The interaction between Trial Number and Condition showed that the effect of Trial Number was not significantly different in the Innov_Engl condition compared to the Standard_Fr condition ($\beta = -0.03$, $SE = 0.12$, $z = -0.25$, $p = 0.8$).

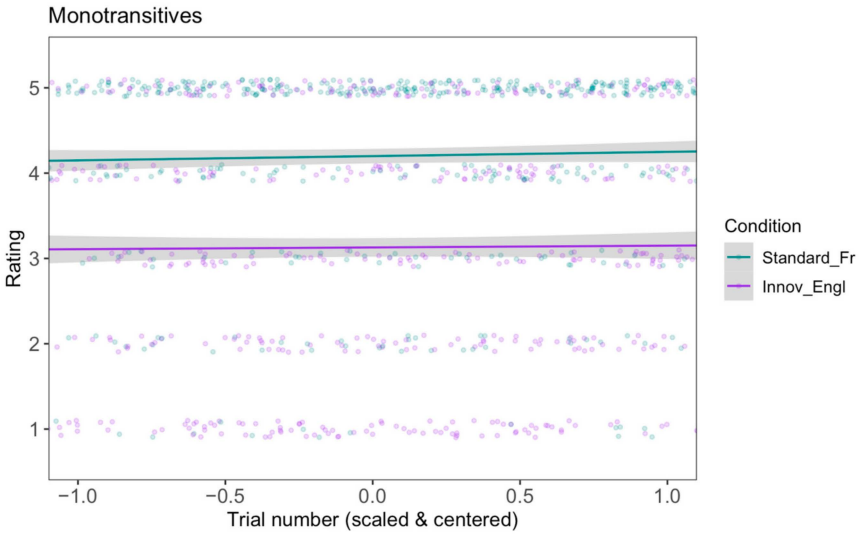

Figure 8. Effect of Trial Number on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the two conditions.

As for the relationship between ratings and French Score (Figure 9), the model revealed that increasing French Score in participants resulted in a significant increase in ratings for Standard_Fr items ($\beta = 1.43$, $SE = 0.19$, $z = 7.71$, $p < 0.0001$). The predictor's interaction with Condition revealed that this effect became more negative for Innov_Engl items compared to Standard_Fr items ($\beta = -2.64$, $SE = 0.21$, $z = -12.49$, $p < 0.0001$). We releveled the model to obtain the exact effect of French Score and found that an increasing French Score in participants led to a decrease in ratings for Innov_Engl sentences ($\beta = -1.21$, $SE = 0.17$, $z = -7.14$, $p_{adj} < 0.0001$).

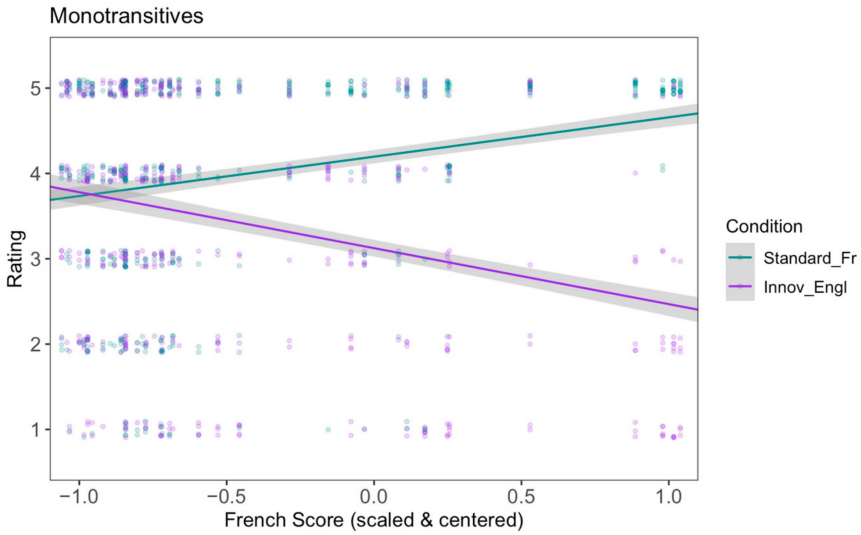

Figure 9. Effect of French Score on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the two conditions.

French Score and Trial Number did not interact significantly in the Standard_Fr condition ($\beta = 0.07$, $SE = 0.11$, $z = 0.62$, $p = 0.5$), indicating that an increasing French Score in participants did not lead to increasing ratings throughout the task. The effect of this interaction did not significantly change in the Innov_Engl condition compared to the Standard_Fr condition ($\beta = -0.15$, $SE = 0.13$, $z = -1.13$, $p = 0.3$).

3.2.2. Response Times

Log-transformed RTs in monotransitive items were analyzed using the linear mixed model in (4):

(4) Log RT ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Trial Number | Participant) + (1 | Item)

Figure 10 illustrates the distribution of individual RTs in each of the two conditions. Overall, Standard_Fr items were rated significantly faster than Innov_Engl items ($\beta = 0.03$, $SE = 0.02$, $t = 2.21$, $p = 0.03$).

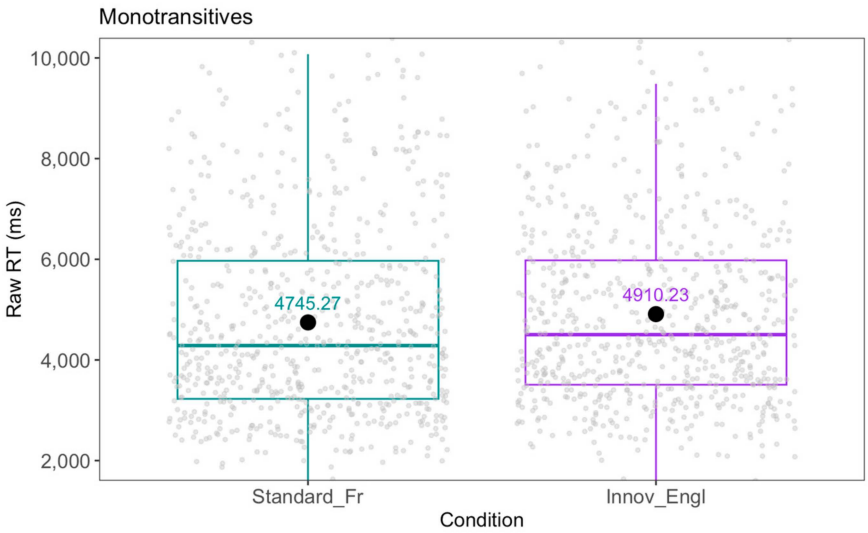

Figure 10. Distribution of individual raw RTs (gray dots) within the two conditions. The bold horizontal line in each box is the median RT per condition. The black dot is the mean RT (indicated as text).

Trial Number (Figure 11) was also shown to have an effect, with participants becoming faster throughout the task in rating Standard_Fr items ($\beta = -0.04$, $SE = 0.02$, $t = -3.03$, $p = 0.003$). The interaction between Trial Number and Condition revealed no significant change in the effect of Trial Number for Innov_Engl items compared to Standard_Fr items ($\beta = -0.03$, $SE = 0.02$, $t = -1.66$, $p = 0.1$).

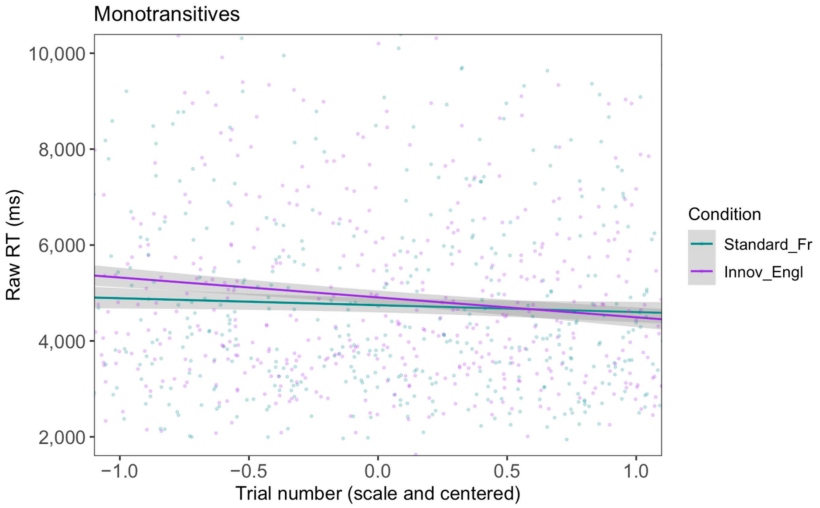

Figure 11. Effect of Trial Number on raw RTs per condition. The gray area around each line is the Standard Error (SE). The dots are individual data points in the two conditions.

As for the effect of French Score on RTs (Figure 12), an increasing French Score in participants resulted in significantly decreasing RTs for Standard_Fr sentences ($\beta = -0.15$, $SE = 0.04$, $t = -3.89$, $p = 0.0002$). Its interaction with Condition showed that the effect of French Score was less negative for Innov_Engl sentences compared to Standard_Fr sentences ($\beta = 0.06$, $SE = 0.02$, $t = 4.01$, $p < 0.0001$). The model was releveled to obtain the exact effect of the predictor in the Innov_Engl condition, and it revealed a decreasing but less strong tendency compared to the Standard_Fr condition ($\beta = -0.08$, $SE = 0.04$, $t = -2.29$, $p_{adj} = 0.03$).

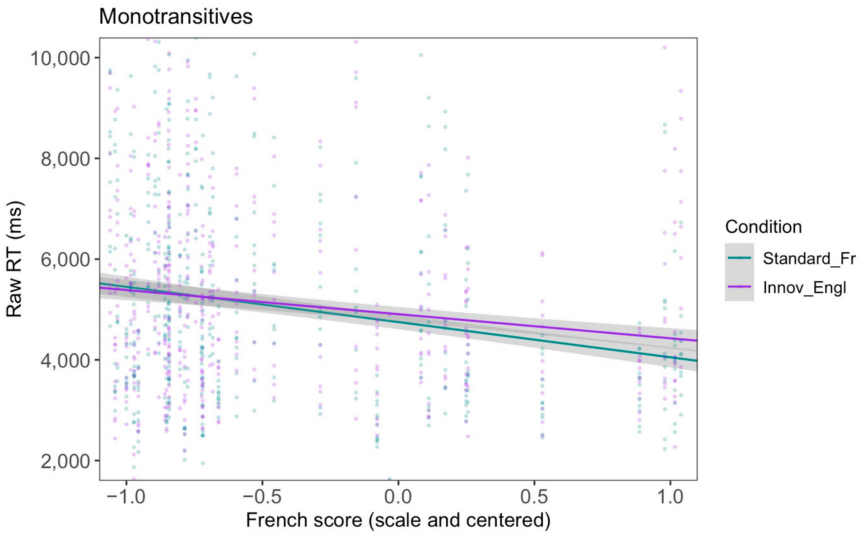

Figure 12. Effect of French Score on raw RTs per condition. The gray area around each line is the Standard Error (SE). The dots are individual data points in the two conditions.

As for the two-way interaction between French Score and Trial Number, it was not significant, indicating that participants did not rate Standard_Fr sentences faster across trials because of their French Score ($\beta = 0.01$, $SE = 0.02$, $t = 0.88$, $p = 0.4$). Compared to Standard_Fr, the effect of this interaction was not significantly different for the Innov_Engl condition ($\beta = 0.02$, $SE = 0.02$, $t = 1.19$, $p = 0.2$).

3.3. Reciprocals

3.3.1. Ratings

Ratings in reciprocal items were analyzed using the ordinal model in (5):

(5) Rating ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Condition | Participant) + (1 + Condition + French Score | Item)

The results showed that Standard_Fr sentences (*Les deux amis s'embrassent* 'The two friends REFL hug') yielded significantly higher acceptability than Innov_Engl sentences (*Les deux amis embrassent* 'The two friends hug') ($\beta = -2.86$, $SE = 0.34$, $z = -8.29$, $p < 0.0001$) (Figure 13).

Trial Number (Figure 14) did not affect participants' ratings significantly in the Standard_Fr condition ($\beta = 0.09$, $SE = 0.12$, $z = 0.77$, $p = 0.4$). Also, the interaction between Trial Number and Condition showed that the predictor's effect was not significantly different in the Innov_Engl condition compared to the Standard_Fr condition ($\beta = -0.19$, $SE = 0.14$, $z = -1.39$, $p = 0.2$).

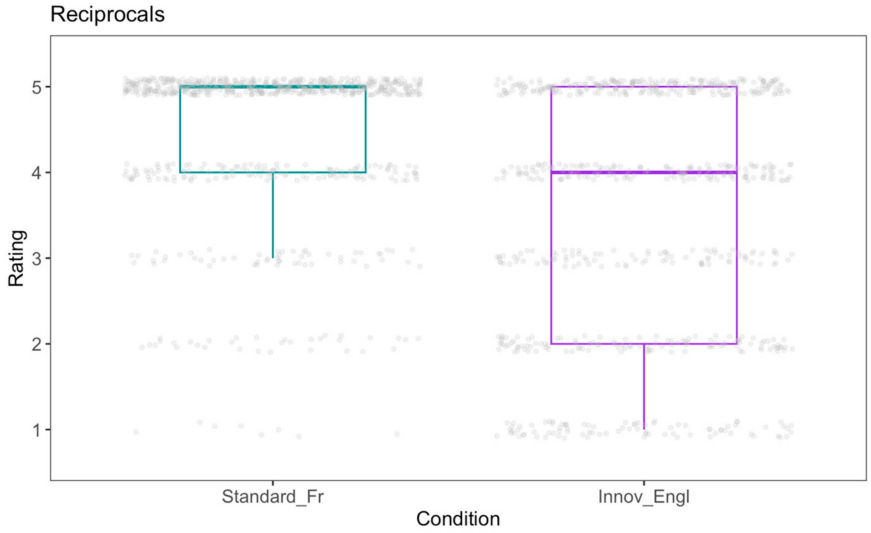

Figure 13. Distribution of individual ratings (gray dots) within the two conditions. The bold horizontal line in each box is the median rating per condition.

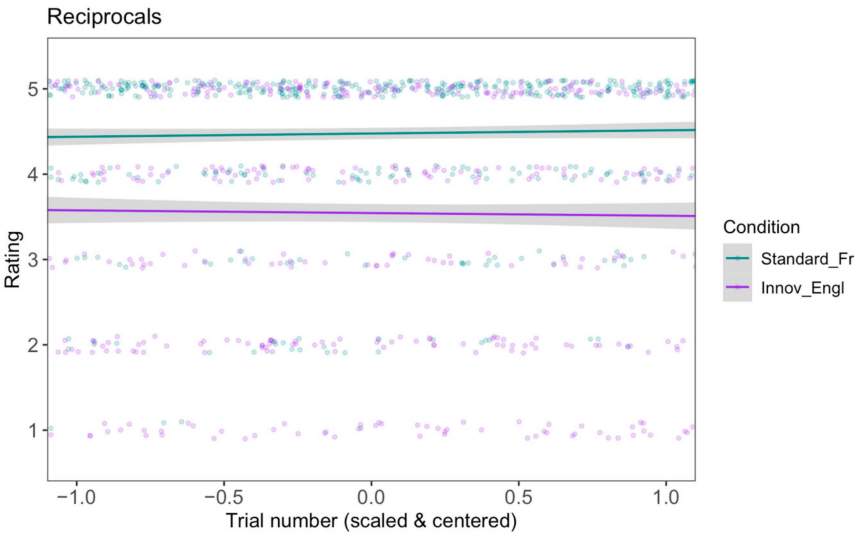

Figure 14. Effect of Trial Number on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the two conditions.

Figure 15 illustrates the relationship between ratings and French Score within the two conditions. The model shows that, for Standard_Fr items, an increasing French Score in participants led to significantly higher ratings ($\beta = 1.86$, $SE = 0.33$, $z = 5.59$, $p < 0.0001$). The interaction between French Score and Condition revealed that the effect of French Score was more negative for Innov_Engl items that for Standard_Fr items ($\beta = -2.72$, $SE = 0.3$, $z = -9.18$, $p < 0.0001$). The model was releveled to obtain the exact effect of the predictor in the Innov_Engl condition, and revealed the opposite pattern, namely that an increasing French Score in participants led to decreasing ratings ($\beta = -0.86$, $SE = 0.29$, $z = -3.02$, $p_{adj} = 0.003$).

French Score and Trial Number did not interact significantly in the Standard_Fr condition ($\beta = -0.08$, $SE = 0.14$, $z = -0.59$, $p = 0.6$), showing that an increasing French Score in participants did not lead to a significant increase in ratings as the task proceeded. Compared to Standard_Fr, the effect of this interaction was not significantly different in the Innov_Engl condition ($\beta = 0.29$, $SE = 0.16$, $z = 1.8$, $p = 0.1$).

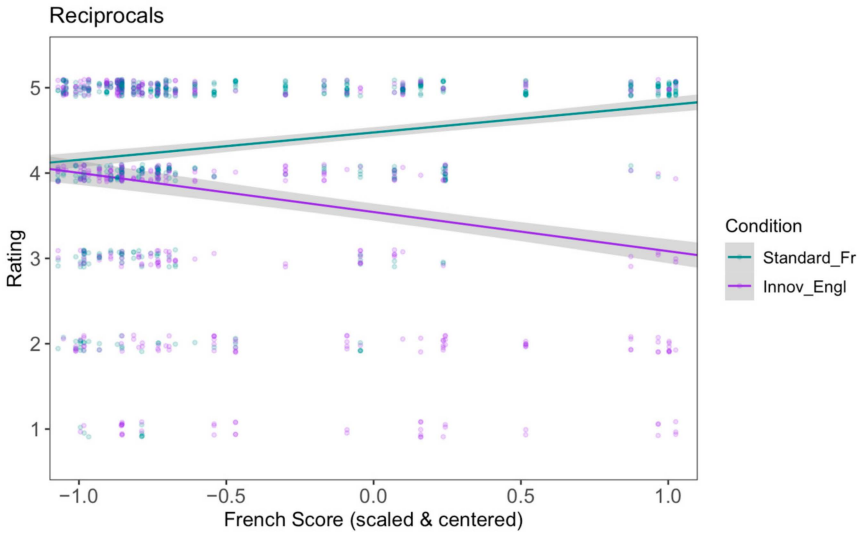

Figure 15. Effect of French Score on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the two conditions.

3.3.2. Response Times

Log-transformed response times (RTs) in reciprocal items were analyzed using the linear mixed model in (6):

(6) Log RT ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Condition + Trial Number | Participant) + (1 | Item)

Overall, participants rated Standard_Fr items significantly faster than Innov_Engl items ($\beta = 0.07$, $SE = 0.02$, $t = 3.43$, $p = 0.001$) (Figure 16).

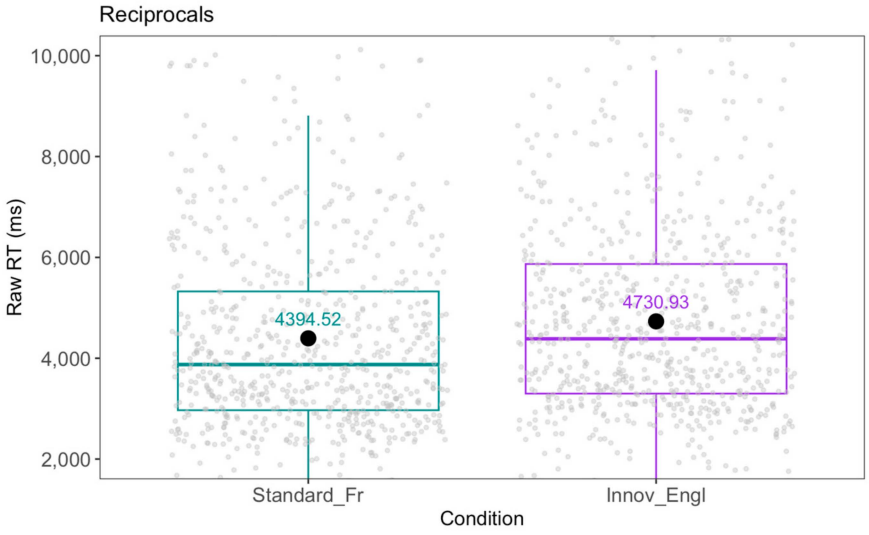

Figure 16. Distribution of individual raw RTs (gray dots) within the two conditions. The bold horizontal line in each box is the median RT per condition. The black dot is the mean RT (indicated as text).

An increasing Trial Number (Figure 17) was shown to lead to a decrease in RTs in the Standard_Fr condition ($\beta = -0.06$, $SE = 0.01$, $t = -4.79$, $p < 0.0001$). The interaction between Trial Number and Condition showed that, compared to Standard_Fr, the effect of Trial Number did not change significantly in the Innov_Engl condition ($\beta = 0.008$, $SE = 0.02$, $t = 0.49$, $p = 0.6$).

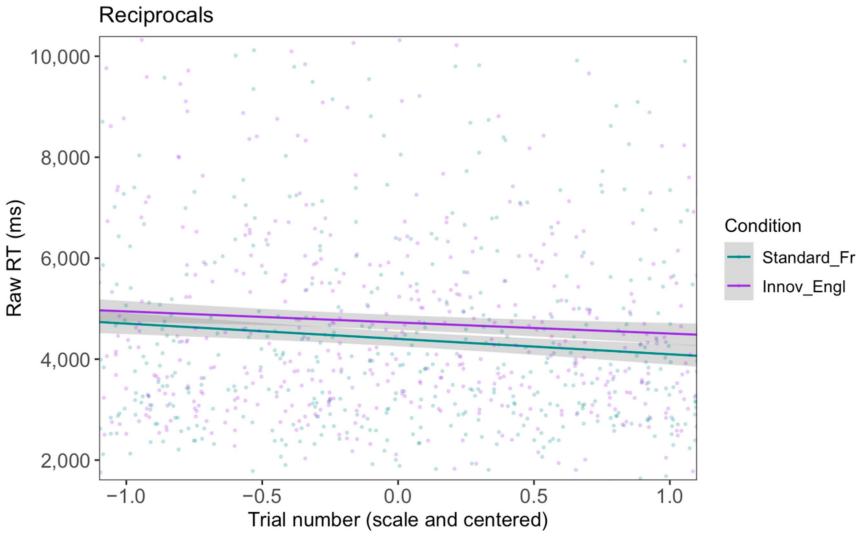

Figure 17. Effect of Trial Number on raw RTs per condition. The gray area around each line is the Standard Error (SE). The dots are individual data points in the two conditions.

Regarding French Score (Figure 18), we detected a significant decrease in RTs with increasing French Score for the Standard_Fr sentences ($\beta = -0.16$, $SE = 0.04$, $t = -4.42$, $p < 0.0001$). The interaction between French Score and Condition revealed that the effect of French Score was less negative for the Innov_Engl sentences compared to Standard_Fr sentences ($\beta = 0.08$, $SE = 0.02$, $t = 4.14$, $p = 0.0001$). In the releveled model, it was shown that participants with an increasing French Score again showed lower RTs in this condition ($\beta = -0.08$, $SE = 0.04$, $t = -1.92$, $p_{adj} = 0.06$), but less strongly compared to Standard_Fr.

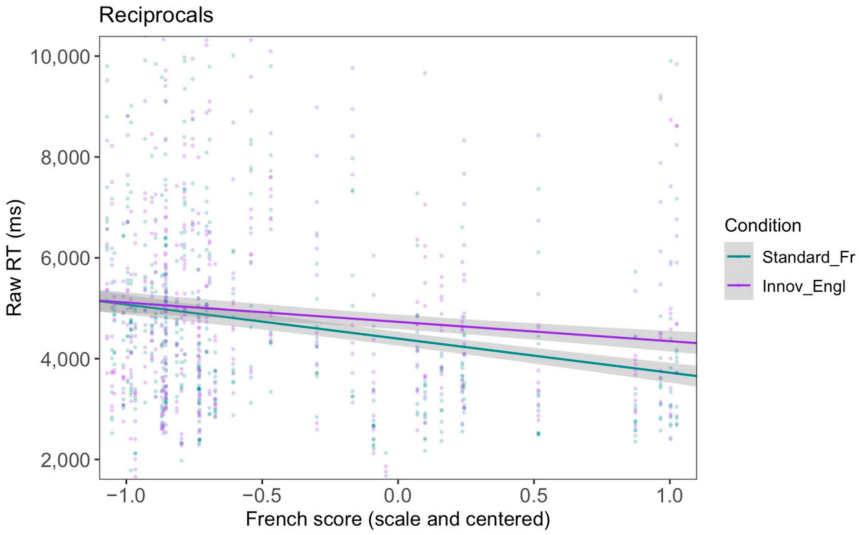

Figure 18. Effect of French Score on raw RTs per condition. The gray area around each line is the Standard Error (SE). The dots are individual data points in the two conditions.

As for the two-way interaction between French Score and Trial Number, it was not significant in the Standard_Fr condition, indicating that, regardless of their French Score, participants did not rate these sentences faster as the task proceeded ($\beta = 0.002$, $SE = 0.01$, $t = 0.14$, $p = 0.9$). This effect did not change significantly in the Innov_Engl condition compared to the Standard_Fr condition ($\beta = -0.01$, $SE = 0.02$, $t = -0.57$, $p = 0.6$).

3.4. Object Clitics

3.4.1. Ratings

Ratings in object clitic items were analyzed using the ordinal model in (7):

(7) Rating ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Condition | Participant) + (1 + Condition + French Score | Item)

Overall, participants accepted Standard_Fr sentences (*Il les met sur la table* 'He them puts on the table') significantly more than Innov_Engl sentences (*Ils met les sur la table* 'He puts them on the table') ($\beta = -4.9$, $SE = 0.39$, $z = -12.41$, $p < 0.0001$) (Figure 19).

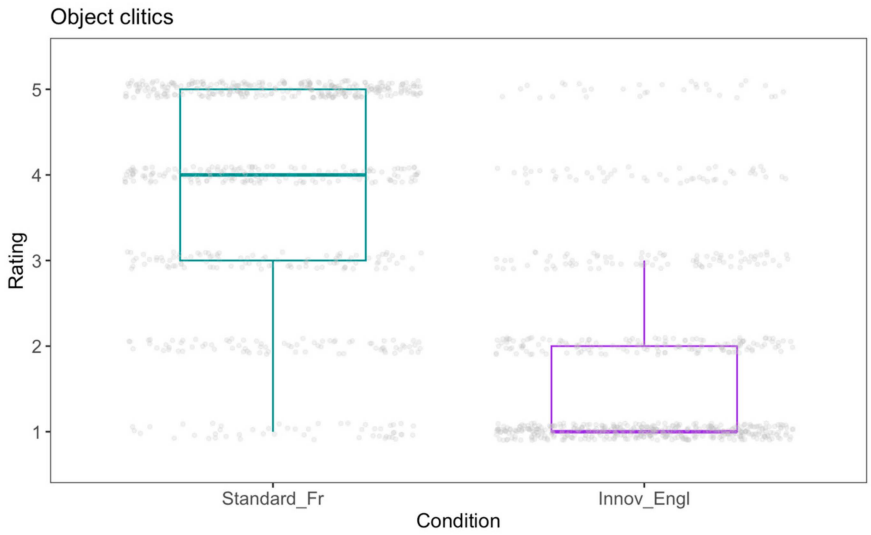

Figure 19. Distribution of individual ratings (gray dots) within the two conditions. The bold horizontal line in each box is the median rating per condition.

Throughout the task, an increasing Trial Number (Figure 20) was shown to lead to a significant increase in participants' ratings for Standard_Fr items ($\beta = 0.21$, $SE = 0.09$, $z = 2.3$, $p = 0.02$). The interaction between Trial Number and Condition revealed that, compared to Standard_Fr, the effect of Trial Number was not significantly different in the Innov_Engl condition ($\beta = -0.17$, $SE = 0.13$, $z = -1.25$, $p = 0.2$).

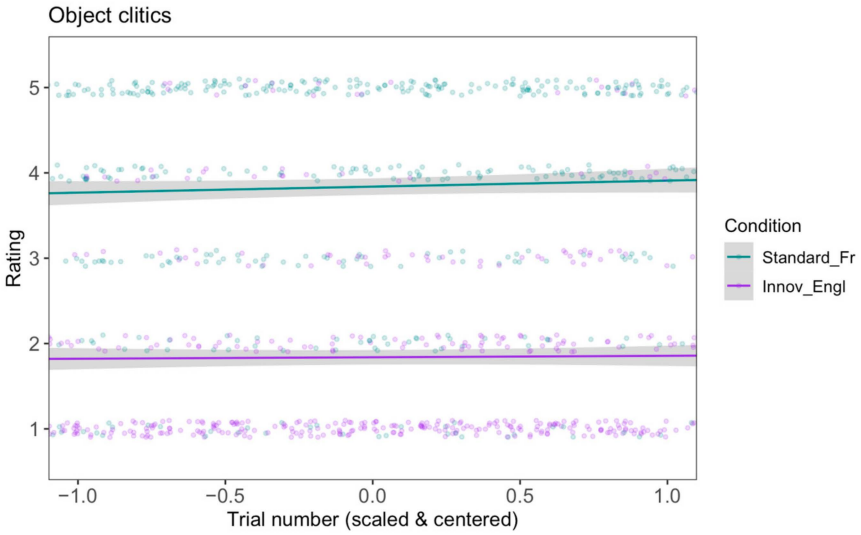

Figure 20. Effect of Trial Number on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the two conditions.

French Score (Figure 21) was found to be a significant predictor for Standard_Fr items, causing an increase in ratings as it increased ($\beta = 1.48$, $SE = 0.22$, $z = 6.6$, $p < 0.0001$). The interaction between French Score and Condition showed that the effect of French Score was more negative in the Innov_Engl condition than in the Standard_Fr condition ($\beta = -3.19$, $SE = 0.38$, $z = -8.34$, $p < 0.0001$). The releveled model revealed that French Score had the opposite effect on these sentences, leading to a significant decrease in ratings with increasing French Score in participants ($\beta = -1.71$, $SE = 0.32$, $z = -5.35$, $p_{adj} < 0.0001$).

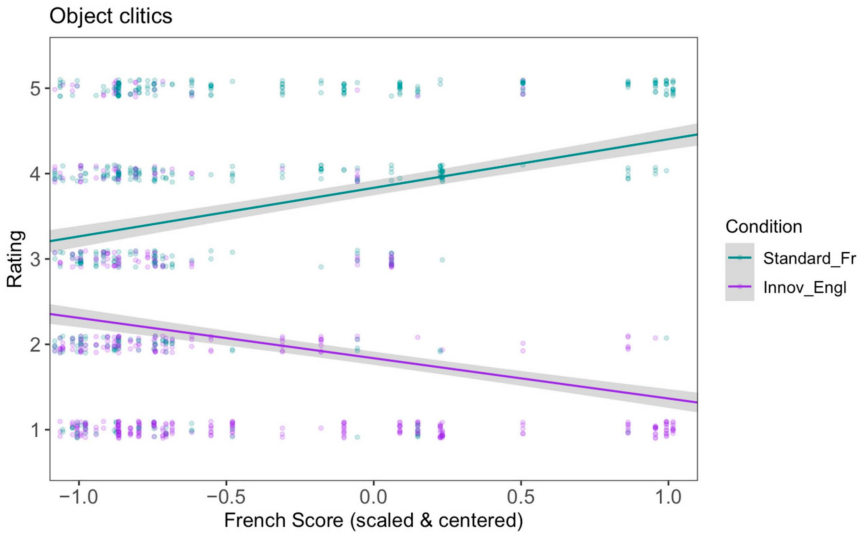

Figure 21. Effect of French Score on rating per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the two conditions.

French Score and Trial Number did not interact significantly in the Standard_Fr condition ($\beta = 0.13$, $SE = 0.09$, $z = 1.29$, $p = 0.2$), showing that an increasing French Score in participants did not lead to increasing ratings over the course of the task. Interestingly, the effect of this interaction was shown to be significantly different for the Innov_Engl condition ($\beta = -0.32$, $SE = 0.15$, $z = -2.17$, $p = 0.03$). Again, we releveled the model to obtain the exact effect of the interaction within the Innov_Engl condition, but it was shown to be non-significant ($\beta = -0.19$, $SE = 0.11$, $z = -1.77$, $p_{adj} = 0.2$).

3.4.2. Response Times

Log-transformed response times (RTs) in object clitic items were analyzed using the linear mixed model in (8):

(8) Log RT ~ Condition + French Score + Trial Number + Condition: French Score + Condition: Trial Number + French Score: Trial Number + Condition: French Score: Trial Number + (1 + Condition + Trial Number | Participant) + (1 | Item)

Unlike in the other structures, participants did not rate the Standard_Fr object clitic sentences significantly faster than the Innov_Engl ones ($\beta = -0.03$, $SE = 0.02$, $t = -1.49$, $p = 0.1$) (Figure 22).

An increasing Trial Number (Figure 23) led, again, to lower RTs in the Standard_Fr condition ($\beta = -0.06$, $SE = 0.01$, $t = -4.79$, $p < 0.0001$). The interaction between Trial Number and Condition indicated that the effect of Trial Number was not significantly different in the Innov_Engl condition compared to the Standard_Fr condition ($\beta = -0.002$, $SE = 0.02$, $t = 0.12$, $p = 0.9$).

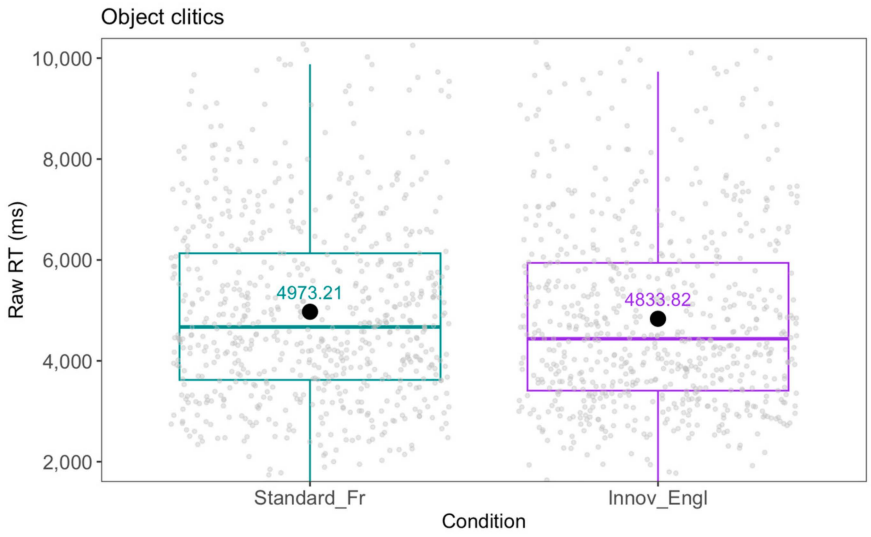

Figure 22. Distribution of individual raw RTs (gray dots) within the two conditions. The bold horizontal line in each box is the median RT per condition. The black dot is the mean RT (indicated as text).

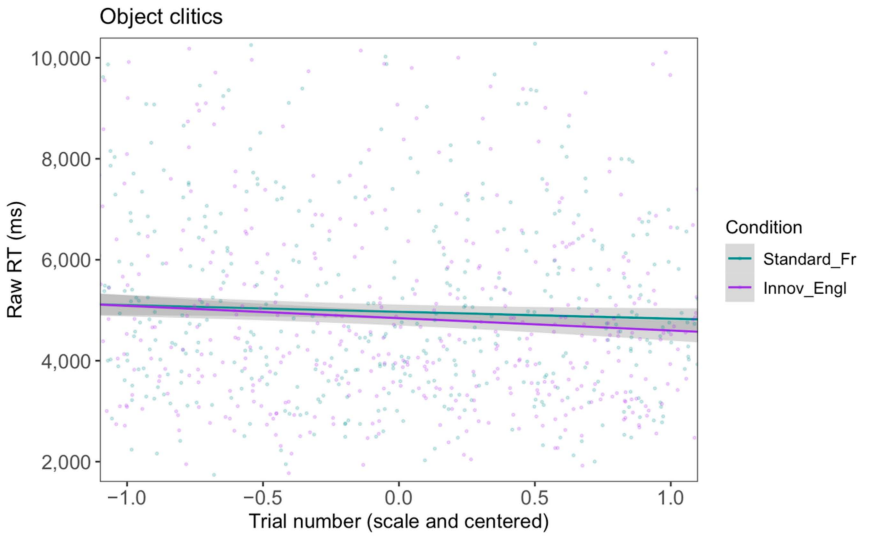

Figure 23. Effect of Trial Number on raw RTs per condition. The gray area around each line is the Standard Error (SE). The dots are individual data points in the two conditions.

An increasing French Score in participants resulted in a significant decrease in RTs for Standard_Fr sentences ($\beta = -0.11$, $SE = 0.04$, $t = -2.84$, $p = 0.001$) (Figure 24). The interaction between French Score and Condition showed that the effect of French Score became more negative for Innov_Engl items than for Standard_Fr items ($\beta = -0.05$, $SE = 0.02$, $t = -2.33$, $p = 0.02$). The releveled model revealed a significant decrease in RTs with an increasing French Score for the Innov_Engl sentences that was stronger than for Standard_Fr sentences ($\beta = -0.16$, $SE = 0.04$, $t = -4.19$, $p_{adj} = 0.0002$).

Moreover, the two-way interaction between French Score and Trial Number was not significant in the Standard_Fr condition, indicating that participants RTs remained stable regardless of French Score across trials ($\beta = 0.003$, $SE = 0.01$, $t = 0.27$, $p = 0.8$). Compared to Standard_Fr, the effect of this interaction was not significantly different for the Innov_Engl condition in the model ($\beta = -0.004$, $SE = 0.02$, $t = -0.23$, $p = 0.8$).

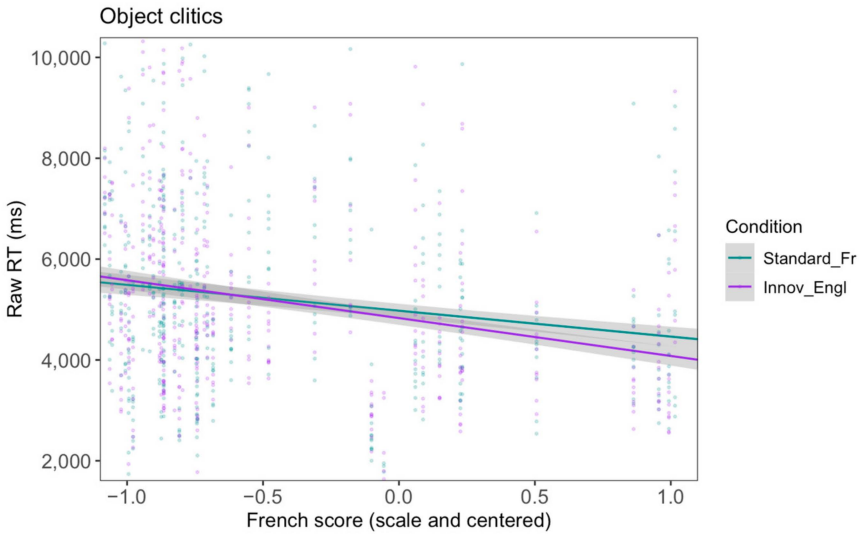

Figure 24. Effect of French Score on raw RTs per condition. The gray area around the lines is the Standard Error (SE). The dots are individual data points in the two conditions.

4. Discussion

This study investigated how Canadian bilingual speakers of French and English with various degrees of contact with French accept and adapt to different types of structural innovations in Canadian French. For this purpose, we conducted a timed acceptability judgment task (TAJT) where we employed both acceptability ratings (offline measure) and response times of acceptability (online measure) as a window into adaptation. The findings are discussed on the basis of the research questions provided in Section 1.3.2.

4.1. Differences in Acceptability Ratings and RTs for Innovations Across Structures

The first research question was: How do Canadian bilingual speakers of French and English accept structural innovations in French compared to the standard (grammatical) variants? Are acceptability patterns different for the different types of innovations?

Our results show that, across the four structure types tested, the standard variants, overall, yielded higher ratings than the innovations, which is in line with our predictions and previous findings in the literature (Montrul and Bowles 2009; Montrul et al. 2015; Kupisch 2012; Kupisch et al. 2014; Higby 2016; Regulez and Montrul 2023). Similarities and differences in the patterns within each type of innovation are discussed in more detail below.

In ditransitives, participants accepted PO_Can sentences (*L'homme donne un cadeau à la femme* 'The man gives a present to the woman') at ceiling and DO_Engl sentences (*L'homme donne la femme un cadeau* 'The man gives the woman a present') significantly lower (median rating 3). As predicted, ratings for PO_Scr items (*L'homme donne à la femme un cadeau* 'The man gives to the woman a present') were in-between (median rating 4) and significantly different from the other two conditions, indicating that the scrambled word order makes this structure less acceptable/natural-sounding out of context than the standard PO_Can, but more acceptable than the English-like innovation. Importantly, the two innovative conditions differed significantly from each other, with DO_Engl yielding higher ratings than DO_Nov (*L'homme donne un cadeau la femme* 'The man gives a present the woman'). This aligns with earlier research showing that bilinguals differentiate between innovations with structural equivalents in the other language and innovations without equivalents (cf. Kupisch 2012; Higby 2016). Differences in ratings between conditions were partially also reflected in response latency: bilinguals rated PO_Can and DO_Nov sentences, i.e., the highest- and the lowest-rated condition, equally fast; the fast rating of DO_Nov items shows the fast rejection of the fully novel structure, which is in line with our predictions.

PO_Scr and DO_Engl sentences were rated, overall, numerically slower, but only the former differed significantly from the two faster conditions.

Monotransitive innovations (*Le garçon obéit le professeur* 'The boy obeys the teacher') were rated lower (median rating 3) and, unlike ditransitives, slower than the standard variant (*Le garçon obéit au professeur*). Similarly, participants accepted innovative reciprocals (*Les deux amis embrassent* 'The two friends hug') significantly less than standard reciprocals (*Les deux amis s'embrassent*) and were also slower at doing so. An important observation is that the innovative condition here indicated the largest median rating (4) compared to the rest of the structures. This could be due to the fact that two of the verbs (*se parler*, *s'écrire*) can still be judged as highly acceptable in the absence of the reflexive *se*, however, with a different meaning (talking and texting other people and not each other). Indeed, after removing these two verbs, the median rating went down to 3. However, post-hoc visualizations for each verb showed that the high acceptability of structures with a missing *se* also applies to verbs that require the reflexive, like *se disputer* (to argue) or *s'entendre* (to get along).

As for the object clitic structure, the innovation (*Il met les sur la table* 'He them puts on the table') yielded, overall, the lowest ratings compared to the other innovations (median rating 1 and range 1–2) and it is the only case in our data where the innovation exhibited faster RTs than the standard variant Standard_Fr (*Il les met sur la table*). Although post-verbal clitic placement has been reported in the speech of Francophones in the US, it seems to be relatively unnatural for our bilinguals, which is probably the reason why Mougeon et al. (2005) did not find any instances in their data. A possible explanation could lie in the nature of this innovation, since it emerges via inversion instead of omission.[16]

Overall, it seems that not every innovation is rated in a similar way despite the fact that all of them have an English equivalent. The structures that we tested here can be put on a continuum of acceptability that might hold for other linguistic processes as well, like production or online processing (cf. Carando 2015).

4.2. Adaptation to Different Types of Innovations Across Trials

Our second research question was: Do bilingual speakers show adaptation to innovations over the course of the task? Is adaptation different for the different types of innovations?

Across structures, Trial Number was not a significant predictor for ratings in the innovations. This could be due to the fact that the relatively high acceptability shown for three out of four innovations did not leave room for further adaptation (Luka and Barsalou 2005). However, this explanation has a weak point, namely that repeated exposure did improve ratings in the standard conditions for ditransitives (PO_Can), monotransitives (Standard_Fr), and object clitics (Standard_Fr) to some extent. This phenomenon is known as the mere exposure effect (Zajonc 2001), referring to the increased preference for a recently encountered structure regardless of grammatical status (Luka and Barsalou 2005). A second explanation can be found in Snyder (2000, 2022), according to which syntactic satiation is a process that applies selectively to some novel structures only (also in Do et al. 2016). Since there is no previous work on our structures, we do not know whether they satiate or not.

Another possible reason could be that adaptation in this context is more likely to be detected by means of a more sensitive measurement. Indeed, Trial Number was a better predictor for response times (RTs) across structures. Participants read and rated the innovative conditions DO_Engl in ditransitives and Innov_Engl in monotransitives, reciprocals, and object clitics significantly faster across experimental trials. This observation could point to the presence of structural facilitation on the level of comprehension due to repeated exposure (Kaschak and Glenberg 2004). We need to keep in mind, though, that this was also the case for the standard conditions across structures, indicating that this cumulative decrease in RTs could also be a result of participants becoming, overall, faster in the task.

To summarize, on a group level, participants did not increase their ratings to innovations, but gradually became faster in reading the stimulus and responding to it. However, on an individual level, we spotted participants who adapted their acceptability, as the post-hoc descriptive analysis in Appendix A shows. We defined adaptation by calculating the most likely rating for the innovative conditions per participant in the first vs. second half of the trials for each structure. The following patterns are considered adaptation: (1) the most likely rating in the first half is below three and becomes equal to or larger than three in the second half, or (2) the most likely rating in the first half is equal to three and becomes larger than three in the second half. We also calculated adaptation to the other conditions to explore whether these participants selectively adapt to innovations or to standard sentences as well. Overall, the number of participants who were found to adapt their acceptability to innovations was different for each structure, with monotransitives indicating the largest (N = 15) and object clitics the lowest (N = 7). Within each structure, more participants tended to adapt only to the innovation rather than to all conditions, a pattern that was clearer for monotransitives and reciprocals compared to ditransitives and object clitics (see Tables A1–A4 in Appendix A). This could indicate that cross-linguistic influence (CLI) from English might play a role at least for these participants (Serratrice et al. 2009), since they only increased their ratings for the English-like structure in French after repeated exposure. However, we should also point out that there is little overlap among participants who showed this tendency across structure types, which raises the question of why some participants are influenced by English in some innovations but not in others.

Overall, three observations can be made: (1) On a group level, adaptation to innovations is easier to detect in response times than in ratings, but other factors (e.g., task effects) might contribute as well. (2) Adaptation to the acceptability of innovations can take place, but is more likely to be found on an individual basis rather than on a group basis. (3) Individuals do not seem to consistently adapt to innovations that have English equivalents. The latter might be dependent on the properties of the structure (i.e., some innovations are more established than others) or on the properties of individual linguistic experience (i.e., some people are more familiar with specific innovations than others due to differences in the input).

4.3. The Role of French Score in Acceptability of and Adaptation to Innovations

The latter point brings us to the third research question: What is the role of individual differences (age of acquisition (AoA) of French and English, amount of current exposure and use of each language, proficiency) in the acceptability of and adaptation to innovations?

The composite variable French Score was shown to have a significant effect on acceptability across all four structures tested: the lower the French Score was in participants, the higher and slower the ratings for the innovations were. This result aligns with our hypotheses and the relevant literature showing the effect of individual differences in similar tasks (Montrul and Bowles 2009; Montrul 2010, 2019; Guijarro-Fuentes and Marinis 2007; Kupisch 2012; Kupisch et al. 2014; Higby 2016; but see Regulez and Montrul 2023).

One possible explanation could be that participants with a lower French Score (i.e., lower contact with French) have, overall, less experience with French (exposure, use, proficiency) and are, therefore, more accepting of novel structures as opposed to participants with a higher French Score (i.e., higher contact with French) (Kupisch 2012). Such an assumption could further be supported by the fact that French Score was also associated with higher ratings for the standard (grammatical) conditions: the higher the amount of French in one's life, the higher and faster the acceptability of structures that align with the standard grammar.

An alternative explanation could be that participants with lower French Scores tend to show more cross-linguistic influence (CLI) from their dominant language, English (Serratrice et al. 2009). This assumption might be supported by the fact that the monolingually raised L1 French–L2 English speakers in our sample (N = 17), who typically exhibit high contact with French (high French Scores), showed very low acceptability of

innovations. Another argument for CLI might come from ditransitives, where French Score was shown to have a different (stronger) effect on ratings in the English-like innovation DO_Engl compared to the innovation without an English counterpart DO_Nov (again, see Figure 2, and results in the respective sub-section). If CLI from English was not relevant at all for these innovations, then we would expect higher acceptability with increasing French Score in participants, regardless of the presence of an English equivalent structure, which is not the case in our data.

However, the speculation about CLI can only be made for ditransitives, since no such manipulation was present for the other structures.[17] In addition, even for ditransitives, the two innovative conditions were read and rated equally fast by participants with lower French Scores. Overall, we acknowledge that disentangling general bilingualism effects from CLI is not straightforward in this study. Our results point to different explanations and raise the need for a more careful investigation in the future.

As for the link between French Score and adaptation to English-like innovations, the interaction between French Score and Trial Number did not reach significance in any of the structures tested. Despite that, in the post-hoc analysis on individual ratings, we observed that participants who adapted their ratings to innovations indicate French Scores ranging from negative to positive values (i.e., lower to higher contact with French). However, this was the case only for ditransitive, monotransitive, and reciprocal innovations; for object clitic innovations, adapting bilinguals fell within the negative range only. This could be attributed to the fact that innovative object clitics were the hardest structure to accept and hence to adapt to, especially for participants with higher French Scores.

To summarize, our results suggest that different types of innovations yield different ratings among Canadian bilingual speakers of French and English. This observation points to the presence of a continuum in the mind of our participants, where particular innovative structures are more acceptable than others (cf. Carando 2015). This might be attributed to the fact that some of them are already part of the input to some extent (e.g., *jouer* with bare object in Ontario French), while others are not (e.g., object clitic inversion). A corpus study targeting these structures in the speech of various bilingual groups would provide evidence for common vs. non-common innovations across different varieties of Canadian French. This raises an important question: Does degree of acceptability reflect the likelihood of an innovation occurring in the speech of these bilinguals?

Furthermore, our findings speak for adaptation both on a group and on an individual level. On a group level, we found processing facilitation, i.e., lower RTs, as a result of repeated exposure across trials. On an individual level, we also detected changes in the acceptability, even for extremely dispreferred innovations like inverted object clitics. These patterns were found for a wider range of participants for ditransitive, monotransitive, and reciprocal innovations as opposed to object clitic innovations, where mostly participants with lower French Scores adapted (cf. Mougeon et al. 2005 and Neumann-Holzschuh 2009 for production). Crucially, individual participants did not adapt consistently to all innovations, which shows that the type of structural innovation plays a role.

Finally, the results on adaptation might indicate already-present or ongoing language change within the Canadian French–English contact context. Although our study does not test the production of innovations with English structural equivalents, which would typically be a sign of contact-induced language change (cf. Fernández et al. 2017; Kootstra and Şahin 2018), the tendencies we detect in acceptability and response latency could point in a similar direction. The fact that innovative patterns in our data become easier to process and—on an individual basis—become more acceptable with time might reflect how linguistic representations begin to change in the bilingual mind, which can lead to potential change both in the language of the individual and in the language of the society.

5. Conclusions

The present study employed a timed acceptability judgment task (TAJT) to investigate overall acceptability and adaptation in the acceptability of different types of Canadian French innovations with a grammatical English equivalent. The results highlight the contribution of structure type and individual differences (French Score) to the acceptability of innovations, which has also been shown in previous studies. Interestingly, these factors were not found to affect adaptation, which, on a group level, was reflected only in response times and not in ratings. However, on an individual level, many participants adapted their ratings, with the number being higher for some types of innovations than for others (cf. Snyder 2000, 2022 and Do et al. 2016 for structure-specific adaptation). Overall, our study makes the following contributions to our understanding of bilingual adaptation to innovations. It shows that, even if adaptation is not reflected in acceptability ratings, it could still take place on a processing level (response times), highlighting the need to potentially have more than one measure for adaptation in the future. Crucially, it also provides evidence for investigating individual adaptation in acceptability, especially in cases where such patterns are not spotted on a group level. We consider these aspects to be a valuable direction for future research that will explore them in a variety of linguistic processes (acceptability, production, processing) and across different language pairs.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of the University of Kaiserslautern-Landau (28 April 2021, Approved Project #37).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The anonymized data, R scripts, and HTML files with complete model outputs are available at the Open Science Framework (OSF) under the following link: https://osf.io/zusxq/?view_only=cf3d5262f07a4002ba9e0c11921c6bc5 (accessed on 30 November 2024).

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Post-Hoc Analysis: Individual Ratings Across Trials

Appendix A.1. Ditransitives

Table A1. Individual participants and the ditransitive condition(s) in which they adapted their ratings.

Participants (N = Raw Counts)	Condition(s)
S25, S32, S33, S53 (N = 4)	DO_Engl
S14, S15, S47 (N = 3)	DO_Engl + PO_Scr
S27 (N = 1)	DO_Engl + PO_Can
S10 (N = 1)	DO_Engl + DO_Nov

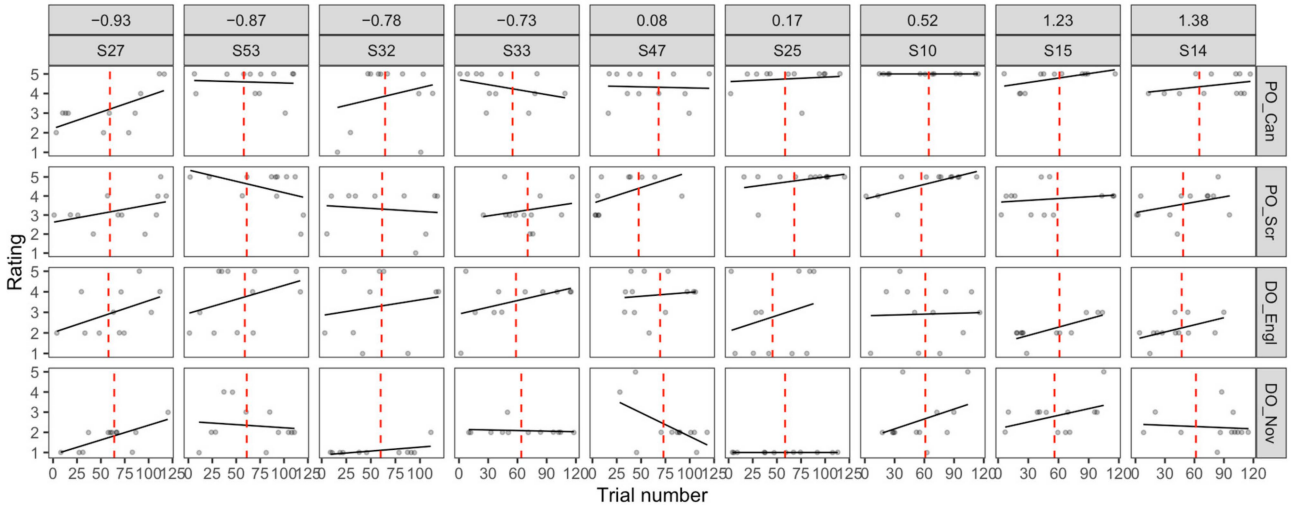

Figure A1. Individual ratings across trials in the four conditions. The dashed vertical line distinguishes between the first and the second half of the ditransitive trials per participant. The regression line shows the trend in ratings across the two parts. The French Score for each participant is also provided in the top row of the facet.

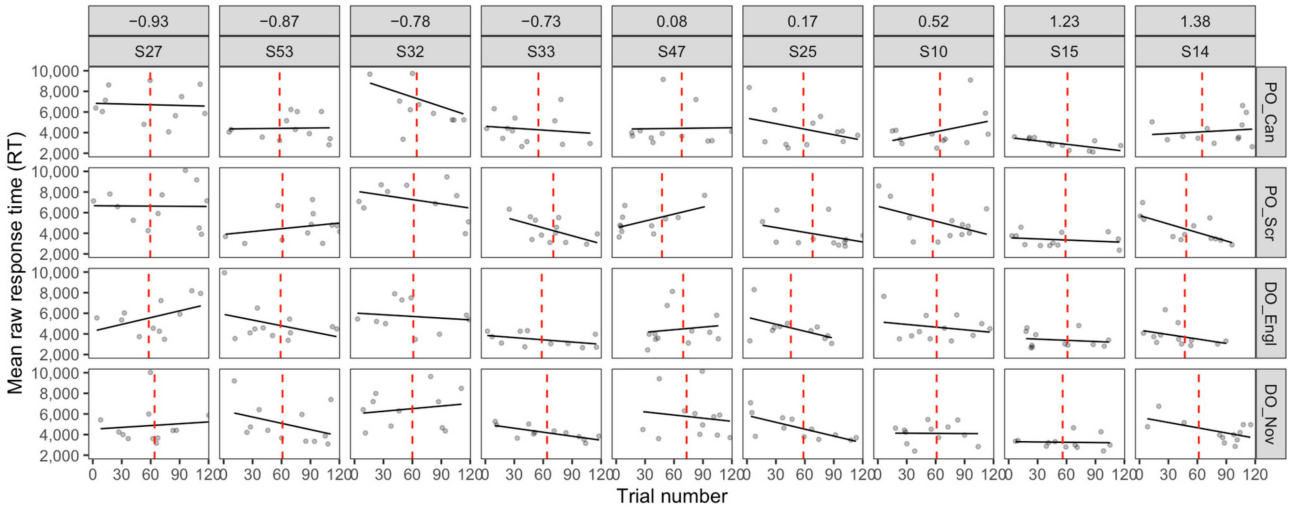

Figure A2. Individual RTs across trials in the four conditions. The dashed vertical line distinguishes between the first and the second half of the ditransitive trials per participant. The regression line shows the trend in RTs across the two parts. The French Score for each participant is also provided in the top row of the facet.

Appendix A.2. Monotransitives

Table A2. Individual participants and the monotransitive condition(s) in which they adapted their ratings.

Participants (N = Raw Counts)	Condition(s)
S1, S14, S2, S22, S28, S30, S32, S43, S44, S45, S54, S55, S6, S8 (N = 14)	Innov_Engl
S52 (N = 1)	Innov_Engl + Standard_Fr

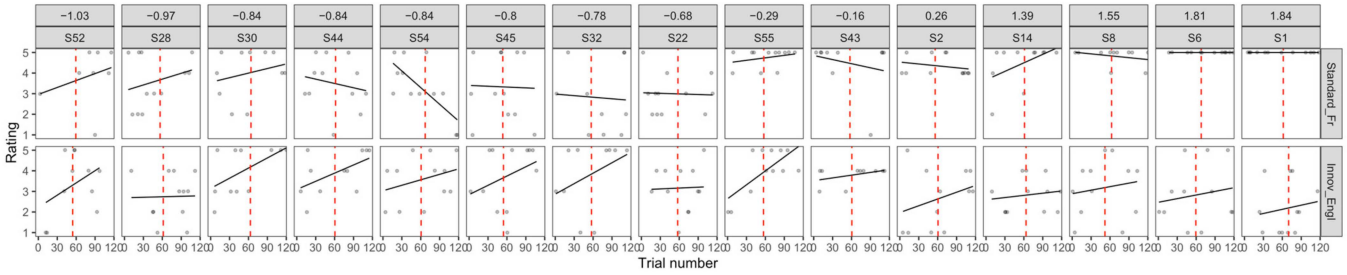

Figure A3. Individual ratings across trials in the two conditions. The dashed vertical line distinguishes between the first and the second half of the monotransitive trials per participant. The regression line shows the trend in ratings across the two parts. The French Score for each participant is also provided in the top row of the facet.

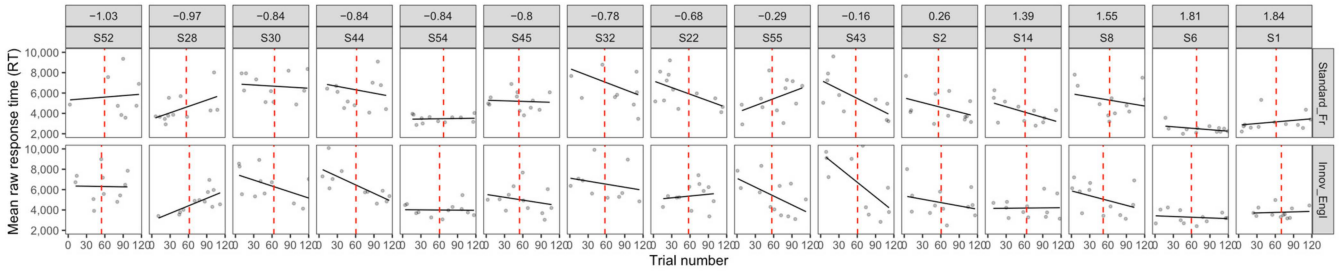

Figure A4. Individual RTs across trials in the two conditions. The dashed vertical line distinguishes between the first and the second half of the monotransitive trials per participant. The regression line shows the trend in ratings across the two parts. The French Score for each participant is also provided in the top row of the facet.

Appendix A.3. Reciprocals

Table A3. Individual participants and the reciprocal condition(s) in which they adapted their ratings.

Participants (N = Raw Counts)	Condition(s)
S1, S14, S15, S22, S3, S37, S54, S59, S6 (N = 9)	Innov_Engl
S18 (N = 1)	Innov_Engl + Standard_Fr

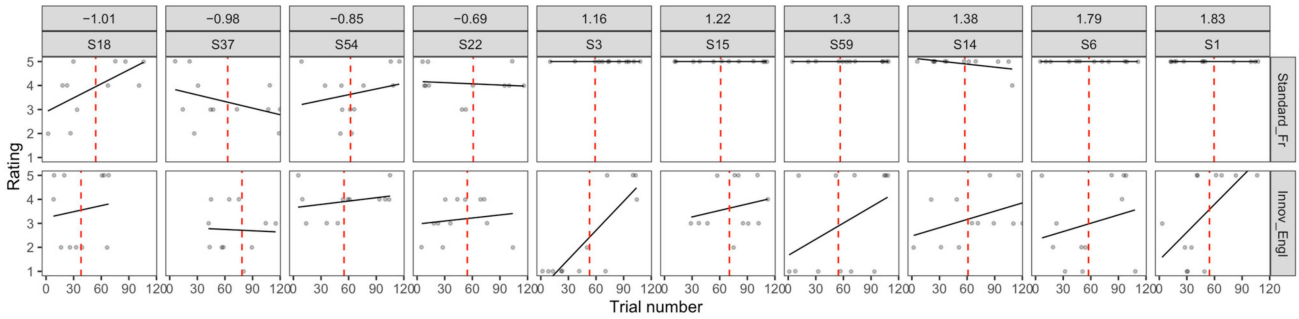

Figure A5. Individual ratings across trials in the two conditions. The dashed vertical line distinguishes between the first and the second half of the reciprocal trials per participant. The regression line shows the trend in ratings across the two parts. The French Score for each participant is also provided in the top row of the facet.

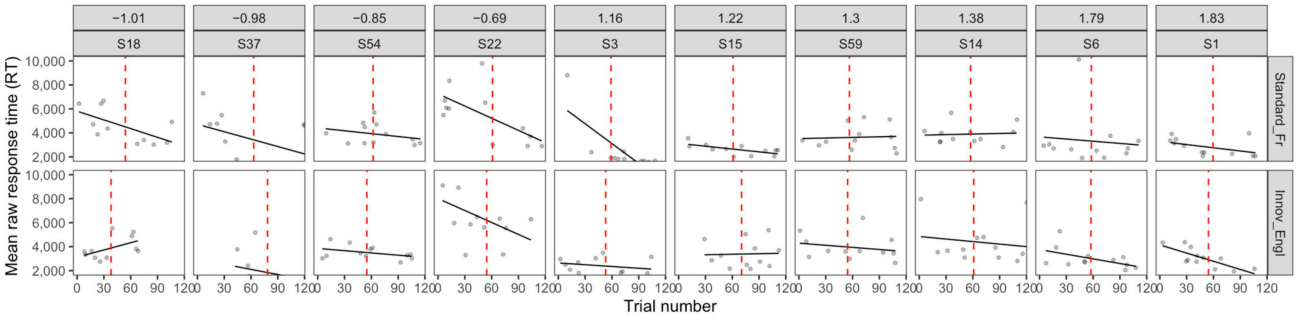

Figure A6. Individual RTs across trials in the two conditions. The dashed vertical line distinguishes between the first and the second half of the reciprocal trials per participant. The regression line shows the trend in ratings across the two parts. The French Score for each participant is also provided in the top row of the facet.

Appendix A.4. Object Clitics

Table A4. Individual participants and the object clitic condition(s) in which they adapted their ratings.

Participants (N = Raw Counts)	Condition(s)
S40, S42, S44, S50 (N = 4)	Innov_Engl
S26, S27, S49 (N = 3)	Innov_Engl + Standard_Fr

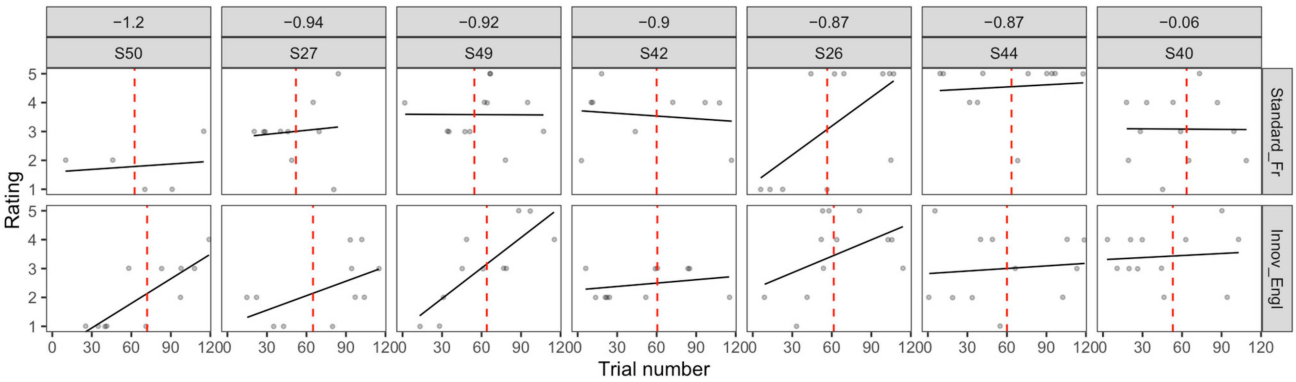

Figure A7. Individual ratings across trials in the two conditions. The dashed vertical line distinguishes between the first and the second half of the object clitic trials per participant. The regression line shows the trend in ratings across the two parts. The French Score for each participant is also provided in the top row of the facet.

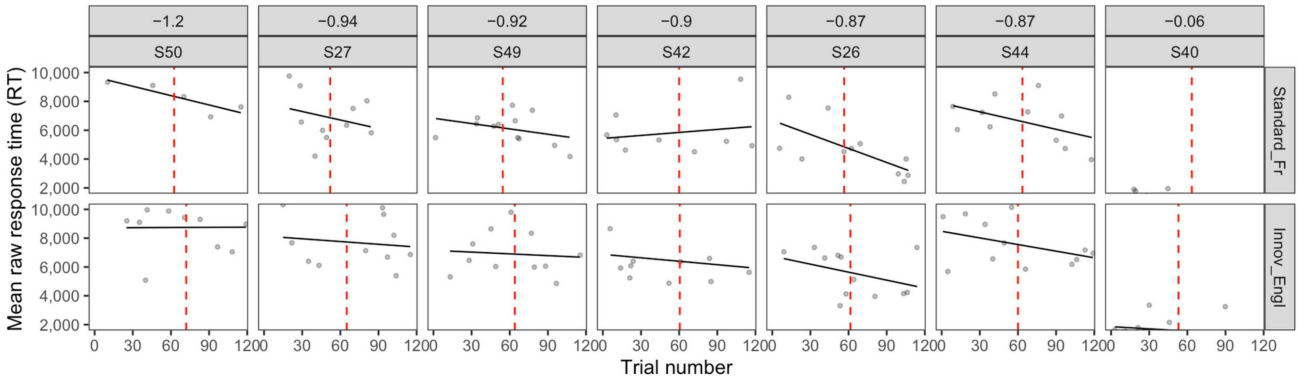

Figure A8. Individual RTs across trials in the two conditions. The dashed vertical line distinguishes between the first and the second half of the object clitic trials per participant. The regression line shows the trend in ratings across the two parts. The French Score for each participant is also provided in the top row of the facet.

Notes

1 Based on the definition of innovation given by Andersen (1989) as cited in Fernández et al. (2017, p. 253): "any element of usage (or grammars) which differs from previous usage (or grammars)".

2 According to the authors, they are "simply less frequent structural types" (p. 453).

3 There is no evidence that the produced structure is entirely novel in Papiamento. The authors just highlight that it is never encountered in the speech of Papiamento speakers outside of the Netherlands, who prefer to produce double object datives, e.g., *Obi ta duna Pieter e buki* 'Obi gives Pieter a book'.

4 DOM omissions also appear in monolingual contexts (Bullock and Toribio (2004) for Dominican Spanish, Alfaraz (2011) for Cuban Spanish as cited in Regulez and Montrul (2023)).

5 Individuals who were born outside of the US and immigrated as adults.

6 Across the three groups, HSs were classified either as simultaneous or as sequential. In the Spanish group, simultaneous HSs were born in the US and acquired English between the ages of 0 and 5, while sequential HSs immigrated to the US between 5 and 13. In the Hindi group, there were only simultaneous HSs who were born in the US or immigrated before the age of 3 and acquired English in early childhood. In the Romanian group, simultaneous HSs were born in the US or immigrated before the age of 5, while sequential HSs immigrated to the US between 7 and 14.

7 Early bilinguals acquired both languages by the age of 10 and used both languages since childhood. Late bilinguals had intensive exposure to English after the age of 10.

8 If causative innovations yielded similarly high ratings as the fully novel structures, then it could be due to the flexibility of bilingual grammars in general rather than influence from English.

9 Italian-dominant bilinguals grew up in Italy and had never spent more than six consecutive months in Germany. German-dominant bilinguals grew up in Germany and had spent between two consecutive months and six consecutive years in Italy. L2ers grew up in Germany and had spent either no time or up to 14 consecutive years in Italy.

10 cf. https://www.canada.ca/en/canadian-heritage/services/official-languages-bilingualism/publications/statistics.html (30 August 2023).

11 They started acquiring the L2 from the age of 6 on.

12 Following Langsford et al. (2019), we chose 'natural' over 'acceptable' in our task description because we realized that the former is more specific and seems to be more appropriate for our purposes: we are interested in how Canadian bilinguals perceive these innovations knowing that some of them might already be part of their input. The specification about what is 'natural' is an adaptation from Bross (2019), who provides phrasing suggestions for such tasks.

13 Following a suggestion from an anonymous reviewer, monotransitives, reciprocals, and object clitics were initially put in one model with structure type as the predictor. Since structure type was shown to interact significantly with Condition, we decided to build three different models to explore the patterns separately within each structure. A script with the combined analysis is on OSF.

14 Following a reviewer's suggestion, we compared a model without Condition to the final model used here, and the latter was significantly better (AIC: 6216 vs. 8854 for the model without Condition). This indicates a main effect of Condition, so we conducted pairwise comparisons via *emmeans*() to see the differences between all condition levels.

15 Similarly to the ratings analysis, we extracted the main effect of Condition to be able to report the pairwise comparisons here. This time, we performed an omnibus Anova test on the final model via the *Anova*() function, since it works for linear mixed

models but not for cumulative link mixed models. Anova showed a significant main effect of Condition on response times ($\chi^2(3) = 22.17$, $p < 0.0001$).

[16] An anonymous reviewer pointed out that the low acceptability of post-verbal clitics could be due to the fact that French clitics are not equivalent to strong pronouns in English.

[17] In monotransitives, innovative sentences with jouer à (to play sports) did not correspond exactly to the English structure, i.e., *Le garçon joue le hockey* 'The boy plays the hockey' instead of *Le garçon joue hockey* 'The boy plays hockey'. As an anonymous reviewer pointed out, this makes claims about CLI leading to higher ratings for this particular innovation even less likely.

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3.1 Additional study related to Study 1

Although this study is not included as one of the thesis papers, it was conducted on the basis of Study 1, addressing similar research questions and employing a comparable methodology. By examining a different structural phenomenon within the Canadian contact setting, it extends the findings of Study 1 by providing additional experimental evidence that bilingual contact may promote structural innovation. Below, I offer a brief overview of the research questions, methodology, and preliminary results. Despite the fact that most participants had been recruited at the time of submission of this thesis, some statistical analyses and manuscript preparation were still ongoing; the findings presented here should therefore be considered provisional. Nevertheless, the study serves as a valuable source that supports and further extends the main findings of Study 1. More information on the project including experimental materials and statistical analyses can be found on OSF:

https://osf.io/rv6hz/overview?view_only=03bf5876837b434ea6f06a151cdb88e4

3.1.1 Motivation and research questions

The present study focuses on a different structural phenomenon in French, namely DF in motion constructions. Following Talmy's typology (2000), languages are typically classified either as VF, where Path is encoded in the verb (e.g., *descendre* 'to go down' in French), or as SF, where Path is encoded in a satellite accompanying the verb (e.g., *down* in *go down* in English). However, bilingual settings can blur these distinctions, especially when typologically different languages, such as French and English, come in contact. This might lead to DF, a phenomenon where the two typologies mix, resulting in the double encoding of Path in the verb and in the satellite (e.g., **descendre bas* 'to go down down'). Hence, DF structures are considered innovations.

The phenomenon of DF was selected because it has been attested to some degree in the spontaneous speech of French-speaking bilinguals living in contact situations, both historically and today (King, 2000; Treffers-Daller, 2012). However, it has been attested sporadically and in restricted contexts, for example in code-switching instances (e.g., *revenir back* 'to come back back'; Prince-Edward-Island French in King, 2000) or with specific particles (e.g., *tomber en bas* 'to fall below; Brussels French in Treffers-Daller, 2012). It is therefore unclear how French DF structures are generally perceived in contact situations.

On this basis, we explored whether bilingual contact boosts the overall acceptability and adaptation in acceptability (satiation) of French DF constructions. Unlike Study 1, we tested bilingual speakers in a high-contact (Canada) and a low-contact environment (France) (cf. Kootstra & Şahin, 2018; Poplack & Levey, 2010). The following research questions were addressed:

RQ1: How do French-English bilinguals in a high-contact (Canada) versus low-contact (France) environment rate innovative DF structures in French (e.g., **descendre bas* 'to go down down')?

RQ2: Do speakers adapt to DF over the course of the experiment by cumulatively increasing their acceptability ratings across trials? If yes, do speakers in Canada show stronger adaptation than speakers in France due to higher contact?

3.1.2 Methodology

To address these questions, an acceptability judgment task with 48 French-English bilinguals in Canada (Mean age = 29.9, SD = 6.4) and 48 French-English bilinguals in France (Mean age = 30.5, SD = 5.4) was conducted. The judgment task was implemented in Gorilla (Anwyl-Irvine et al., 2020) and participants were recruited over Prolific (Palan & Schitter, 2018). Information on participants' linguistic background including age of acquisition (AoA)

of French and English, as well as amount of French and English exposure and use were collected via LEAP-Q (Marian et al., 2007) and are provided in Table 1.

Table 1. Descriptives of participants in Canada (A) and France (B).

Group	*N*	*Mean French AoA (SD)*	*Mean English AoA (SD)*	*French Exposure % (SD)*	*French Use % (SD)*	*English Exposure % (SD)*	*English Use % (SD)*
A. Canada							
Early bilinguals (simultaneous and sequential)	16	0.75 (0.77)	3.94 (1.77)	50.00 (19.92)	66.19 (25.24)	47.00 (19.59)	37.64 (22.80)
L1 French - late L2 English	32	0.72 (0.77)	9.28 (3.11)	62.68 (20.31)	74.80 (22.65)	36.03 (19.68)	30.62 (24.87)
B. France							
Early bilinguals (simultaneous and sequential)	5	1.00 (1.22)	3.40 (1.82)	55.00 (7.91)	78.00 (18.91)	37.60 (6.99)	21.60 (18.85)
L1 French - late L2 English	43	0.70 (1.17)	9.86 (2.33)	71.23 (18.09)	83.12 (17.70)	26.67 (17.24)	16.05 (16.66)

The experimental items were French sentences containing a motion event and presented in four conditions (see Table 2). *Baseline* is the canonical, verb-framed variant in French (e.g., *descendre* 'to go down'). *DF Locative* is a marginally attested double-framing variant where the Path verb combines with a locative satellite instead of a directional (Path) satellite (e.g., *descendre en bas* 'to go down below') (cf. Treffers-Daller, 2012). *DF Path* is the target innovation where Path is encoded both on the verb and on the satellite (e.g., *descendre bas* 'to go down down'). *Neutral Verb* is another marginal variant where a neutral verb like *aller* 'to go' combines with a locative satellite, mirroring the English SF configuration (e.g., *aller en bas* 'to go below/down'). Ten French verbs corresponding to six different axes were

used: *entrer* 'to enter' (in-axis), *sortir* 'to exit' (out-axis), *descendre* 'to go down' (down-axis), *tomber* 'to fall' (down-axis), *monter* 'to go up' (up-axis), *avancer* 'to go forward' (forwards-axis), *progresser* 'to progress' (forwards-axis), *reculer* 'to go back' (backwards-axis), *revenir* 'to come back' (backwards-axis), and *se retourner* 'to turn around' (backwards-axis).

All experimental sentences were preceded by a context sentence, such as *Il a senti tout d'un coup une odeur de brûlé et…* 'He suddenly smelled something burning and…', in order to set a ground for the motion event. In total, 40 experimental items were created (10 items per condition), distributed across four presentation lists in a Latin Square design and interspersed with 80 fillers containing the structures tested in Karkaletsou et al. (2024), 50% of which were innovative.

Overall, the different conditions represent a continuum: *Baseline* is expected to be the most accepted variant, *DF Path* is expected to be the least accepted one, and the other two conditions should fall between. Participants were instructed to rate these sentences on a scale from 1 (totally unnatural) to 5 (totally natural) (see Karkaletsou et al., 2024 for similar instructions). The task was untimed, and all instructions were provided in French.

Table 2. Set of conditions with an example stimulus (without context sentence).

Condition	*Example stimulus*
Baseline	… il est **descendu** à grande vitesse. '…he went down at great speed'
DF Locative	… il est **descendu en bas** à grande vitesse. '…he went down below at great speed'
DF Path	… il est **descendu bas** à grande vitesse. '…he went down down at great speed'
Neutral Verb	…il est **allé en bas** à grande vitesse. '…he went down at great speed'

Participants' *Ratings* (ordered dependent variable) were analyzed via a cumulative link mixed-effects model (*ordinal* package; Christensen, 2023) in R (R Core Team, 2023). *Condition* (factor with 4 levels: Baseline, DF Locative, DF Path, Neutral Verb), *Country* (factor with two levels: Canada, France), *Trial Number* (continuous, centered and scaled) and their two-way and three-way interactions were used as fixed effects. *Participant* (factor with 96 levels) and *Item* (factor with 40 levels) were added as random effects in a maximal structure with random intercepts and slopes for all fixed effects with correlations. For model simplification and comparison, the same procedures as in Karkaletsou et al. (2024, p. 12) were followed.

In the Results section (3.1.3), I will report main predictor effects and interactions obtained via Analysis of Deviance *Anova*() (*car* package; Fox & Weisberg, 2019), and pairwise comparisons obtained via *emmeans* (*emmeans* package; Lenth et al., 2018). We extracted the pairwise comparisons via post-hoc testing (with *p*-value adjusting) and not through the model output directly due to the presence of many factor levels, and hence many comparisons.

3.1.3 Results

In this section, I only report the results that show how participants rated and adapted to the DF Path condition (i.e., the structural innovation of interest) compared to the other conditions. The Analysis of Deviance on the final model[4] revealed a significant main effect of *Condition* ($\chi^2(3) = 316.7$, $p < .0001$), and significant interactions between *Condition* and *Country* ($\chi^2(3) = 33.04$, $p < .0001$) and *Condition* and *Trial Number* ($\chi^2(3) = 16.4$, $p = .001$). However, the three-way interaction was not proven significant ($\chi^2(3) = 3.7$, $p = .3$).

[4] Final model formula: *Rating ~ Condition * Country * Trial Number + (1 + Condition | Participant) + (1 + Condition + Country | Item)*

Overall, DF Path was the lowest rated condition across both countries. In Canada, DF Path sentences were rated lower than Baseline (β = -4.25, *SE* = 0.4, z = -11.1, p < .0001), DF Locative (β = -2.97, *SE* = 0.3, z = -9.4, p < .0001) and Neutral Verb sentences (β = -2.43, *SE* = 0.3, z = -7.2, p < .0001). In France, similar patterns were observed: DF Path vs. Baseline (β = -6.49, *SE* = 0.4, z = -15.9, p < .0001), DF Path vs. DF Locative (β = -4.44, *SE* = 0.3, z = -13.6, p < .0001), DF Path vs. Neutral Verb (β = -3.19, *SE* = 0.3, z = -9.3, p < .0001). However, DF Path yielded significantly higher ratings in Canada than in France (β = 0.71, *SE* = 0.3, z = -2.1, p = .03) (see Figure 2). As for the effect of *Trial Number*, the analysis revealed that, over the course of the task, bilinguals in France significantly decreased their ratings for DF Path (β = -0.34, *SE* = 0.1, z = -3.6, p = .001), while this was not the case for bilinguals in Canada who remained stable over time (β = -0.17, *SE* = 0.1, z = -2.03, p = .2).

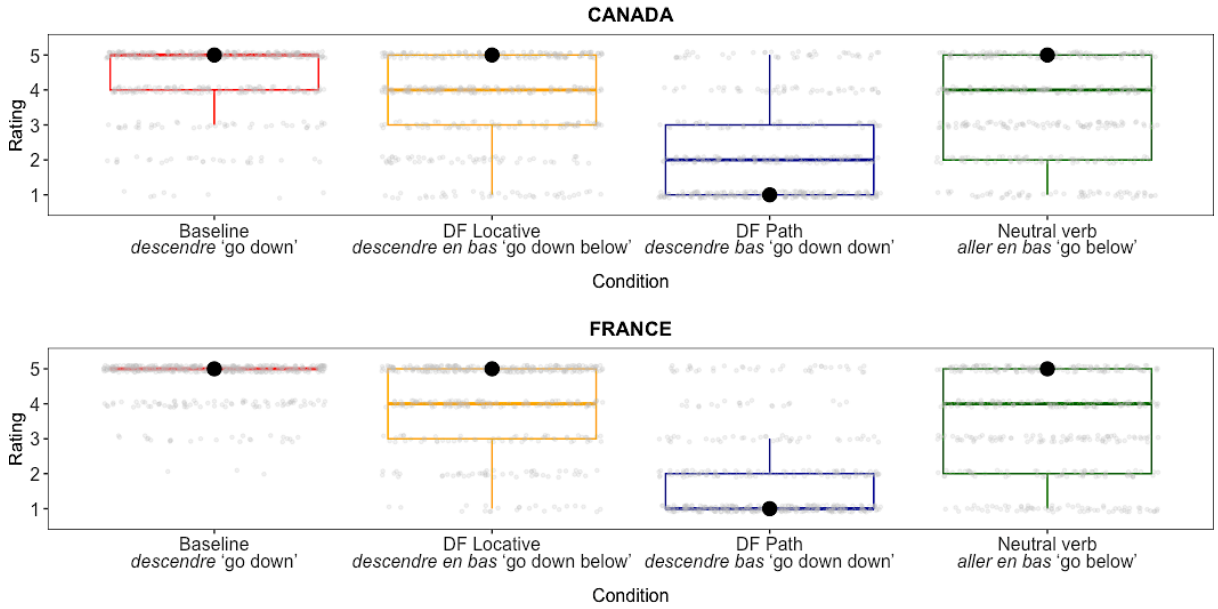

Figure 2. Distribution of raw ratings per *Condition* and *Country*. The black dot represents the most likely rating (mode) and the horizontal line the median rating.

3.1.4 Summary and conclusions

Taken together, the results indicate that DF Path constructions remain strongly dispreferred in modern French, even among bilingual speakers in high(er)-contact environments. In both Canada and France, DF Path received the lowest ratings compared to all other variants, confirming its status as an innovative and typologically marked structure.

At the same time, the data suggest an effect of bilingual contact. Bilinguals in Canada showed significantly higher acceptability for DF Path than bilinguals in France, indicating that sustained exposure to English may have increased tolerance for such structures. Although the effect is relatively small, it is consistent with the assumption that contact with a SF language like English can lead to the emergence or establishment of structural innovations such as DF (cf. King, 2000; Treffers-Daller, 2012).

With respect to adaptation/syntactic satiation, the results provide no evidence that participants cumulatively increased their acceptability ratings for DF Path during the task. Canadian bilinguals remained stable across trials, while French bilinguals showed a slight decrease in their ratings. This pattern suggests that brief repeated exposure does not lead to immediate syntactic satiation for DF constructions in French (cf. Karkaletsou et al., 2024).

Overall, this study complements Study 1 by showing that bilingual contact can modulate the acceptability of structural innovations, but that such effects are limited. Although speakers in a high-contact environment appear more receptive to structural innovations like DF, such structures remain substantially less acceptable than more canonical variants. The findings therefore support the broader conclusion that bilingual contact may facilitate, but does not fully drive, the integration of innovative forms into a bilingual's grammar.

Study 2 - Karkaletsou et al. (2025a)

Cross-linguistic structural priming of innovations in Canadian French

Evidence from a language contact situation

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Intra-individual language contact in bilinguals is considered a potential source for the emergence of structural innovations in a language, eventually leading to grammatical language change. This study investigates the psycholinguistic mechanisms involved in this process, focusing on cross-linguistic structural innovation priming. In a web-based self-paced reading experiment with production pre- and posttests, we tested Canadian French–English bilinguals on innovative French ditransitive and monotransitive structures primed by English sentences with the same structure or by control primes. No priming effect emerged for monotransitives. For ditransitives, however, reading times in the segment immediately following the innovation were significantly faster when primed by the corresponding English structure. In production, the proportion of innovative sentences did not significantly increase from pretest to posttest for either structure. Yet, production rates of innovative forms in both tasks were modulated by the individual degree of French contact. We discuss these differential outcomes with reference to theoretical accounts of the psycholinguistics of contact-induced change. Overall, these findings suggest that cross-linguistic priming can provide a pathway for structural innovations to enter bilingual grammars, potentially leading to language change. However, such processes are apparently constrained by the linguistic properties of the respective structure.

Keywords: language contact, structural innovations, adaptation, comprehension priming, production

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1. Introduction

A key question in linguistic and psycholinguistic research on language change is how structural innovations (i.e., syntactic structures that deviate from the standard prescriptive grammar of a language) emerge in a language. Within this field, a prominent position holds that the emergence of innovations is facilitated by language contact in bilingual individuals (cf. Fernández et al., 2017). On this basis, the present study investigates structures that are innovative in one language in that they carry the syntax of their grammatical translation equivalents in the other language. Initially, structural innovations might only arise among individual speakers. Over time and with repeated exposure and use, these individual innovations might spread to other speakers within the community or to other communities, leading to their consolidation in language and eventually to long-term grammatical language change (e.g., Doğruöz & Backus, 2009; Fernández et al., 2017; Heine & Kuteva, 2008; also see De Smet, 2017; Schmid, 2015).

However, the psycholinguistic mechanisms underlying these processes remain understudied. Relevant work suggests that *cross-linguistic structural priming* might be a driver of contact-induced language change (Baroncini et al., 2025; Fernández et al., 2017; Jaeger & Rosenbach 2008; Kootstra & Muysken, 2017, 2019; Kootstra & Şahin, 2018). Cross-linguistic structural priming occurs when exposure to a particular syntactic structure in a language facilitates subsequent comprehension or production of the same structure in another language. Cross-linguistic structural priming can be considered a particularly suitable candidate mechanism for language change for several reasons. First, it can reveal pathways through which particular structures emerge or are reinforced cross-linguistically. Second, structural priming effects can be long-lasting (e.g., Kaschak, 2007; Kaschak et al., 2011; Kaschak et al., 2014). Third, structural priming is typically enhanced when the speaker encounters more than one prime. Such cumulative priming effects, also referred to as (cumulative) *adaptation* (Kaan & Chun, 2018), may potentially cause long-lasting changes to a speaker's structural representations. Thus, cross-linguistic structural priming provides insight into how language contact can shape bilinguals' comprehension and production both short-term and long-term, with the latter pertaining to adaptation and potentially to language change.

Most cross-linguistic structural priming studies have investigated syntactic structures that are similar across languages (e.g., Bernolet et al., 2013; Hartsuiker et al., 2004; Kootstra & Doedens, 2016). Few studies, though, have tested structures that exist only in the prime language. If such structures nonetheless cause priming effects, they may lead to the production of innovative target structures (adults: Fernández et al., 2017; Hopp & Jackson, 2023; Kootstra & Şahin, 2018;

children: Hsin et al., 2013; van Dijk & Unsworth, 2023). However, results remain inconclusive regarding which structures or bilingual speakers are more susceptible to innovation and change (e.g., Fernández et al., 2017; Hopp & Jackson, 2023; Meisel, 2024). One reason is that most studies rely on production, where participants may hesitate to produce sentences perceived as ungrammatical. This can be avoided in comprehension, where priming effects can be observed without requiring production. Comprehension priming can thus reveal how speakers adapt to innovations not yet in their repertoire, capturing potential early-stage language change (Fraundorf & Jaeger, 2016; Karkaletsou et al., 2024). Despite its methodological advantage, comprehension priming of innovations is extremely understudied.

To address these gaps, the present study investigates adaptation in the comprehension of two French structural innovations in adult Canadian French–English bilinguals, whose across-time and current contact with French varies. Moreover, it investigates potential cumulative priming effects on subsequent unprimed production to test whether changes in the representations associated with adapted comprehension can lead to longer-term adaptation also in production (Tooley & Traxler, 2010).

The Canadian context was selected for several reasons. First, most cross-linguistic priming studies on structural innovations examine bilingual groups or communities within otherwise officially monolingual societies (e.g., Fernández et al., 2017; Hopp & Jackson, 2023; Kootstra & Şahin, 2018). These show that high language contact at the individual or community level — but not at the broader societal level — boosts innovations and contributes to change. However, officially bilingual societies like Canada (Statistics Canada, 2021 Census) have not been studied from this perspective, raising the question of whether high contact at multiple levels influences change similarly. Second, non-priming research on Canadian French shows that high English–French contact can drive the production (Mougeon et al., 2005) or acceptance (Karkaletsou et al., 2024) of innovative structures. Yet it remains unclear whether Canadian bilinguals adapt their comprehension and/or production of innovations in French when exposed to equivalent English structures, which could shed light on how such innovations emerge. Third, despite Canada's high overall bilingualism rate, individuals vary widely in their French contact. This variability allows us to test whether bilinguals with greater English–French contact (hence lower French-only contact) are more susceptible to innovations and thus to change.

1.1 Previous studies on cross-linguistic priming of structural innovations

Most cross-linguistic priming research has explored syntactic structures that are similar across the prime and the target language (e.g., Bernolet et al., 2013; Hartsuiker et al., 2004; Jacob et al., 2017; Kootstra & Doedens, 2016; Loebell & Bock, 2003; Schoonbaert et al., 2007; Travis et al., 2017). Little focus, though, has been given to structures that are innovative in the target language when they borrow the syntax of their translation equivalent in the prime language. This is crucial to investigate because such innovations have been found both in the speech of bilingual children (Nicoladis, 2006) and adults (Doğruöz & Backus, 2009; Dubois & Noetzel, 2005; Mougeon et al., 2005; Treffers-Daller, 2012). However, it is not clear how these innovations emerged: Is it due to contact with the other language or due to internally motivated changes, or both (cf. Dubois & Noetzel, 2005; Mougeon et al., 2005)?

In one of the first studies on cross-linguistic innovation priming, Hsin et al. (2013) found that Spanish–English bilingual children aged 4–5 could be primed from English to produce novel prenominal adjective–noun phrases in Spanish (**un verde libro* 'a green book') instead of the typical postnominal order (*un libro verde*). Similarly, van Dijk and Unsworth (2023) tested the same phenomenon in Spanish–Dutch and French–Dutch bilingual children. Results revealed that they were influenced by the prime languages Spanish/French to produce postnominal adjectives in Dutch, where prenominal is the standard grammatical option. These are, to our knowledge, the only two studies on innovation priming in children's production — but what about adults?

While there is some evidence that innovation priming may be stronger in children due to less stable representations and weaker inhibitory control (e.g., Hsin et al., 2013), there is at least some evidence that innovation priming can also occur in adults. In one of the few studies of this kind, Fernández et al. (2017) showed that Spanish–English bilinguals in New York City (high contact) and Córdoba, Argentina (low contact) could be primed from English to produce English-like innovations in Spanish (i.e., Spanish transitive constructions without the obligatory accusative marker *a* and reciprocals without the obligatory reflexive *se*). Although the overall number of innovations was low, US bilinguals produced more innovations than Argentinian bilinguals, suggesting that higher contact with a non-target language may facilitate innovation. Similarly, Kootstra and Şahin (2018) found that Papiamento–Dutch bilinguals in the Netherlands (high contact) and Aruba (low contact) produced prepositional object datives in Papiamento (*Obi ta duna e buki na Pieter* 'Obi gives a book to Pieter'), a highly dispreferred structure in Papiamento, after similar Dutch primes, with higher-

contact bilinguals in the Netherlands showing more innovations than those in Aruba.

These two studies indicate that bilingual adults can be primed cross-linguistically to produce innovations, especially when contact with the target language is low(er). However, both studies tested early bilinguals and considered the type of environment (high vs. low contact). A recent study by Hopp and Jackson (2023) also investigated cross-linguistically different structures, but this time in L1 German–late L2 English speakers in Germany. They found no priming from German to use innovative word orders in English (**On Sunday drinks the father in the pub*). While not fully consistent with Meisel's (2024) claim that L2 learners are "the most likely agents of fundamental syntactic change" (p. 31), these findings may be due to the specific innovation tested.

The few studies investigating cross-linguistic priming of innovations have primarily focused on production, with very little work on comprehension. This focus likely stems from language change being primarily observable in speech. However, focusing on production may contribute to inconclusive results, as bilinguals might hesitate to produce structures that they perceive as ungrammatical, even after repeated exposure. Comprehension priming could reveal how processing of an innovation changes based on input from another language, potentially indicating early stages of language change before production occurs (Tooley & Traxler, 2010). Supporting this, Jacob et al. (2025) found that early Turkish–German bilinguals in Germany read innovative German sentences with ungrammatical analytic comparatives (**mehr schön* 'more beautiful') faster after Turkish primes with the equivalent Turkish comparative than after control primes.

Overall, prior work on cross-linguistic priming of innovations shows relatively consistent findings for children but not for adults. Adult studies mostly target production and typically test one structure (except Fernández et al., 2017), leaving open which structures are more prone to innovation. Despite that, a common consensus seems to be that argument structure phenomena may be especially susceptible to change (Fernández et al., 2017) since the subcategorization information encoded in the lexical representation and its mapping onto syntax vary considerably across languages (Levin & Rappaport Hovav, 2005 as cited in Fernández et al., 2017). This is why we also test argument structure in this study. It also remains unclear which bilinguals adapt to innovations the most. Existing studies either test one group of bilinguals in one environment (Hopp & Jackson, 2023; Jacob et al., 2025) or different groups in different environments (Fernández et al., 2017; Kootstra & Şahin, 2018), but none examine individual variation in contact within a single environment. This is crucial, however, for contact settings like Canada, where we ask whether bilinguals with higher English–French contact

(hence lower French-only contact) are more susceptible to innovation than bilinguals with predominantly French contact.

1.2 The present study

This study investigates immediate and cumulative priming (adaptation) in the real-time comprehension of French innovations by Canadian French–English bilinguals. It also tests whether repeated exposure influences production and examines the role of bilinguals' individual contact with French (cf. Fernández et al., 2017; Kootstra & Şahin, 2018). To this end, we used a cross-linguistic priming task with self-paced reading, where English prime sentences preceded French target sentences. A written picture-description pretest established baseline production of innovations, while a posttest assessed changes in production after the priming task.

Most studies on innovation priming focus on local phrase-level phenomena, such as adjective–noun order (van Dijk & Unsworth, 2023) or comparative formation (Jacob et al., 2025). Our study is among the first to investigate sentence-level innovations, specifically two argument structure phenomena in French modeled on English (cf. Karkaletsou et al., 2024). The first concerns ditransitives. Standard French uses Prepositional Object (PO) structures with the dative marker *à* (*L'homme donne un cadeau à la femme*), whereas English allows both PO (*The man gives a present to the woman*) and Double Object (DO) structures (*The man gives the woman a present*). French DO-like structures omitting *à* (**L'homme donne la femme un cadeau*) are innovative. The second involves monotransitives requiring prepositions *à* or *de* on their object in French (*Le garçon obéit à la femme / s'approche de la femme*) but not in English (*The boy obeys the woman / approaches the woman*). Omitting the preposition in French (**Le garçon obéit la femme / s'approche la femme*) is likewise innovative.

Innovative monotransitives are attested in Ontario French (Mougeon et al., 2005), whereas innovative ditransitives lack reported evidence. Hence, we test two structures that might be at different stages of ongoing change in French. However, both innovations show high acceptance among Canadian bilinguals, particularly those with lower French contact (Karkaletsou et al., 2024). We therefore test whether bilinguals adapt their comprehension and/or production differently to innovations that appear more established (monotransitives) versus more novel (ditransitives).

1.3 Research questions and hypotheses

The first research question (RQ1) explores whether French sentences with an innovative syntax can be primed by English sentences of the same structure. If this is the case, we should observe a priming effect in our self-paced reading results, with innovative French target sentences being read faster after English primes carrying the same structure than after control primes. We predict such effects for both innovation types.

The second research question (RQ2) investigates whether bilinguals rapidly adapt to English-like innovative French sentences upon repeated exposure during the experimental session. If such rapid adaptation takes place, we should observe a significant main effect of trial number, with gradually faster reading times for the innovations while the experiment proceeds. While we predict such adaptation effects for both innovation types, we might find differences based on previous findings. In particular, Karkaletsou and colleagues (2024) found different adaptation effects in acceptability ratings for monotransitive versus ditransitive French innovations, potentially because the former is a more familiar innovation than the latter. If similar processes are involved in real-time comprehension, bilingual speakers might show stronger adaptation to monotransitive than to ditransitive French targets.

The third research question (RQ3) examines whether exposure to the innovative French structures during the experimental session leads to increased production of such innovative structures after the experiment. We predict that, if priming has longer-term effects on participants' representations, it might influence subsequent production, leading to a higher number of innovations in the posttest compared to the pretest. This is expected for both ditransitive and monotransitive innovations (cf. Fernández et al., 2017).

The fourth research question (RQ4) explores to what extent innovation priming, and also the production of innovative French structures in general, are affected by the individual degree of contact with French. One possibility is that speakers with lower French contact might show stronger innovation priming in comprehension. In production, individuals with lower French contact may be relatively less reluctant to produce innovative sentences than individuals with higher French contact; the latter may be especially hesitant to produce innovative structures because they are perceived as ungrammatical. Finally, the degree of French contact may also affect adaptation to innovative structures, with stronger adaptation effects in individuals who experience less French contact (cf. Fernández et al., 2017; Kootstra & Şahin, 2018).

2. Methodology

2.1 Participants

Data collection was conducted via Prolific (https://www.prolific.co/) using pre-screening criteria to recruit bilingual French–English speakers aged 18–40. Participants provided informed consent and completed the LEAP-Q (Marian et al., 2007) for linguistic background information.

Eighty-six participants initially completed the study; 13 were excluded due to early acquisition of additional languages or language-related disorders. The final sample included 73 Canadian bilinguals (Mean age = 28.7, *SD* = 6.1) born, raised and residing in Canada. Participants varied in their age of onset (AoO) of French and English acquisition: Eighteen participants (24.7%) acquired both languages before age 5 (Mean AoO French = 2.1 years, *SD* = 0.7; English = 1.8 years, *SD* = 0.8); twenty-four (32.9%) acquired English from birth and French from age 5 onward (Mean AoO French = 6.6 years, *SD* = 1.9); and thirty-one (42.5%) acquired French from birth and English after age 5 (Mean AoO English = 8.2 years, *SD* = 3.04). On average, participants reported exposure to French 38.7% (*SD* = 29.5) and use of French 43% of their time (*SD* = 36.9).[1] All completed the LexTALE proficiency test for French (Brysbaert, 2013) and English (Lemhöfer & Broersma, 2012).[2] For the distribution of participants across French and English exposure, use and proficiency see respective figure on OSF (under "Plots").

To account for individual differences in contact, a composite French Score was created using factor analysis (*factanal* in R; Raiche & Magis, 2022). This score combined four variables: AoO difference for French and English (LEAP-Q), proportion of current French exposure (LEAP-Q), proportion of current French use (LEAP-Q), and French proficiency (LexTALE). Higher French scores indicate higher individual French contact across time and currently in life (cf. Karkaletsou et al., 2024). Detailed information on how the French score was created can be found in the OSF for this paper, including the weights of the individual variables.

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1. In LEAP-Q, participants reported the percentage of current and average exposure and use of each language. Only those whose percentages for English and French summed up to ~100% were included.

2. In LexTALE, participants judged whether the provided letter strings are existing or non-existing words. Although it is a lexical decision task, it reliably estimates overall proficiency including syntactic knowledge (Lemhöfer & Broersma, 2012).

2.2 Materials

The production pretest involved an unprimed written picture description task in French (cf. Cleland & Pickering, 2006 for written versus oral modality in priming), using six verbs per structure (12 total) and one image per verb. Images from the MultiPic database (Duñabeitia et al., 2022) featured three entities arranged in a triangle. Each verb appeared only once to avoid repetition and self-priming. The two structures served as fillers for each other and were mixed with six additional three-entity filler images targeting other structures. For ditransitives, the verbs used were *donner* 'to give', *vendre* 'to sell', *apporter* 'to bring', *montrer* 'to show', *envoyer* 'to send', and *lancer* 'to throw'. Images included an animate subject (e.g., wizard), an animate indirect object (e.g., mailman), and an inanimate direct object (e.g., newspaper). French labels for the entities and the verb appeared alongside the images and object positions were counterbalanced across verbs (Figure 1). For monotransitives, the verbs were *jouer (à)* 'to play sports/games', *obéir (à)* 'to obey', *ressembler (à)* 'to resemble', *jouer (de)* 'to play an instrument', *se souvenir (de)* 'to remember', and *s'approcher (de)* 'to approach'. Images included an animate subject (e.g., pilot), an inanimate object (e.g., soccer ball), and a context (e.g., forest). All ditransitive and monotransitive verbs were shown in isolation, without any information about their subcategorization frame or any function words. The posttest mirrored the pretest, using the same verbs but different arguments and images to prevent spillover effects. For ditransitives, object positions were reversed across verbs to avoid order effects. Stimuli were randomized within participants.

The self-paced reading stimuli consisted of English prime–French target sentence pairs using the same six verbs per structure type as in the pre-/posttest. English primes and French targets shared the same verb (translation equivalent) to maximize the potential for a priming effect (cf. Schoonbaert et al., 2007). French targets used the innovative variant: ditransitives omitted the dative marker *à* on the indirect object, while monotransitives omitted the prepositions *à* or *de* on the object.

French ditransitive targets were preceded by English primes in three conditions: Grammatical Double-Object (DO) primes (the grammatical structural equivalent in English), Grammatical Prepositional-Object (PO) primes (the grammatical alternative in English), and Ungrammatical PO primes (the ungrammatical alternative in English) (Table 1-top). Monotransitive targets were preceded by English primes in two conditions: Grammatical primes (the grammatical structural equivalent in English) and Ungrammatical primes (the ungrammatical alternative in English) (Table 1-bottom). We included ungrammatical control primes to control for whether a priming effect is indeed caused

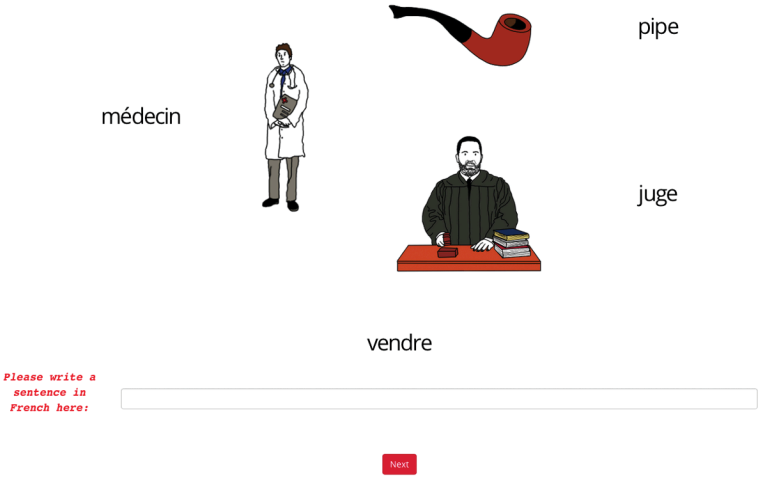

Figure 1. Example ditransitive stimulus in the pretest, as presented on Gorilla

by structural equivalence, or by ungrammaticality as such (i.e., with ungrammatical primes causing faster reading of ungrammatical targets irrespective of structure). For ditransitives, the Ungrammatical PO English primes contained scrambled POs, which are grammatical structures in French. For monotransitives, the Ungrammatical English primes contained accusative marking on the direct object. All stimuli were segmented into five regions, with Region 3 containing the innovation; this region served as the critical region in the analyses.

Table 1. Example ditransitive (top) and monotransitive (bottom) stimulus

Ditransitive Prime Condition	**Region 1**	**Region 2**	**Region 3**	**Region 4**	**Region 5**
Grammatical Double Object	The man	sells	the actress a ring	during the sale	at the store.
Grammatical Prepositional Object	The man	sells	a ring to the actress	during the sale	at the store.
Ungrammatical Prepositional Object	The man	sells	to the actress a ring	during the sale	at the store.
Ditransitive Target					
French innovation	Le sorcier	vend	***le pompier une jupe**	dans le parc	de la ville.
	'The sorcerer'	'sells'	'the firefighter a skirt'	'in the park	'of the city.'
Monotransitive Prime Condition	**Region 1**	**Region 2**	**Region 3**	**Region 4**	**Region 5**
Grammatical	The team	obeys	the captain	during the match	in the stadium.
Ungrammatical	The team	obeys	to the captain	during the match	in the stadium.
Monotransitive Target					
French innovation	La femme	obéit	***le pompier**	dans la rue	devant la maison.
	'The woman'	'obeys'	'the firefighter'	'in the street'	'in front of the house.'

Twelve English prime–French target pairs were created per condition per structure, resulting in 36 ditransitive and 24 monotransitive stimuli. Using a Latin Square design, stimuli were distributed across three lists for ditransitives and two for monotransitives, then combined into six final lists (3x2) to test both structures in the same session. Each list included 96 items: 60 experimental items (36 ditransitives, 24 monotransitives) and 36 fillers (reciprocal structures), presented in randomized order. Participants' attention was checked using yes/no comprehension questions for one-third of the items, with half requiring "yes" responses. Stimuli were split into two blocks per participant, each containing half of the items (18 ditransitives, 12 monotransitives, 18 fillers). Blocks were separated by a 3-minute break, with the same order of blocks presented across participants.

2.3 Procedure

All tasks were conducted using Gorilla (Anwyl-Irvine et al., 2020). Participants began with an untimed pretest, writing sentences for on-screen images using provided labels. Next, they completed the self-paced reading priming task. Each trial started with a 500 ms fixation cross, followed by an English prime sentence presented region-by-region in a moving-window display. Participants had to press the spacebar to reveal each segment. After the prime, another fixation cross appeared for 500 ms, followed by the French target sentence appearing in the same way. After the priming task, participants completed the posttest, following the same procedure as in the pretest. They then took the English and French LexTALE tests (presented in this fixed order to align with the priming direction), followed by the LEAP-Q which they completed in their preferred language (Canadian English or Canadian French). Instructions were consistently provided in English, the priming language. The study lasted approximately 50 minutes in one session, and participants received compensation through the platform upon completion.

2.4 Data pre-processing and analyses

Production data were analyzed with generalized linear mixed-effects models and reading-time data with linear mixed-effects models using *lme4* (Bates et al., 2015b) in R 4.4.2 (R Core Team, 2023). Models initially included a maximal random-effects structure (i.e., all random slopes by participant and item with their correlations). Upon non-convergence or overfitting, the maximal structure was gradually simplified: correlations among random effects were removed, zero- or near-zero variance components were eliminated stepwise, then correlations among remaining effects were reintroduced (Bates et al., 2015a). Models were compared via like-

lihood ratio tests using the *anova*() function in R (*car* package; Fox & Weisberg, 2019), and the final model was selected based on AIC and BIC criteria.

In the results, we first report main predictor effects and interactions, and then the specific model outputs to show the direction of these effects. Main effects and interactions were extracted from the final models via Analysis of Deviance (Type II Wald chi-square test) using the function *Anova*() (*car* package). If the main effect of a categorical predictor or the interaction between a categorical and a continuous predictor was significant, we re-leveled the model to obtain the rest of the comparisons.

Pre- and posttest

French pre- and posttest productions were categorized as: (A) 'Target Standard' for complete, grammatical PO ditransitives (canonical or scrambled) and monotransitives (with *à*- or *de*-marking); (B) 'Target Innovative' for complete productions with the investigated omissions (*à* for ditransitives, *à* or *de* for monotransitives); (C) 'Non-target/Other' for complete but non-(A) or (B) productions; and (D) 'Incomplete/Missing'. We excluded (C) and (D) from the analyses, removing 135/888 ditransitives (15.2%) and 150/888 monotransitives (16.9%).

Ditransitive and monotransitive data were analyzed separately, and the proportion of innovations over standard productions was measured. Fixed effects were *Task* (categorical predictor: Pretest, Posttest), *French Score* (continuous predictor, scaled and centered) and their interaction. *Task* was treatment-coded with Pretest as reference. *French Score* was added in an additional analysis since we first investigated only the effect of *Task* and later the effect of *French Score* on innovative productions.

Self-paced reading

Ditransitive and monotransitive data were analyzed separately due to design differences (i.e., different number of English prime conditions). RTs were trimmed stepwise. First, trials with total raw RTs for the English primes ≤ 1000 ms were excluded (i.e., ≤ 200 ms per region; cf. Jegerski, 2014), since priming is unlikely in these cases. Second, log RTs in target regions 2 (pre-innovation), 3 (innovation) and 4 (post-innovation) that were ± 2 standard deviations (*SD*s) from the mean reading time of the region per participant and *Prime Condition* were eliminated. Target RTs were log-transformed for the trimming to make the underlying distributions as normal as possible, since the raw RT distributions are always left-skewed. Overall, almost 4.5% of the data were removed per structure.

Log-transformed RTs for Region 3 (innovation) and Region 4 (i.e., post-innovation) were analyzed separately. We analyzed RTs in the post-innovation

region because spillover or delayed effects appear often in self-paced reading studies (Frank et al., 2013), especially among bilinguals (e.g., Jegerski & Keating, 2023 for early bilinguals; Kosaka, 2024 for L2 learners). The models included *Prime Condition* (categorical predictor: Grammatical DO vs. Grammatical PO vs. Ungrammatical PO for ditransitives; Grammatical vs. Ungrammatical for monotransitives), *Trial Number* (continuous predictor, scaled and centered), *French Score* (continuous predictor, scaled and centered) and their interactions as fixed effects. *Prime Condition* was treatment-coded with Grammatical DO and Grammatical respectively (i.e., the English structural equivalent primes to the French target) as reference levels. *Trial Number* was included to investigate potential adaptation effects across trials. Similarly to the production data, *French Score* was included in additional analyses.

3. Results

3.1 Production tasks (Pre- and Posttest)

3.1.1 *Production of ditransitive innovations*

In the pretest, participants produced 343 standard PO sentences (either with a canonical or scrambled constituent order) and 12 sentences with an innovative ditransitive structure which resembled the English DO structure. In the posttest, 373 standard PO sentences and 18 innovative ditransitives were produced. Overall, innovations were produced by a total of fifteen participants (i.e., 20.5% of the sample).

The Analysis of Deviance revealed no main effect of *Task* ($\chi^2(1) = 0.26$, $p = .60$), showing that the proportion of innovative ditransitives did not significantly increase from pre- to posttest ($\beta = 0.35$, $SE = 0.69$, $z = 0.51$, $p = .60$).

3.1.2 *Production of monotransitive innovations*

The results for the pretest showed a total of 251 standard monotransitives and 103 innovative monotransitives. In the posttest, participants produced 273 standard monotransitives and 104 innovative monotransitives. Innovations were produced by forty-three participants in total (i.e., 58.9% of the sample).

The Analysis of Deviance revealed no main effect of *Task* ($\chi^2(1) = 0.02$, $p = .80$), indicating no significant difference between pre- and posttest concerning the number of innovations produced ($\beta = -0.12$, $SE = 0.77$, $z = -0.15$, $p = .80$).

3.1.3 *Production of innovations and individual contact with French*

To assess whether the production of French innovations was influenced by participants' French contact, we conducted additional analyses incorporating *French*

Score as a predictor. The respective model analyses predicted *Target Sentence (innovative or standard)*, with *Task, French Score*, and their interaction as predictors as well as random intercepts for participants and items. For ditransitives, *French Score* showed a significant main effect ($\chi^2(1) = 7.43$, $p = .006$), but no interaction with *Task* ($\chi^2(1) = 0.003$, $p = .96$). Concretely, increasing *French Score* was associated with fewer innovations in the pretest ($\beta = -2.37$, $SE = 1.09$, $z = -2.16$, $p = .03$), and this effect did not significantly change in the posttest ($\beta = 0.06$, $SE = 1.13$, $z = 0.05$, $p = .90$). For monotransitives, *French Score* also showed a significant main effect ($\chi^2(1) = 50.04$, $p < .0001$), but no significant interaction with *Task* ($\chi^2(1) = 0.09$, $p = .8$). Again, increasing *French Score* led to fewer innovations in the pretest ($\beta = -3.27$, $SE = 0.51$, $z = -6.43$, $p < .0001$), and this effect remained stable in the posttest ($\beta = 0.12$, $SE = 0.42$, $z = 0.29$, $p = .8$) (Figure 2).

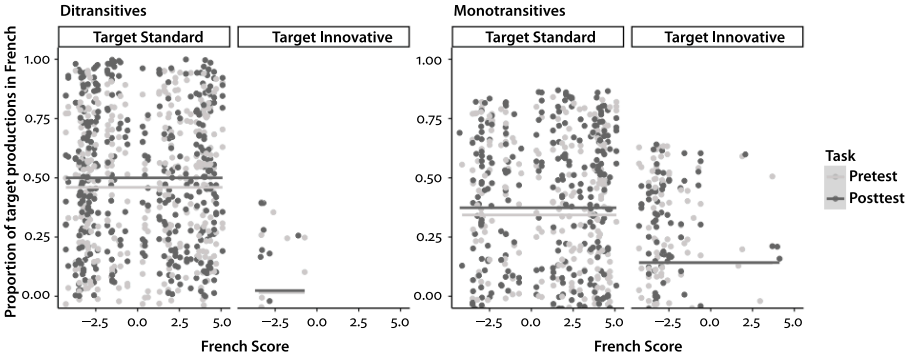

Figure 2. Individual (dots) Target Standard and Target Innovative productions in the pre- and posttest as a function of French Score (non-centered) for ditransitives (left) and monotransitives (right)

3.2 Priming task (Self-paced reading)

3.2.1 *RTs for ditransitive innovations*

Here we report the results for Region 3 (innovation) and Region 4 (post-innovation). Mean RTs in milliseconds for both regions are shown in Table 2.

For innovative French ditransitives, the main effect of *Prime Condition* in Region 3 was not significant ($\chi^2(2) = 0.93$, $p = .60$), suggesting that participants did not read the innovative segment of the French target faster after encountering Grammatical DO primes (i.e., structural equivalent) than after encountering the other two conditions (see Table 3-A). *Trial Number* was shown to have a significant main effect on RTs ($\chi^2(1) = 28.78$, $p < .0001$), with participants reading the critical segment overall faster across experimental trials. However, the interaction

Table 2. Mean RTs in ms (standard error) across target regions per English *Prime Condition*

French target region	Grammatical DO Prime	Grammatical PO Prime	Ungrammatical PO Prime
Critical Region 3	935.4 (20.7)	935.8 (21.2)	968.6 (22)
Postcritical Region 4	699.6 (12)	732.6 (13.3)	697.5 (11.2)

between *Trial Number* and *Prime Condition* did not reach significance ($\chi^2(2) = 3.3$, $p = .20$), indicating that participants were becoming faster at reading the innovative segment regardless of the preceding prime (Table 3-A).

Unlike Region 3, Region 4 (post-innovation) revealed a main effect of *Prime Condition* ($\chi^2(2) = 7.66$, $p = .02$), with Grammatical DO primes leading to faster reading for this segment compared to Grammatical PO primes but not compared to Ungrammatical PO primes (Table 3-B). We releveled the model to obtain the difference between the other two conditions, and it revealed that Ungrammatical PO primes also led to faster RTs compared to Grammatical PO primes ($\beta = 0.03$, $SE = 0.01$, $t = 2.53$, $p = .01$). Regarding adaptation across the task, *Trial Number* had a significant main effect ($\chi^2(1) = 17.63$, $p < .0001$) but again did not interact significantly with *Prime Condition* ($\chi^2(2) = 2.15$, $p < .3$). This shows that participants were also reading this French region faster across trials regardless of the structure of the English prime (Table 3-B). For a visualization of the *Trial Number* effect on the two target regions of interest see respective figure on OSF (under "Plots").

Table 3. Summary (fixed effects) linear mixed models of log RTs for ditransitives (Intercept: Grammatical DO, scaled and centered *Trial Number* centered at 0)

A. Region 3 (le pompier une jupe*)**

	β	*SE*	*t*	*p*
(Intercept)	6.65	0.06	113.15	<.0001
Prime Condition 1 *(DO prime vs. Grammatical PO prime)*	−0.007	0.02	−0.38	.7
Prime Condition 2 *(DO prime vs. Ungrammatical PO prime)*	0.01	0.02	0.58	.6
Trial Number	−0.06	0.02	−3.36	**.001*****
Prime Condition 1 * *Trial Number*	−0.02	0.02	−1.25	.2
Prime Condition 2 * *Trial Number*	−0.03	0.02	−1.77	.1

Model formula: log-RT Region-3 ~ Prime Condition
* Trial Number + (1 + Trial Number | Participant) + (1 | Item)

B. Region 4 (*dans le parc*)

	β	*SE*	*t*	*p*
(Intercept)	6.45	0.04	174.39	<.0001
Prime Condition 1 (DO prime vs. Grammatical PO prime)	0.03	0.01	2.28	**.02***
Prime Condition 2 (DO prime vs. Ungrammatical PO prime)	−0.003	0.01	−0.25	.8
Trial Number	−0.04	0.01	−3.13	**.002****
*Prime Condition 1 * Trial Number*	0.006	0.01	0.41	.7
*Prime Condition 2 * Trial Number*	−0.01	0.01	−1.01	.3

Model formula: log-RT Region 4 ~ Prime Condition
* Trial Number + (1 + Trial Number | Participant) + (1 | Item)

3.2.2 *RTs for monotransitive innovations*

Mean RTs in milliseconds in the French critical Region 3 and postcritical Region 4 of monotransitives per English *Prime Condition* are presented in Table 4.

Table 4. Mean RTs in ms (standard error) across target regions per English *Prime Condition*

French target region	Grammatical Prime	Ungrammatical Prime
Critical Region 3	589.9 (10.5)	582.4 (10.6)
Postcritical Region 4	627.7 (11.5)	624.5 (10.6)

Region 3 revealed no main effect of *Prime Condition* ($\chi^2(1) = 1.26$, $p = .2$), indicating that participants did not read the French innovation faster after encountering Grammatical primes (i.e., structural equivalent) than after encountering Ungrammatical primes in English (Table 5-A). *Trial Number* showed a significant main effect in this region ($\chi^2(1) = 8.15$, $p = .004$) but did not interact significantly with *Prime Condition* ($\chi^2(1) = 0.52$, $p = .5$). Hence, RTs for this region decreased significantly across trials, but to the same extent after Grammatical and after Ungrammatical English primes (Table 5-A).

The postcritical Region 4 did not reveal a main effect of *Prime Condition* either ($\chi^2(1) = 0.05$, $p = .8$), showing that RTs in this segment were not significantly different after Grammatical primes compared to Ungrammatical primes in English (Table 5-B). Similarly to Region 3, *Trial Number* showed a significant main effect ($\chi^2(1) = 15.22$, $p < .0001$), but no significant interaction with *Prime Condition* ($\chi^2(1) = 3.29$, $p = .1$). Again, participants were getting faster at reading the target

regardless of the type of the English primes (Table 5-B). For a visualization of the *Trial Number* effect on the two target regions of interest, see respective figure on OSF.

Table 5. Summary (fixed effects) linear mixed models of log RTs for monotransitives (Intercept: Grammatical, scaled and centered *Trial Number* centered at 0)

A. Region 3 (*le pompier)

	β	*SE*	*t*	*p*
(Intercept)	6.26	0.04	161.35	<.0001
Prime Condition	−0.02	0.02	−1.11	.3
(Grammatical vs. Ungrammatical prime)				
Trial Number	−0.05	0.02	−2.39	**.02** *
*Prime Condition * Trial Number*	−0.01	0.02	−0.72	.5

Model formula: log-RT Region 3 ~ Prime Condition
* Trial Number + (1 + Prime Condition + Trial Number | Participant) + (1 + Prime Condition + Trial Number | Item)

B. Region 4 (*dans la rue*)

	β	*SE*	*t*	*p*
(Intercept)	6.34	0.04	157.77	<.0001
Prime Condition	−0.003	0.01	−0.24	.8
(Grammatical vs. Ungrammatical prime)				
Trial Number	−0.04	0.01	−2.65	**.01****
*Prime Condition * Trial Number*	−0.03	0.01	−1.81	.1

Model formula: log-RT Region 4 ~ Prime Condition
* Trial Number + (1 + Trial Number | Participant) + (1 | Item)

3.2.3 *RTs for innovations and individual contact with French*

Additional analyses to examine the role of the individual degree of contact with French were conducted. For ditransitives, the Analysis of Deviance revealed no significant main effect of *French Score*, neither for Region 3 ($\chi^2(1) = 0.0001$, $p = .9$) nor for Region 4 ($\chi^2(1) = 0.42$, $p = .5$). Indeed, the models showed that participants read both target regions at a similar speed after Grammatical DO primes regardless of their French scores (Region 3: $\beta = 0.007$, $SE = 0.06$, $t = 0.13$, $p = .9$; Region 4: $\beta = -0.04$, $SE = 0.04$, $t = -0.97$, $p = .3$). The interaction between *French Score* and *Prime Condition* also did not reach significance in Region 3 ($\chi^2(2) = 2.6$, $p = .3$) or in Region 4 ($\chi^2 = 2.8$, $p = .2$). In other words, the effect of *French Score* did not significantly change across prime conditions: increasing French Score in participants did not result in faster reading of Region 3 after Grammatical PO

primes (β = −0.02, *SE* = 0.02, *t* = −0.88, *p* = .4) or after Ungrammatical PO primes (β = −0.03, *SE* = 0.02, *t* = −1.62, *p* = .1) compared to after Grammatical DO primes. The same was found for the postcritical Region 4: Grammatical DO vs. Grammatical PO Prime (β = 0.006, *SE* = 0.01, *t* = 0.43, *p* = .7) and Grammatical DO vs. Ungrammatical PO Prime (β = 0.02, *SE* = 0.1, *t* = 1.63, *p* = .1).

For monotransitives, no main effect of *French Score* was detected in Region 3 ($\chi^2(1) = 0.98$, *p* = .3) or in Region 4 ($\chi^2(1) = 0.000$, *p* = .9). Indeed, the model output showed that increasing French score in participants did not significantly affect RTs either in Region 3 (β = 0.02, *SE* = 0.04, *t* = 0.42, *p* = .7) or Region 4 (β = −0.01, *SE* = 0.04, *t* = −0.34, *p* = .7). However, the interaction between *French Score* and *Prime Condition* was proven significant in the innovation region ($\chi^2(1) = 5.13$, *p* = .02), revealing that increasing French score in participants led to faster reading of this segment after Ungrammatical primes compared to Grammatical primes in English (β = −0.03, *SE* = 0.01, *t* = −2.29, *p* = .02). The same was found for the post-innovation segment (β = −0.04, *SE* = 0.01, *t* = −2.85, *p* = .004). This shows that, for participants with higher individual contact with French, Ungrammatical primes in English facilitated reading of the innovation and post-innovation regions more than Grammatical primes did. Despite the fact that Ungrammatical English primes triggered faster RTs than Grammatical primes in participants with higher French Score, the releveled models showed that the effect of *French Score* in the Ungrammatical Prime condition remained non-significant both for Region 3 (β = −0.02, *SE* = 0.04, *t* = −0.39, *p* = .7) and for Region 4 (β = −0.05, *SE* = 0.04, *t* = −1.35, *p* = .20).

4. Discussion

This study investigated whether innovative ditransitive and monotransitive French structures can be primed by their English equivalents, and to what extent bilingual participants in Canada may rapidly adapt to such innovative structures during the experimental session. In addition, we explored longer-term priming effects on subsequent unprimed production. Finally, we also investigated whether these effects are influenced by the individual degree of French contact, as measured by the French Score.

4.1 Cross-linguistic priming of innovations (RQ1)

The self-paced reading results showed different patterns for ditransitives and monotransitives. For ditransitives, as predicted, we found a significant priming effect, with faster reading times (RTs) for innovative French DO sentences after

English DO (*sells the actress a ring*) primes than after English PO primes (*sells a ring to the actress*) in the post-innovation region. For monotransitives, in contrast, no priming effect emerged. This differential finding is consistent with prior work investigating cross-linguistic innovation priming for different structural phenomena and language pairs, where some studies found innovation priming (e.g., Hsin et al., 2013; Jacob et al., 2025; van Dijk and Unsworth, 2023), while others did not (e.g., Hopp & Jackson, 2023).

Interestingly, our results for ditransitives also showed significant innovation priming for ungrammatical PO primes with the same recipient–theme order as in the DO (**sells to the actress a ring*). In other words, the innovative French target DO structure (**vend le pompier une jupe*) was easier to process after *any* English prime sentences with the same recipient–theme order, irrespective of whether they were grammatically correct or not. A possible explanation for this finding is that, during processing of the ungrammatical English PO prime, the parser may have noticed that the sentence is incorrect and may have tried to determine the presumably intended correct version of the sentence. As ungrammatical PO sentences such as *The man sells to the actress a ring* can easily be turned into a grammatically correct English DO sentence by deleting the preposition *to*, this process may have led to the activation of a DO representation during processing of the ungrammatical prime, which may then have caused a priming effect.

The assumption that the parser attempts to repair ungrammatical prime sentences during processing, and activates a grammatically correct equivalent of the ungrammatical sentence, may also constitute a possible explanation for the lack of priming for monotransitives: For ungrammatical English primes such as *The team obeys to the captain during the match*, the parser may repair the sentence by deleting the preposition *to*, leading to the activation of a grammatically correct monotransitive sentence. As this is precisely the prime structure in the control condition, no difference between the two conditions may emerge.

Another possible explanation for the difference between ditransitives and monotransitives relates to the representations of the French verbs which serve as the head of the two structures: Monotransives with prepositions can only occur with a highly restricted set of specific verbs. Thus, the information whether a monotransitive verb can serve as the grammatical head of this specific structure or not necessarily has to be stored within the lexical entry for the verb. This may make innovative French monotransitives with these verbs particularly hard to prime. For French ditransitives, in contrast, the respective ditransitive verbs can obviously all serve as the head of a ditransitive structure because they frequently occur as part of traditional French PO ditransitives. In general, it is conceivable that cross-linguistic structural priming of innovations is affected by syntactic and

lexico–syntactic properties of the respective innovative structure, and may thus occur for some phenomena, but not for others.

4.2 Adaptation to the innovative structures during the experimental session (RQ2)

Regarding adaptation to the innovative structure during the experiment, both the ditransitive and the monotransitive results revealed significant main effects of *Trial Number* in both the critical and postcritical regions of the French target, with gradually faster RTs for the innovative structures as the experiment progressed regardless of the condition of the English prime. The effect of *Trial Number* is at least consistent with the claim that participants gradually adapted to the innovative structures while they were exposed to more and more sentences with such structures during the experiment. Such gradual adaptation effects for novel structures during experimental sessions have also been reported by other studies (Fraundorf & Jaeger, 2016; Jacob et al., 2025; Kaschak & Glenberg, 2004).

That said, it is unclear to what extent such effects really represent adaptation to the innovative structure or adaptation to the experimental procedure (cf. Karkaletsou et al., 2024). Specifically, participants may have gradually got used to the self-paced reading procedure and therefore become generally faster over time. However, a potential counter-argument is that adaptation during the experimental session appears to be stronger for ditransitives than for monotransitives (see the slopes of the regression lines in Figures 3 and 4, as well as the model summaries in Tables 3 and 5). To further support this statistically, we conducted additional analyses directly testing the interaction between *Structure Type* (ditransitives vs. monotransitives) and *Trial Number*, which can be found on OSF. Results revealed that participants' speeding up in the postcritical region was significantly stronger for ditransitives than for monotransitives ($\beta = 0.04$, $SE = 0.02$, $t = 2.16$, $p = .04$), with a similar but marginal trend in the critical region.[3] If the effect of *Trial Number* were caused by adaptation to the experimental procedure, both structures should have been equally affected. Thus, it most likely reflects adaptation to the innovation itself.

3. The same analysis was also run for the region preceding the innovative structure, Region 2 (verb). This analysis revealed no interaction between *Structure Type* and *Trial Number*, suggesting that differences in speeding up between the two structures emerged upon encountering the innovation.

4.3 Production of innovations in pretest versus posttest (RQ3)

During the experimental session, the participants encountered a substantial number of innovative ditransitive and monotransitive sentences. To investigate to what extent this exposure potentially facilitated subsequent production, we compared the proportions of innovative sentences in pre- versus posttest.

While we had predicted that exposure to the innovative structures during the experiment would lead to increased production of such structures in the posttest, the results showed no significant increase for either of the two innovations. In other words, while the adaptation effects observed in the self-paced reading data suggest that participants rapidly adapted to the innovative French structures, this adaptation effect was apparently not strong enough to increase production of the respective innovations in the posttest. This suggests that, while it is in principle possible to prime innovative structures, innovations may possess a degree of resistance against production priming in particular, to avoid the production of structures which are not yet fully grammatical in the target language.

The comparison between pre- and posttest aside, the production tests showed a general difference between ditransitive and monotransitive innovations: While innovative ditransitives were rare (12 cases in the pretest and 18 in the posttest), innovative monotransitives were considerably more common (103 cases in the pretest and 104 in the posttest). This may suggest that innovative monotransitives may already be entering Canadian French as an acceptable structure (cf. Karkaletsou et al., 2024; Mougeon et al., 2005). A possible explanation for why monotransitives — but not ditransitives — might undergo change is that *à*-omission in ditransitives typically occurs only with pronoun recipients (*Le garçon lui donne la ceinture* 'The boy gives him the belt'). This might create more resistance to omit the dative marker in a context where recipients are full NPs. Monotransitives, in contrast, involve verbs that either require an accusative marker or not, facilitating the emergence of innovative forms. As suggested by a reviewer, another explanation could be that English translation equivalents for the ditransitives have two options (PO, DO), while English translation equivalents for the monotransitives only have one option. Hence, there could be more pressure from English in monotransitives.

4.4 Processing of innovations and the influence of individual contact with French (RQ4)

Interestingly, our results from both self-paced reading and production revealed several insightful effects of the degree of individual contact with French, as measured by the French score. Perhaps most importantly, for both ditransitives and

monotransitives, production of innovations was influenced by the individual degree of contact with French, with individuals with lower French scores (i.e., lower French contact) producing significantly more ditransitive and monotransitive innovations than individuals with higher French scores. This finding is partially in line with what we predicted. A possible explanation for this effect is that cross-linguistic influence from English may be stronger in individuals who experience less contact with French, for instance because their sense of ungrammaticality in French may be relatively weaker (cf. Karkaletsou et al., 2024 for similar results in acceptability judgments). In any case, the effect of French contact in the production data suggests that processes of intra-individual language contact may vary across bilingual individuals and may be substantially affected by individual language experience and input.

In addition to the main effect of French contact in production, the self-paced reading results for monotransitive innovations revealed unexpected interactions between *Prime Condition* and *French Score* in both the innovation and post-innovation regions. Specifically, participants with high French scores read monotransitive innovations faster after English ungrammatical primes than after grammatical primes. While this was not predicted, one possibility is that individuals with higher French scores place additional emphasis on which structures are grammatical or ungrammatical in French, thus being facilitated by ungrammaticality rather than by structural similarity in English. This may lead to ungrammaticality priming effects, with ungrammatical English primes preparing the individual for the processing of subsequent ungrammatical French targets.

4.5 Cross-linguistic innovation priming and contact-induced language change

Finally, what do the results tell us about the potential role of innovation priming in contact-induced language change? If it is indeed the case that English DO sentences prime innovative French DOs, such effects may serve as a possible pathway that allows the DO structure to enter the French language. Specifically, activation of the DO structure during the processing and production of English DO sentences may influence the formulation of French ditransitive sentences in subsequent French conversations, eventually leading to the production of innovative French DOs (cf. Jacob et al., 2025 for a different structure and language pair). The significant immediate priming effect for ditransitive innovations shows that such innovation priming effects can at least in principle occur. However, the lack of an effect in the production posttest indicates that exposure to several innovative DO sentences during the experimental session was not sufficient to overcome a speaker's reluctance to produce ungrammatical sentences. Thus, cross-linguistic

innovation priming in production may only occur after persistent exposure to a large number of English DO sentences over an extended period of time. This may also constitute an explanation for why grammatical language change typically requires extended time periods. In any case, the observed adaptation effects in our data suggest that, once an innovative structure eventually starts getting produced, individuals tend to adapt to the new structure relatively quickly. Finally, our findings show that, while adaptation to innovations in real-time comprehension does not depend on the degree of individual contact with French, bilinguals' overall production of innovations is significantly affected by it.

5. Summary and conclusion

Our study examined immediate priming and adaptation effects for ditransitive and monotransitive innovations in Canadian French, to gain insight into the psycholinguistic underpinnings of grammatical language change. For ditransitive innovations, we found a significant priming effect, suggesting that structural representations activated during processing of a prime sentence can influence subsequent linguistic behavior in the target language, even for structures that do not yet exist in the target language. In this respect, our results are consistent with the claim that new syntactic structures may transfer from one language to the other through cross-linguistic innovation priming in bilingual individuals (e.g., Kootstra & Muysken, 2019; Kootstra & Şahin, 2018). However, the absence of priming for monotransitive innovations suggests that innovation priming seems to depend on linguistic properties of the respective structure, specifically on whether priming has to overcome lexico–syntactic information which would normally prevent specific verbs from being used monotransitively. This also probably explains why not all structures that exist in one language of a bilingual gradually transfer to the other language. Moreover, the self-paced reading results showed that participants rapidly adapted to the innovative structures during the experimental session. This suggests that, once an innovative structure has successfully entered a language through cross-linguistic influence, bilingual speakers may rapidly adapt to it. Lastly, our data also show that bilinguals' production of innovations, and thus their susceptibility to change, is modulated by individual differences linked to the degree of French contact.

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Data availability statement

Anonymized raw data, detailed anonymized participant information, RMarkdown files with the analysis code, .txt files with full model outputs, plots corresponding to the reported effects, as well as experimental materials are available at the Open Science Framework (OSF) via the following link: https://osf.io/dycva/overview?view_only=9439e84618074a548360d7dda6054b3c

CRediT statement of author contributions

Conceptualization: FK, GJ and SA; methodology: FK, GJ and SA; investigation: FK; resources: SA; software: FK; formal analysis: FK; data curation: FK and GJ; writing — original draft preparation: FK and GJ; writing — review and editing: FK, GJ, SA; visualization: FK; supervision: SA and GJ; project administration: FK; funding acquisition: SA and GJ. All authors have read and agreed to the published version of the manuscript.

Ethics and informed consent statement

The research reported in this manuscript was conducted according to the ethics guidelines in the Declaration of Helsinki. Informed consent was obtained from all participants involved in the study.

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Study 3 - Karkaletsou et al. (2025b)

Cross-linguistic innovation priming and grammatical language change: The case of reciprocal innovations in Canadian French-English bilinguals

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Abstract

This paper investigates cross-linguistic priming and adaptation as potential mechanisms underlying contact-induced grammatical change in bilinguals. Focusing on Canadian French-English bilinguals, it examines whether innovative French reciprocal constructions in which the obligatory reflexive marker *se* is missing can be primed by their English equivalents. In a self-paced reading task combined with production pre- and posttests, participants read French target sentences preceded by English primes with either structurally similar or control structures. Reading times revealed significant immediate priming in early trials, indicating facilitation from English to French, and cumulative adaptation across the experiment, reflecting increased processing efficiency with repeated exposure. However, this adaptation did not extend to production: participants did not produce significantly more innovative reciprocals post-priming. Individual language experience modulated production patterns, with lower French contact predicting higher innovation use. These results suggest that cross-linguistic priming initiates early entrenchment of novel structures, while within-language adaptation supports their consolidation, together forming a potential pathway toward contact-induced language change.

Keywords: cross-linguistic priming, linguistic innovations, grammatical language change, entrenchment, conventionalization

1. Introduction

Research on language contact has shown that bilingual environments can be a fertile ground for structural innovations, defined here as syntactic structures that deviate from the canonical patterns in the grammar of a language. Such innovative language use in bilinguals can range from dispreferred, infrequent grammatical variants to entirely ungrammatical structures. One possible source of such innovations is *cross-linguistic influence* in bilinguals (Serratrice et al., 2009). For instance, bilinguals may start (over)using a syntactic pattern that is normally dispreferred in the target language, such as adjective-noun word order in Spanish or French, due to cross-linguistic influence from another language where this is the standard majority pattern, such as English (e.g., Cuza & Pérez-Tattam, 2016; Nicoladis, 2006). Bilinguals may even start producing a pattern that is fully ungrammatical in the target language, but standard in the other language, such as transitive structures without differential object marking in Spanish, when in contact with English (e.g., Regulez & Montrul, 2023). The present paper focuses on the latter type of innovations.

Typically, structural innovations initially emerge within a restricted group of bilingual individuals (typically referred to as *agents of change*) and may later spread beyond this group to the wider linguistic community, potentially leading to long-term contact-induced language change (e.g., Doğruöz & Backus, 2009; Fernández et al., 2017; Heine & Kuteva, 2008). One psycholinguistic mechanism that has been proposed to drive this process is *cross-linguistic structural priming*, also referred to as *syntactic priming* (Arslan et al., 2025; Baroncini et al., 2025; Fernández et al., 2017; Jacob et al., 2025; Kootstra & Muysken, 2017, 2019; Kootstra & Şahin, 2018). Cross-linguistic structural priming occurs when exposure to a particular syntactic structure in one language facilitates the subsequent comprehension or production of a similar

structure in another language. With respect to grammatical structures that exist in both languages, structural priming has been demonstrated for a variety of different grammatical phenomena and language pairs (e.g., see Van Gompel & Arai, 2018 for a review). When the primed structure exists only in the prime language, priming may lead to the temporary activation and, eventually, the production of an innovative structure in the target language. With repeated exposure over time, priming effects are typically enhanced. Such cumulative priming, also referred to as (cumulative) *adaptation* (Kaan et al., 2019; Kaan & Chun, 2018; Kootstra & Doedens, 2016), may cause long-lasting changes to speakers' structural representations and thus contribute to integrating novel syntactic patterns into a bilingual's grammar, ultimately leading to language change.

To date, relevant studies have shown that bilinguals can be primed to process or produce structures that are innovative in the target language but grammatical in the prime language. However, a big part of this research has focused on syntactic structures that are partially compatible with both grammars involved, such as word order differences (e.g., Baroncini & Torregrossa, 2025; Hopp & Jackson, 2023; Hsin et al., 2013; Kootstra & Şahin, 2018). Less is known, though, about cross-linguistic priming of structural innovations that alter the structure of a sentence (e.g., Fernández et al., 2017; Karkaletsou et al., 2025; Jacob et al., 2025). Such cases may pose different processing demands and offer a particularly strong test of whether priming can introduce novel structures into a bilingual's comprehension or production repertoire. Overall, findings from these few studies suggest that bilingual speakers – especially those in high-contact situations – seem to be prone to adapting to innovations that are formally fully ungrammatical structures either in their production (see Fernández et al., 2017 for omissions of accusative and

reciprocal markers in Spanish) or in their online processing (see Karkaletsou et al., 2025 for omissions of accusative and dative markers in Canadian French).

However, structure type appears to matter in these processes. Fernández and colleagues (2017), for instance, found that their bilingual speakers were primed from English to produce Spanish innovations missing the obligatory reciprocal marker more frequently than innovations missing the obligatory accusative marker. On a similar note, Karkaletsou et al. (2025) showed that bilinguals in Canada were primed from English in their real-time processing of French innovations without the obligatory dative marker, but there was no priming for innovations without the obligatory accusative marker. The authors suggest that this may be at least partly due to specific structural properties related to whether elements of the argument structure are encoded as part of the lexical entry or not (for more on this argument see Discussion in the respective paper).

Hence, a further exploration of the role of structure type in cross-linguistic innovation priming and language change is needed. This lays the foundation for the current study, which investigates priming and adaptation in the online processing and production of innovative reciprocals in French that omit the obligatory reciprocal marker *se* (cf. Fernández et al., 2017 for Spanish). Crucially, the use of *se* is essential to yield reciprocity in French and its omission alters the underlying argument structure, potentially leading to impeded comprehension since it is unclear whether the verb is reciprocal or transitive (e.g., *se rencontrer* 'to meet (each other)' vs. *rencontrer* 'to meet (someone)'). Considering this, innovative reciprocals represent a more radical structural change than what has been investigated in previous work, where the underlying argument structure was more or less preserved but certain obligatory object markers were missing (Fernández et al., 2017; Karkaletsou et al., 2025). On this basis, we examine this more extreme

case of structural innovation and therefore explore the limits of adaptation and language change in bilinguals, specifically in Canadian French-English bilinguals.

The Canadian context was selected for several reasons. First, it is an officially bilingual setting (*Statistics Canada*, 2021) where language contact is a widespread reality that has persisted historically, but is also a source of great variation among bilinguals in terms of their individual language dominance, input and use (i.e., individual language contact). Unlike most previous work that examined priming in bilinguals within otherwise officially monolingual societies (e.g., Fernández et al., 2017; Jacob et al., 2025; Kootstra & Şahin, 2018), the current study investigates cross-linguistic priming of innovations across different forms of bilingualism within a single contact situation, thus shedding light onto the conditions and constraints of contact-induced language change (Filipović & Hawkins, 2025; Hawkins & Filipović, 2024). Second, there is already some research on Canadian French suggesting that high individual French-English contact (consequently lower French-only contact) appears to be one of the factors driving bilingual adaptation to structural innovations on multiple levels of language processing and use (Karkaletsou et al., 2024; Karkaletsou et al., 2025; Mougeon et al., 2005). However, the limits of these processes still remain unclear, especially when considering the differential findings for the different phenomena tested. Given the long-standing and widespread, yet extremely diverse, contact situation in Canada, we expect that specific types of bilinguals and/or specific communities and provinces indicating high(er) contact would be fruitful environments for the emergence of structural innovations like reciprocals without *se*-marker in French. Such tendencies might stem from the need to converge the two languages or even from social pressure, which might lead to outputs that would not appear elsewhere because they are considered radical and complex (cf. Hawkins & Filipović, 2024).

1.1 Cross-linguistic priming of structural innovations: A literature review

The majority of cross-linguistic structural priming studies to date have examined syntactic structures that are similar or near-similar across the prime and target languages (e.g., Bernolet et al., 2013; Hartsuiker et al., 2004; Jacob et al., 2017; Kootstra & Doedens, 2016; Loebell & Bock, 2003; Schoonbaert et al., 2007; Travis et al., 2017). While these studies provide important insights into how bilinguals map syntactic structures across languages, they shed less light on how innovative structures are processed or emerge in language use.

A smaller body of work has directly addressed this latter question by testing structures that are innovative in the target language due to cross-linguistic influence from the prime language. For example, Hsin et al. (2013) showed that Spanish-English bilingual children were primed to produce English-like prenominal adjective-noun sequences in Spanish (**un verde libro* 'a green book') instead of the standard postnominal order (*un libro verde* 'a book green'). Similarly, van Dijk and Unsworth (2023) found that French-Dutch and Spanish-Dutch bilingual children produced postnominal adjectives in Dutch under the influence of structurally similar primes in French or Spanish, even though the prenominal position is the standard variant in Dutch. In another study targeting word order, Baroncini & Torregrossa (2025) showed that Italian-Greek bilingual children were primed from Greek to use verb-subject-object (VSO) structures in Italian, a word order that is infelicitous in Italian but fully grammatical in Greek.

Although children may show stronger innovation priming effects due to less stable linguistic representations and weaker inhibitory control (cf. Hsin et al., 2013), evidence suggests that adults can also exhibit such effects under certain conditions. For instance, Kootstra and Şahin (2018) tested Papiamento-Dutch bilinguals in the Netherlands and Aruba, where Netherlands is the high(er)-contact environment and Aruba the low(er)-contact environment. Their results

showed that both groups were primed from Dutch to produce innovative prepositional datives in Papiamento (?*Obi ta duna e buki na Pieter* 'Obi gives a book to Pieter'), a variant that is rather infelicitous and rare compared to the standard, widely-used double object structure (*Obi ta duna Pieter e buki* 'Obi gives Pieter a book'). However, bilinguals in the Netherlands, particularly younger ones, produced overall more such structures than bilinguals in Aruba, presumably due to the higher language contact in the former case. In another study, Baroncini et al. (2025) found that heritage speakers of Italian in Germany (adolescents and adults) showed priming from German in their production of satellite-framed motion structures in Italian (?*La bambina corre fuori dal supermercato* 'The girl runs out of the supermarket'). Satellite-framed structures in Italian are considered infelicitous – thus innovative – in the context of this type of motion (boundary crossing), but they are the standard variant in German.

A study that examined innovations which become fully ungrammatical in the target language once they follow the syntax from the prime language was conducted by Fernández et al. (2017). Concretely, they found that Spanish-English bilinguals in the US (high-contact) and Argentina (low-contact) produced English-like Spanish innovations, such as Spanish transitive constructions without the obligatory accusative marker *a* and reciprocals without the obligatory reflexive *se*, after being primed with similar structures in English. In line with previous findings, they also reported higher innovation rates in the US bilinguals compared to the Argentina bilinguals. Moreover, there were differences between the various structure types, whereby innovative reciprocals were produced to a larger extent than innovative transitives.

However, not all studies with adults have found robust effects for such innovations. Hopp and Jackson (2023), for instance, tested L1 German-L2 English adolescents in Germany and found no priming from German in the production of ungrammatical verb-second (V2) word

orders in English, such as **On Sunday drinks the father in the pub*. These results may indicate that findings across innovation priming studies vary depending on the structure type and the degree of bilinguals' contact with the target language. Another reason for these mixed results could lie in the methodological emphasis on production tasks, where participants may avoid producing forms that they judge as ungrammatical, even if their comprehension is facilitated by prior exposure. This reluctance could mask early-stage adaptation processes that occur during comprehension. Indeed, comprehension-based priming tasks – particularly those measuring online processing – allow researchers to capture adaptation to innovations (Arslan et al., 2025; Fraundorf & Jaeger, 2016; Kaschak & Glenberg, 2004; Tooley, 2023; Tooley & Traxler, 2010), even if speakers do not produce them yet. On this basis, Jacob et al. (2025) found that Turkish-German bilinguals read innovative comparatives in German (*mehr schön* 'more beautiful') faster after similar primes in Turkish than after alternative primes, even though such comparatives are ungrammatical in standard German. They also adapted to the innovation across experimental trials by processing it cumulatively faster.

In another recent work, Karkaletsou and colleagues (2025) investigated Canadian French-English bilinguals' adaptation to two types of innovative structures in French involving ditransitive verbs without the obligatory dative marker *à* (**Le sorcier vende [à] la femme une jupe* 'The sorcerer sells the woman a skirt') and monotransitive verbs without the obligatory accusative markers *à* and *de* (**Le garçon obéit [à] la femme / s'approche [de] la femme* 'The boy obeys the woman / approaches the woman'). They examined priming in participants' real-time processing (reading), as well as their pre- and post-priming production. For monotransitives, no priming effects were found in either processing or production, while for ditransitives, priming effects emerged only in processing. A possible explanation for this discrepancy is the different

underlying properties of the tested structures, specifically the fact that accusative markers are stored within the lexical entry of specific monotransitive verbs, while this is not the case for ditransitive markers, the use of which is constrained by syntactic criteria (e.g., when the recipient is expressed as a full noun phrase). As for the role of language contact, it was proven significant only in production, with lower French-only contact leading to more innovations, but not in priming in processing.

To sum up, there is some research suggesting that adult bilinguals can be primed cross-linguistically to adapt to different types of innovations either by producing them more or by processing them faster over time. It has also been shown that bilinguals' susceptibility to structural innovations and, potentially, change is significantly affected by language contact in most cases. However, in the few existing studies we find various discrepancies, ranging from the employed methodologies to the bilingual populations, linguistic environments and syntactic structures tested. Especially regarding the latter, there seems to be a general tendency to examine argument structure innovations that mostly emerge via omitting obligatory morphosyntactic markers. A closer look, though, reveals differences which are mostly related to how the argument structure is encoded in each case. Hence, although such omission-induced innovations may overall be more cognitively demanding to process, and thus more revealing of the conditions under which bilinguals adapt to these structures, we should pay more attention to the underlying structural properties.

1.2 Entrenchment and conventionalization in language change

In the previous section, a series of studies was presented demonstrating that bilinguals can be primed across languages to adapt to structural innovations, which, over time, might persist

and thus contribute to longer-term language change. This section will introduce two theoretical concepts that show how innovations can potentially lead to contact-induced language change – namely *entrenchment* and *conventionalization*.

The role of entrenchment in language change has been discussed extensively in the usage-based literature. Entrenchment refers to the degree to which a linguistic pattern emerges in a speaker's mental grammar through repeated exposure and use (De Smet, 2017; Lantto, 2021; Schmid, 2015). Highly entrenched patterns are more resistant to change, whereas less entrenched ones may be more susceptible to reanalysis or replacement. From a community perspective, repeated individual usage can lead to conventionalization, whereby a formerly innovative form becomes a gradually accepted norm. Lantto (2021) distinguishes between individual entrenchment, meaning how deeply a feature is integrated into an individual's grammar and language use, and community-wide conventionalization, noting that these two processes need not develop in parallel. Contact-induced changes can thus emerge unevenly across speakers, depending on factors such as exposure, proficiency, and interactional setting.

In the present study, the reciprocal innovation in French represents a more radical case of change than those examined in previous bilingual priming work. By combining processing and production measures, we can explore both the early-stage activation of this form (which may precede its production) and the potential for repeated exposure to shift its entrenchment in individual grammars. The findings can therefore inform how immediate priming effects interact with longer-term processes of conventionalization in contact settings.

1.3 The present study

This study investigates cross-linguistic priming for a French structural innovation, namely reciprocals without the obligatory reflexive marker *se*, in Canadian French-English bilinguals. This particular structural innovation differs from the innovative structures investigated in most previous studies on cross-linguistic innovation priming, in the sense that it removes an obligatory morphosyntactic element (the reflexive marker *se*) from the subcategorization frame of reciprocal French verbs (e.g., **Ils rencontrent* 'They meet-RECIPROCAL'). Thus, in order to establish itself in the language, this structural innovation has to overwrite the fact that these particular verbs, when used in a sentence, obligatorily require the inclusion of *se*.

It has been observed that Canadian French-English bilinguals may accept such innovations more readily upon repeated exposure (Karkaletsou et al., 2024). However, it remains unclear whether priming from English can facilitate their processing or even lead to their production (cf. Fernández et al., 2017 for production of innovative, English-like reciprocals in Spanish). The Canadian context offers a unique testing ground for this question, since French-English contact is overall high at a societal level, but individual bilinguals vary considerably in their degree of French contact. Previous work has shown that such variability can modulate the emergence and acceptance of innovations (Karkaletsou et al., 2024; Mougeon et al., 2005), but its role in priming and adaptation remains underexplored (cf. Karkaletsou et al., 2025).

Using a self-paced reading task, we presented participants with French target sentences containing the reciprocal innovation, preceded by either structurally similar English primes or English control primes. By dividing stimuli into two blocks with an obligatory break in-between, we could assess both immediate priming (faster reading after similar primes) and adaptation (faster reading over the course of the experiment across the two blocks). To test for possible long-

lasting priming effects, all participants went through French production pre- and posttests before and after the experiment, allowing us to check whether exposure to the innovative French structure during the experiment increased participants' likelihood of producing the innovative structure.

1.4 Research questions and hypotheses

Our first research question is whether French sentences containing the reciprocal innovation (i.e. French sentences with a reciprocal verb in which the obligatory reflexive marker *se* is missing) can be primed by English sentences with the same structure. If this is the case, self-paced reading data should show faster reading times for innovative French targets after structurally similar English primes than after primes with otherwise similar primes with an alternative control structure (Jacob et al., 2025; Karkaletsou et al., 2025).

Our second research question examines whether participants gradually adapt to the reciprocal innovation while being exposed to more and more innovative French target sentences during the experiment. If adaptation takes place, it should be indicated by cumulatively faster reading times for innovative targets as the experiment proceeds (Jacob et al., 2025; Karkaletsou et al., 2025; Kootstra & Doedens, 2016; see also Karkaletsou et al., 2024 for similar results in response times during acceptability judgments). In addition, this cumulative priming effect may interact with immediate priming, with stronger cumulative priming when the innovative structure is also primed by a structurally similar English immediate prime.

The third research question investigates whether exposure to the reciprocal innovation during the reading task influences subsequent production of the innovative structure after the experiment. If priming produces lasting changes in structural representations, participants should

produce more innovative reciprocals in the posttest than in the pretest, similar to post-priming production increases observed in other studies (Fernández et al., 2017).

Finally, as a fourth research question, we investigate how individual differences in French contact (assessed via a composite individual contact score) affect priming and adaptation in processing and subsequent production of reciprocal innovations. One possibility is that bilinguals with lower French contact will exhibit stronger priming effects, greater adaptation during online processing, and a higher rate of innovative reciprocal productions, while individuals with higher French contact, who may be more attuned to standard, canonical patterns, may show weaker effects (cf. Fernández et al., 2017; Karkaletsou et al., 2025; Kootstra & Şahin, 2018).

2. Methodology

2.1 Participants

Participants were recruited via Prolific (https://www.prolific.co/) using prescreening criteria to target Canadian bilingual French-English speakers aged 18-40. All participants provided informed consent. To obtain information about the participants' individual language background, all participants completed the LEAP-Q (Marian et al., 2007). As measures of lexical proficiency in French and English, all participants also completed the LexTALE proficiency tests for French (Brysbaert, 2013) and English (Lemhöfer & Broersma, 2012).

Initially, eighty-six participants took part. A total of thirteen participants were excluded due to early acquisition of additional languages or reported language-related disorders. The final dataset comprised 73 Canadian bilinguals (Mean age = 28.7 years, *SD* = 6.1), all born, raised, and residing in Canada. Participants varied with respect to their age of onset of acquisition (AoA) for French and English, as well as with respect to their current exposure and use of French (reported

in percentage of time). Table 1 provides descriptives for these variables by AoA group. Note that this grouping is used for descriptive purposes only, while in our statistical analyses we employ a continuous measure of our participants' linguistic experience instead.

In order to obtain a measure of individual French contact for each participant, we relied on a factor analysis in R via *factanal()* (Raiche & Magis, 2022) to calculate an individual composite score (subsequently referred to as *French Score*) which contained information about an individual participant's current and over-time contact with French. The composite score was based on four contact-related variables measured through the language background questionnaire and proficiency tests: *AoA difference between French and English (LEAP-Q)*, *proportion of current French exposure (LEAP-Q)*, *proportion of current French use (LEAP-Q)*, and *French proficiency (LexTALE)*. Based on the weights determined through factor analysis, each participant was assigned an individual French Score, with higher scores indicating higher individual French contact. Detailed information on how the French Score was determined, including the weights for the individual variables, is available on OSF. The mean French Score per AoA group is provided in Table 1.

Table 1. Participants' descriptives by AoA group.

Group	*N*	*Mean French AoA (SD)*	*Mean English AoA (SD)*	*French Exposure % (SD)*	*French Use % (SD)*	*English Proficiency % (SD)*	*French Proficiency % (SD)*	*Mean French Score (SD)*
2L1 (simultaneous and sequential)	18	2.39 (1.72)	1.22 (1.52)	19.78 (17.13)	23.11 (32.02)	94.38 (5.54)	62.70 (13.98)	–1.58 (2.09)
L1 English - L2 French	24	6.62 (1.93)	0.79 (1.02)	19.62 (19.60)	15.00 (15.97)	92.03 (8.55)	58.11 (7.84)	–2.63 (1.01)
L1 French - L2 English	31	0.74 (1.34)	8.26 (3.04)	64.32 (21.72)	75.81 (23.71)	87.90 (9.09)	76.61 (10.31)	2.95 (1.63)

2.2. Stimuli and design

The production pre- and posttests consisted of an unprimed written picture-description task in French. Participants were presented with images and verbs to use and were asked to produce a sentence describing these images. Six verbs with a potential reciprocal interpretation were used, namely *(se) rencontrer* 'to meet (each other)', *(s')embrasser* 'to hug (each other)', *(se) disputer* 'to argue (with each other)', *(se) battre* 'to fight (each other)', *se téléphoner* 'to call (each other)' and *(se) parler* 'to talk (to each other)'. The particular verbs were chosen because they convey a reciprocal meaning in French only via the reflexive *se*, while their English translation equivalents can also convey a reciprocal interpretation without the use of the complementation 'each other'. Each verb was presented only once to prevent repetition or self-priming effects, and all verbs were presented in isolation, without any cues to their subcategorization frame (i.e., without *se*). The images, selected from the MultiPic database (Duñabeitia et al., 2022), depicted three entities, two of which were always animate figures and one depicted a context. These entities were presented arranged in a triangular configuration (Figure 1). French lexical labels for the entities together with

the respective verb accompanied each image. The posttest replicated the pretest procedure, employing the same verbs but introducing new arguments and images to minimize spillover effects. Stimuli were randomized within tasks individually for each participant.

For the self-paced reading task, the critical items consisted of sentence pairs with English primes and French targets, designed to test structural priming of the innovative French reciprocal construction. The English primes were presented in three conditions: a Structurally Similar experimental prime consisting of a bare main verb (*The writer and the editor meet*), a Grammatical Control prime with *each other* complementation on the main verb (*The writer and the editor meet each other*), and an Ungrammatical Control prime with *each other* complementation in a noncanonical position, so that the word order corresponds to the required word order in French sentences with the reflexive *se* (**The writer and the editor each other meet*). All targets were French reciprocal sentences in which the obligatory reciprocal marker *se* was missing (**Le sculpteur et le sorcier rencontrent sur la plage dans la nuit*). All primes and targets were segmented into five regions. In targets, the critical verb (*rencontrent*) was always in Region 3, immediately followed by a prepositional (temporal or local) phrase in Region 4 (*sur la plage*) (Table 2).

We created a total of 36 item sets, with each item set consisting of a French innovative target sentence preceded by the three different versions of its corresponding prime. These sentence pairs were distributed across three presentation lists according to a Latin Square design, so that each list contained a total of 12 sentence pairs from each of the three prime conditions. These were interspersed with 60 filler items. Filler items also consisted of sentence pairs with English primes and French targets, but with different syntactic structures (ditransitives and monotransitives). Within each presentation list, the 96 sentence pairs were presented in two blocks, dividing the

experiment in half. The two blocks were presented in a fixed order across participants, but the items within each block were shown in a randomized order. One-third of the trials were followed by a yes/no comprehension question, with "yes" and "no" answers balanced across items.

Figure 1. Example trial from pretest (left) and posttest (right) for the verb *rencontrer* 'to meet'.

Table 2. Example prime-target pair (English prime in all three conditions and French target).

Prime Condition	*Region 1*	*Region 2*	*Region 3*	*Region 4*	*Region 5*
Structurally Similar (bare main verb)	The writer	and the editor	meet	at the cafe	in the city.
Grammatical Control (*each other* complementation following the main verb)	The writer	and the editor	meet each other	at the cafe	in the city.
Ungrammatical Control (*each other* complementation preceding the main verb)	The writer	and the editor	*each other meet	at the cafe	in the city.
Target					
French innovation	Le sculpteur	et le sorcier	*rencontrent	sur la plage	dans la nuit.
	The sculptor	and the sorcerer	meet	on the beach	at night

2.3 Procedure

All tasks were implemented using Gorilla (Anwyl-Irvine et al., 2020). The session began with the production pretest. This was followed by the self-paced reading experiment. Each self-paced reading trial began with a 500 ms fixation cross, after which the first segment of an English prime sentence appeared. Sentences were presented in a moving-window display: participants pressed the spacebar to reveal each segment sequentially, while unrevealed segments remained masked. Following the prime sentence, another fixation cross was shown for 500 ms before the first region of the French target sentence appeared. The experiment concluded with a posttest identical in format to the pretest but using new images to avoid repetition effects. Participants then completed the French and English LexTALE vocabulary tests, followed by the LEAP-Q in their preferred language (Canadian English or Canadian French). All instructions were given in English. The session lasted approximately one hour (Median duration = 50 minutes). Participants were compensated through Prolific.

2.4 Data preprocessing and analyses

Reading time data were analyzed using linear mixed-effects models (*lmer*) and production data using generalized linear mixed-effects models (*glmer*) in the *lme4* package (Bates et al., 2015b) in R version 4.4.2 (R Core Team, 2023). Initial models included maximal random-effects structures with random intercepts by participant and item as well as random slopes with correlations for all fixed effects. If the maximal model failed to converge or overfit, the structure was simplified following the procedure suggested in Bates et al. (2015a). Specifically, correlations among random effects were removed, zero- or near-zero variance components were eliminated stepwise, then correlations among remaining effects were reintroduced. Finally, model

selection was performed guided by AIC and BIC comparisons using the *anova*() function in the *car* package (Fox & Weisberg, 2019). Significance of main effects and interactions was assessed with Type II Wald chi-square tests (Analysis of Variance) in the same package. In the results section, we first report main predictor effects and interactions, and then the specific model outputs to show the direction of these effects. If the main effect of a categorical predictor or the interaction between a categorical and a continuous or another categorical predictor is significant, we re-level the model to obtain the rest of the comparisons.

Self-paced reading data

For the self-paced reading data, reading times were first trimmed to remove extreme values. For English prime sentences, trials with raw reading times below or equal to 100 ms (Jegerski, 2014), or above 4000 ms at the verb region (Region 3) were excluded. For French target sentences, the same thresholds were applied both to the critical verb (Region 3) and the immediately following region (Region 4). Additionally, trials with reading times more than 2.5 standard deviations above the mean reading time for each of the two regions of interest were removed. All trimming resulted in the removal of 2.1% of all data points. Data were also checked to confirm comparable numbers of participants per list and a balanced number of observations per participant.

Log-transformed reading times for Region 3 and Region 4 combined were analyzed. We combined the two regions since participants would be able to eventually realize that there might be an omission in the argument structure of the verb in Region 3 only after reading Region 4. Therefore, we do not treat Region 4 as a spillover region, as is often the case in self-paced reading studies, but rather as an essential part of Region 3, where the basic experimental manipulation takes place. The linear mixed-effects model included *Prime Condition* (categorical predictor with

three levels: Structurally Similar, Grammatical Control, Ungrammatical Control), *Presentation Block* (categorical predictor with two levels: First Block, Second Block), *French Score* (continuous predictor, scaled and centered) and their interactions as fixed effects. *Prime Condition* and *Presentation Block* were treatment-coded with Structurally Similar (i.e., the English structural equivalent primes to the French target) and First Block as reference levels. *Presentation Block* was included to investigate potential adaptation effects with repeated exposure over the course of the task.

Pre- and posttest

For the production data, responses from the pre- and posttest were coded into four categories: (A) "Target Standard" for complete and grammatical reciprocals with the canonical reflexive marker *se*; (B) "Target Innovative" for complete productions omitting *se* in the reciprocal construction; (C) "Non-target/Other" for complete but non-(A) or -(B) productions; and (D) "Incomplete/Missing" for incomplete or missing responses. After excluding categories (C) and (D) from further analyses, the final dataset contained a total of 456 target reciprocal sentences falling under either (A) or (B).

In logistic regression, we measured the proportion of innovations over standard productions. Fixed effects were *Task* (categorical predictor: Pretest, Posttest), *French Score* (continuous predictor, scaled and centered) and their interaction. *Task* was treatment-coded with Pretest as reference.

3. Results

3.1. Priming in self-paced reading

The current analysis addresses the following questions: Do participants show overall priming and priming across the two experimental blocks (adaptation) by reading the ungrammatical French target significantly faster after Structurally Similar English primes compared to alternative primes? And does *French Score* (measuring individual French contact) play a role in priming and adaptation?

The Analysis of Variance on the final model revealed a significant main effect of *Presentation Block* ($\chi^2(1) = 40.34$, $p < .001$) and a significant interaction between *Prime Condition* and *Presentation Block* ($\chi^2(2) = 7.32$, $p = .03$), but no significant main effect of *Prime Condition* alone ($\chi^2(2) = 1.19$, $p = .55$). As for the role of individual French contact, *French Score* did not have a significant main effect ($\chi^2(1) = 0.67$, $p = .41$) and did not interact significantly with any of the other predictors in the model (see Tables 3 & 4).

Focusing on the significant main effects and interactions, the model output revealed that, in the First Block (i.e., the first 18 critical trials), participants read the French target region of interest significantly faster after Structurally Similar English primes (/*meet*/) compared to after Grammatical Control primes (/*meet each other*/) ($\beta = 0.05$, $SE = 0.02$, $t = 2.58$, $p = .01$). They also read it marginally faster after Structurally Similar English primes compared to after Ungrammatical Control primes (/**each other meet*/) ($\beta = 0.04$, $SE = 0.02$, $t = 1.92$, $p = .055$) (see also Table 4 and Table A1 in Appendix A).

In addition, it was shown that, after Structurally Similar primes, reading for the French target was significantly faster in the Second Block compared to the First Block ($\beta = –0.07$, $SE = 0.02$, $t = –3.16$, $p < .001$). Crucially, participants decreased their reading times across blocks more

strongly after Grammatical Control primes than after Structurally Similar primes (β = –0.07, *SE* = 0.03, t = –2.58, p = .01). A similar, but marginal pattern was observed after Ungrammatical Control primes (β = –0.05, *SE* = 0.03, t = –1.99, p = .05) (also in Table 4).

Due to the significant interaction, we releveled the model to obtain the pairwise differences between the different prime conditions in the Second Block. Unlike in the First Block, no significant differences between Structurally Similar and Grammatical Control primes (β = –0.02, *SE* = 0.02, t = –1.08, p = .3), or between Structurally Similar and Ungrammatical Control primes (β = –0.02, *SE* = 0.02, t = –0.89, p = .4) were obtained here (see Figure 2).

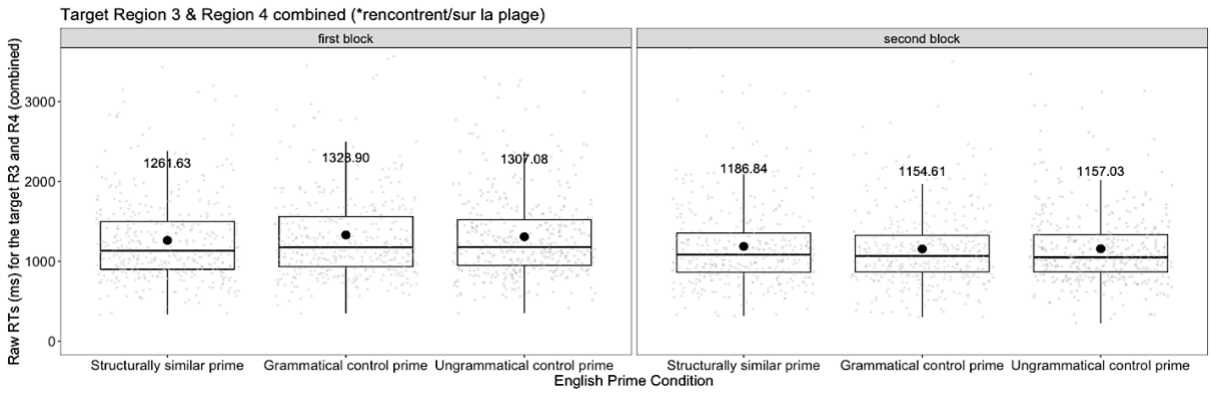

Figure 2. Distribution of raw reading times (ms) in each English *Prime Condition* across the two experimental blocks. The mean RT per *Prime Condition* and *Presentation Block* is indicated as a black dot and as text.

Table 3. Output from the Analysis of Variance (Anova) indicating main effects and interactions between predictors in self-paced reading.

	ChiSq	*Df*	*p*
Prime Condition	1.19	2.00	.551
Presentation Block	40.34	1.00	**< .001*** **
French Score	0.67	1.00	.412
Prime Condition × Presentation Block	7.32	2.00	**.026***
Prime Condition × French Score	0.99	2.00	.609
Presentation Block × French Score	0.61	1.00	.434
Prime Condition × Presentation Block × French Score	0.68	2.00	.712

Table 4. Fixed-effects output of the linear-mixed effects model on self-paced reading data.

	β	*SE*	*df*	*t*	*p*
Intercept (Structurally Similar prime, First Block)	7.07	0.04	87.84	199.23	< .001***
Priming effect A (Structurally Similar prime vs. Grammatical Control prime)	0.05	0.02	2389.80	2.58	**.010***
Priming effect B (Structurally Similar prime vs. Ungrammatical Control prime)	0.04	0.02	2392.33	1.92	**.055 .**
Presentation Block (First Block vs. Second Block)	–0.07	0.02	161.74	–3.16	**< .001*** **
French Score (continuous)	–0.03	0.04	85.43	–0.90	.370
Priming effect A × Presentation Block	–0.07	0.03	2389.63	–2.58	**.010***
Priming effect B × Presentation Block	–0.05	0.03	2390.13	–1.99	**.050 .**
Priming effect A × French Score	0.00	0.02	2381.73	0.18	.860
Priming effect B × French Score	0.01	0.02	2381.12	0.52	.600
Presentation Block × French Score	–0.02	0.02	230.18	–0.85	.400

	β	*SE*	*df*	*t*	*p*
Priming effect A × *Presentation Block* × *French Score*	0.02	0.03	2382.39	0.71	.480
Priming effect B × *Presentation Block* × *French Score*	–0.00	0.03	2382.14	–0.01	1.00

Final model formula: log(sum reading time for Target Region 3 & Region 4) ~ Prime Condition x Presentation Block x French Score + (1 + Presentation Block | Participant) + (1 | Item)

3.2. Production in pre- versus posttest

This analysis addresses the question whether participants are prone to producing more reciprocal innovations after priming than before priming – hence whether they are more prone to change after being primed – and whether French Score influences this tendency.

Out of a total of 456 target sentences across both tasks, 166 (36.4%) were standard productions in the pretest (i.e., sentences with *se*) and 197 (43.2%) were standard productions in the posttest. As for innovations (i.e., sentences without *se* yielding a reciprocal meaning), 36 (7.9%) were produced in the pretest and 57 (12.5%) in the posttest. Overall, 69 out of 73 participants produced reciprocal sentences of either of the two types. Six out of 69 participants produced innovations only in the pretest, 7 only in the posttest and 14 across both tasks. This sums up to 27 'innovators', which is about 40% of the participants. To test the probability of producing an innovative structure over a standard structure in the pretest versus posttest and to test the effect of French Score in these processes, we ran a generalized linear mixed model with *Task* (Pretest, Posttest) and *French Score* in interaction.

The Analysis of Variance on this model revealed a significant main effect of *French Score* ($\chi^2(1) = 19.16$, $p < .001$), but no significant main effect of *Task* ($\chi^2(1) = 0.01$, $p = .94$) or of the interaction between *Task* and *French Score* ($\chi^2(1) = 0.33$, $p = .57$). As for the direction of the *French Score* effect, the model output showed a significant decrease in the log odds of producing

an innovative reciprocal structure with increasing *French Score* in participants (β = –3.45, *SE* = 0.9, t = –3.84, $p < .001$). Since the interaction between the two predictors was proven non-significant, the effect of *French Score* is not significantly different in the Pretest versus Posttest (β = –0.45, *SE* = 0.78, t = –0.57, p = .6) (see Table 5 for full model output and Figure 3). In other words, lower *French Score* in participants is associated with higher use of reciprocal innovations overall regardless of whether production is before or after a priming session.

Table 5. Fixed effects output of the generalized linear mixed-effects model on production data.

	β	*SE*	*z*	*p*
Intercept (Pretest, French Score at 0)	–4.72	1.81	–2.60	**.010***
Task (Pretest vs. Posttest)	–0.44	2.21	–0.20	.840
French Score	–3.45	0.90	–3.84	**<.001****
Task × French Score	–0.45	0.78	–0.57	.570

Final model formula: Sentence (Innovative over Standard) ~ Task x French Score + (1 | Participant) + (1 | Item)

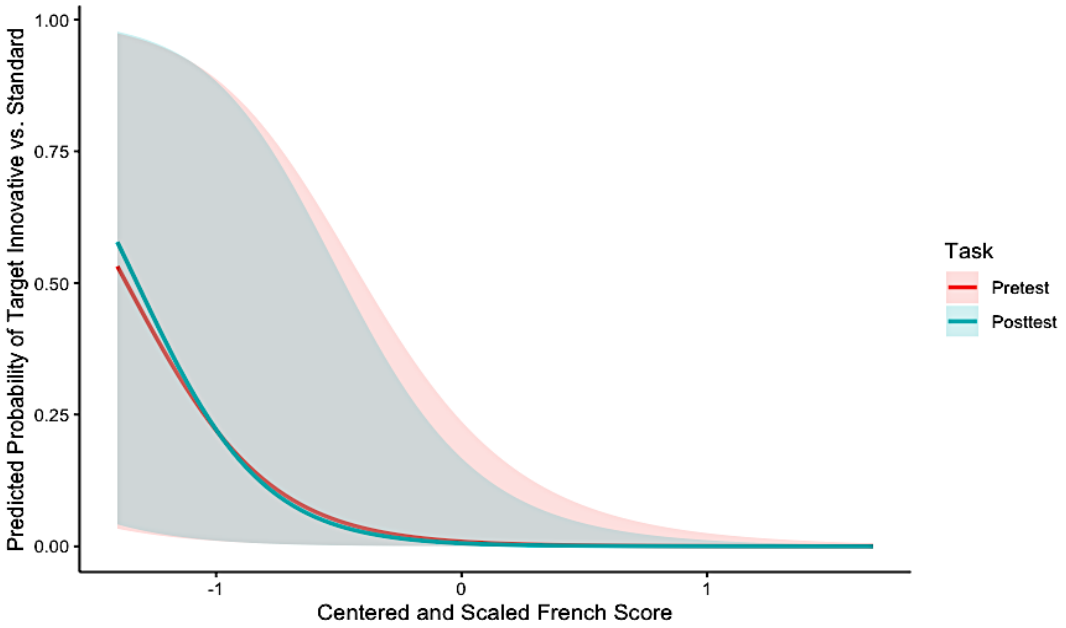

Figure 3. Predicted probability of innovative (over standard) reciprocal productions across Pretest and Posttest as a function of *French Score*.

4. Discussion

The main goal of our study was to investigate the possible role of cross-linguistic innovation priming and adaptation in contact-induced grammatical language change. To achieve this, we investigated whether innovative reciprocal French structures can be primed by their English structural equivalents in real-time processing, and to what extent French-English bilingual speakers in Canada may rapidly adapt to such innovative structures during the experimental session. In addition, we tested longer-term priming effects on subsequent unprimed production. Finally, we also explored whether priming effects both in online processing and in production are influenced by the individual degree of French contact, as measured by the French Score variable.

Innovation priming as a mechanism of entrenchment. With respect to the question of whether innovative French reciprocal structures can be primed by similar English structures, the self-paced

reading results revealed a significant priming effect, with faster reading times for the region containing the innovative construction (Region 3 and Region 4 combined, e.g., **rencontrent/sur la plage* 'meet / on the square') when the target was preceded by Structurally Similar English primes (*meet/at the cafe*) than when preceded by Grammatical Control primes (*meet each other/at the cafe*). In addition, participants showed marginally faster reading of the French target when primed by Structurally Similar sentences compared to Ungrammatical Control sentences with an alternative structure (**each other meet/at the cafe*). Crucially, this priming effect occurred only in the First Block of presentation, with no priming in the Second Block. The observed innovation priming effect as such is largely consistent with previous studies reporting innovation priming effects in comprehension (Arslan et al., 2025; Jacob et al., 2025; Karkaletsou et al., 2025), and production (Baroncini et al., 2025; Baroncini & Torregrossa, 2025; Fernández et al., 2017; Hsin et al., 2013; Kootstra & Şahin, 2018; van Dijk & Unsworth, 2023). However, our results differ from these previous studies in the sense that the effect was limited to the First Block, leading to a significant interaction between *Prime Condition* and *Presentation Block* in our analyses. A possible explanation for this interaction is based on the fact that, as discussed in more detail below, reading times were also affected by adaptation to the innovative French structure during the experimental session. Due to this adaptation effect, reading times for the innovative structure were already very fast towards the end of the experiment, leaving little room for a facilitative effect of the prime.

With regard to the possible role of the observed priming effect in contact-induced language change, a newly-arrived innovative structure (such as an innovation which is merely occasionally produced by bilingual speakers, and thus not fully established in the language yet) may consolidate itself in the language through cross-linguistic priming, particularly in bilingual

conversations involving code-switching. Additionally, while we measured the priming effect using a comprehension task, theoretical accounts of cross-linguistic structural priming (e.g., Hartsuiker et al., 2004; Jacob et al., 2017) typically assume that cross-linguistic priming in comprehension and production is based on the same underlying mechanisms. If we follow this claim and assume that the observed priming effect can be generalized to production, cross-linguistic innovation priming in bilinguals may constitute a pathway which allows innovative structures to enter a target language.

Adaptation as a mechanism of conventionalization. In addition to effects of the prime, our analyses also revealed a main effect of *Presentation Block*, with significantly faster reading times for the critical target region in the Second Block than in the First Block irrespective of the preceding prime. This suggests that the participants adapted to the innovative French structure during the experiment while gradually coming across more French target sentences with the innovative structure, resulting in faster reading times towards the end of the experimental session. The cumulative priming/adaptation effect is in line with findings from previous studies which show gradual adaptation to other structural innovations in a variety of different languages (e.g., Fraundorf & Jaeger, 2016; Jacob et al., 2025; Karkaletsou et al., 2024; Karkaletsou et al., 2025; Kaschak & Glenberg, 2004). Just as in our study, adaptation effects in these previous studies were already measurable within a single experimental session. This suggests that, once an innovative structure starts to occur in a language (for instance in the sense that it is occasionally produced by a particular subgroup within the linguistic community, such as bilinguals), the human processor tends to adapt to this innovative structure relatively quickly. If we follow the assumption from language-acquisition research that such cumulative priming effects may facilitate the formation of

stored abstract structural representations for the primed structure (e.g., Hartsuiker & Bernolet, 2017; Kholodova et al., 2023; Rowland et al., 2012), this gives rise to the possibility that cumulative within-language priming constitutes a mechanism of conventionalization, which allows the innovative structure to spread from an initial group of agents of change to the entire linguistic community.

Production of innovative structures. In addition to immediate priming and adaptation during the experiment, we also explored potential longer-term priming effects from online processing onto subsequent unprimed production. For this purpose, we compared the proportion of innovations produced in the Pretest versus Posttest. Results revealed no significant increase of innovative structures from Pretest to Posttest, although there was a numerical upwards tendency in the predicted direction, with 36 instances of innovative sentences in the Pretest and 57 instances in the Posttest. This finding aligns with previous relevant work from Karkaletsou et al. (2025) showing that, although it is possible to prime English-like French innovations in real-time processing, speakers might hesitate to actually produce such structures despite the fact that they might have already adapted to them (see also Karkaletsou et al., 2024 for adaptation to innovations in offline acceptability and in response times).

At first glance, the fact that exposure to the innovative French structure during the experiment did not lead to a cumulative priming effect in the post-experiment production test may appear to constitute a counter-argument against the claim that an innovative structure may spread across a linguistic community through structural priming. Note, however, that in natural language use, an innovative structure which has recently entrenched itself in a subgroup of speakers would repeatedly get encountered over an extensive period of time. This may lead to substantially

stronger cumulative priming than in an experimental session. As also suggested by Jacob et al. (2025), the cumulative priming effect may eventually become strong enough to overcome a speaker's hesitation to produce an ungrammatical sentence.

Innovation priming and individual differences. Finally, we investigated the role of individual amount of contact with French in the priming of and adaptation to innovations. Our results revealed a non-significant effect of *French Score* in priming in processing, indicating that participants' individual contact with French did not influence how they read the French innovation overall or after particular English primes (cf. Karkaletsou et al., 2025). However, in production, French contact played an important role. Specifically, speakers with lower *French Score* were shown to be more prone to using innovative reciprocals regardless of whether they were previously exposed to such structures during the priming task. This aligns with previous work showing that (individual) language contact in bilinguals seems to affect speakers' susceptibility to innovativeness in language either in experimental priming (e.g., Fernández et al., 2017; Karkaletsou et al., 2025; Kootstra & Şahin, 2018) or in more naturalistic settings (e.g., Mougeon et al., 2005).

Taken together, from a language change perspective, these results provide empirical evidence for how bilingual processing mechanisms may map onto diachronic processes. The fact that participants could adapt rapidly to the innovative reciprocal structure suggests that, once such a structure begins to appear in linguistic input, speakers' cognitive systems are capable of accommodating it relatively easily (entrenchment). This ability for rapid adaptation provides the cognitive basis upon which conventionalization (i.e., the community-level stabilization of a formerly innovative form) can occur. In other words, immediate cross-linguistic priming may

initiate entrenchment at the individual level, while cumulative within-language priming may reflect the early dynamics of conventionalization, whereby repeated usage and exposure consolidate the innovation as part of the grammatical system of the community.

5. Conclusion

Our study examined immediate and cumulative priming effects for innovative reciprocal structures in Canadian French to gain insight into the psycholinguistic mechanisms that may underlie contact-induced grammatical change. The self-paced reading results revealed a significant immediate priming effect in the First Block, showing that bilingual speakers processed the French innovation faster after Structurally Similar English primes than after alternative primes. This suggests that cross-linguistic activation can temporarily facilitate the processing of an emerging structure in the target language, even when that structure is not yet conventionalized in the speakers' grammar. In this respect, our findings support the view that new syntactic configurations may enter a language through cross-linguistic priming in adult bilinguals, consistent with previous work on innovation priming (e.g., Fernández et al., 2017; Jacob et al., 2025; Karkaletsou et al., 2025; Kootstra & Muysken, 2019; Kootstra & Şahin, 2018). Beyond immediate priming, participants also adapted to the innovative structure over the course of the experiment, as indicated by overall faster reading times in the Second Block compared to the First Block. This cumulative priming effect suggests that, once an innovation has been activated through cross-linguistic input, bilingual speakers can rapidly adapt to it within the target language itself. However, this adaptation did not translate into a significant increase in innovative productions after priming, indicating that adaptation in production might require more exposure over time. Lastly, our results showed that the individual degree of contact with French modulated

susceptibility to change: bilinguals with lower *French Score* were more likely to produce the innovation overall, whereas *French Score* did not significantly affect priming or adaptation in real-time processing. Taken together, these findings suggest that immediate cross-linguistic priming reflects an early stage of entrenchment, during which a novel structure is cognitively established through bilingual activation, while cumulative within-language adaptation reflects the consolidation of this structure within the target language. Once such innovations start to appear in the linguistic input, speakers' rapid adaptation can provide the basis for their eventual conventionalization at the community level.

Data Accessibility Statement:

Data, analysis script, and supplementary materials for the study reported in this manuscript are available on OSF via the following link:

https://osf.io/9b4rq/overview?view_only=4439acbe1cd748fb89285fb771c22ea4

Ethics and consent:

The research reported in this manuscript was conducted according to the ethics guidelines in the Declaration of Helsinki. Informed consent was obtained from all participants involved in the study.

Authors' contributions:

Conceptualization: **FK**, GJ and SA; methodology: **FK**, GJ and SA; investigation: **FK**; resources: SA; software: **FK**; formal analysis: **FK**; data curation: **FK** and GJ; writing — original draft preparation: **FK** and GJ; writing — review and editing: **FK**, GJ, SA; visualization: **FK**; supervision: SA and GJ; project administration: **FK**; funding acquisition: SA and GJ. All authors have read and agreed to the submitted version of the manuscript.

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Appendix A – Descriptive tables and plots

Table A1. Raw RT (ms) descriptives for target regions R3 and R4 (separately and combined).

English Prime Condition	*Target region*	*Mean RT (ms)*	*SD RT (ms)*	*SE RT*	*Min RT (ms)*	*Max RT (ms)*
Structurally Similar prime	R3	594.60	288.58	9.88	116.30	2,282.30
Grammatical Control prime	R3	597.46	320.10	10.92	119.90	3,800.26
Ungrammatical Control prime	R3	611.44	311.06	10.63	120.10	3,099.90
Structurally Similar prime	R4	629.68	328.93	11.26	116.80	2,850.10
Grammatical Control prime	R4	645.21	363.96	12.42	133.70	3,616.80
Ungrammatical Control prime	R4	620.52	307.31	10.50	106.60	2,900.00
Structurally Similar prime	R3 + R4	1,224.28	523.22	17.91	316.20	3,665.50
Grammatical Control prime	R3 + R4	1,242.67	574.63	19.61	300.50	5,300.06
Ungrammatical Control prime	R3 + R4	1,231.97	516.71	17.65	226.70	4,149.90

Chapter 4. General discussion

The overarching aim of this thesis has been to investigate bilingual speakers' adaptation to structural innovations, and how such adaptation can inform our understanding of the psycholinguistic mechanisms underlying contact-induced language change. Focusing on Canadian French-English bilinguals, all studies (Studies 1, 2 and 3 as well as the additional study in Section 3.1) collectively explored the extent to which speakers adapt their perception (acceptability judgments), online processing and production of innovative syntactic structures in French that are modeled on grammatical structures in English. The findings converge on the conclusion that bilingual structural adaptation is a multidimensional phenomenon that unfolds differently across different levels of linguistic performance (perception, online processing, production) and is shaped primarily by structural and – to a lesser extent – by individual factors. The sections in this chapter provide a more detailed summary (4.1) and discussion (4.2) of the main findings in relation to the overarching research questions of the thesis, as well as their implications for theories and mechanisms of language change, followed by some methodological considerations (4.3).

4.1 Summary of findings across all studies

The three main studies included in this dissertation, complemented by the additional study presented in Section 3.1, examined how Canadian French-English bilingual adults perceive, process and produce different types of structural innovations in French. Taken together, these studies reveal a coherent, yet diverse, picture of how bilinguals adapt to innovations across different domains of linguistic performance, while highlighting the constraints imposed by structure type and individual bilingual contact.

Findings from Study 1: Acceptability and adaptation to French structural innovations

Study 1 (Karkaletsou et al., 2024) tested three types of omission-induced, English-like structural innovations in Canadian French (ditransitives, monotransitives and reciprocals), assessing whether repeated exposure within French leads to adaptation reflected as increased acceptability (syntactic satiation) and/or faster response times across trials. It also investigated how these processes are modulated by structure type and individual differences in bilingual contact, specifically by speakers' individual degree of language contact (assessed via the composite variable *French Score*).

At the group level, bilinguals consistently rated all three innovations lower and slower than their grammatical French counterpart structures. Nonetheless, acceptability varied by structure type. Innovations that involved omission of argument-marking prepositions (e.g., ditransitives: **L' homme donne [à] la femme un cadeau* 'The man gives the woman a present'; monotransitives: **Le garçon obéit [à] la professeure* 'The boy obeys the teacher') were overall less acceptable than those that involved omission of the reciprocal marker *se* (e.g., **Les deux amis [se] rencontrent dans le parc* 'The two friends meet in the park'). Regarding adaptation (syntactic satiation), acceptability ratings at the group level remained stable across trials, indicating that short-term repeated exposure does not significantly influence bilinguals' evaluative judgments. However, response times did reveal adaptation, with participants responding cumulatively faster to innovative structures over the course of the experiment. This suggests that bilinguals show adaptation in more implicit measures even when their explicit evaluative judgments do not reflect similar patterns. Despite this discrepancy between judgments and response times at the group level, adaptation was observed at the individual level for some participants, but this tendency was inconsistent across different structures.

Moreover, individual differences in contact were found to modulate acceptability. Participants with lower *French Scores* (i.e., lower current and across-time exposure and use of

French, lower French proficiency) tended to rate innovations higher and slower than participants with higher *French Scores*. This implies that bilinguals with more extensive French experience seem to show greater sensitivity to grammatical violations and, therefore, reject them faster. However, *French Score* was not shown to affect syntactic satiation at an individual level, since speakers who adapted their ratings to some degree did not necessarily indicate lower contact with French.

Findings from the additional study: Acceptability and adaptation to French DF innovations

The additional study in Section 3.1 examined a structurally different innovation, namely DF in motion constructions in French (e.g., **descendre bas* 'to go down down'). Unlike the structures tested in Karkaletsou et al. (2024), this innovation is not a result of direct structural transfer from English, but rather a result of mixing of the French and the English motion typology. The overall acceptability of and adaptation to DF was tested with French-English adult bilinguals in two different environments, namely Canada (high-contact) and France (low-contact).

Results align with the general trajectory observed in Karkaletsou et al. (2024). Across both contact environments, DF innovations were rated lower compared to the grammatical variant in French (*descendre* 'to go down'). Crucially, Canadian bilinguals rated them significantly higher than bilinguals in France. This supports the broader pattern that high contact in bilinguals boosts the overall acceptability of innovations. Similarly to Karkaletsou et al. (2024), no across-trial adaptation at the group level was observed. Canadian bilinguals showed stable ratings over the course of the task, while French bilinguals' ratings slightly decreased. This suggests that DF innovations are resistant to syntactic satiation despite repeated exposure, possibly due to their typological markedness or rarity.

Taken together, both acceptability judgment studies show that, although innovations are rated lower than the corresponding grammatical variants, high contact – either on an individual or on a societal level – boosts their overall acceptance among bilinguals. However, adaptation in acceptability ratings (syntactic satiation) is hard(er) to detect, while adaptation on a more implicit level of performance (i.e., response times) is more likely to take place across speakers.

Findings from Study 2: Cross-linguistic priming of French ditransitive and monotransitive innovations

Study 1 showed that repeated exposure within French did not lead to adaptation in terms of increasing acceptability of innovations across trials (syntactic satiation); however, it did lead to adaptation in terms of cumulatively faster response times. To explore adaptation in the context of language contact (and not within one single language), Study 2 (Karkaletsou et al., 2025a) used cross-linguistic structural priming from English to investigate whether Canadian bilinguals adapt both their online processing and their production of French innovations. It focused on two types of innovations that were also tested in Karkaletsou et al. (2024), namely innovative ditransitives omitting *à* (e.g., **L' homme donne la femme un cadeau* 'The man gives the woman a present') and innovative monotransitives omitting *à / de* (e.g., **Le garçon obéit [à] la professeure* 'The boy obeys the teacher').

Results reveal that priming depends strongly on structure type. Concretely, English primes facilitated the online processing of innovative ditransitives, with participants reading the post-innovation region in the French target sentences faster when preceded by structurally similar English primes than when preceded by alternative primes. In contrast, monotransitive innovations did not exhibit any priming at all. This suggests that not all omission-based innovations benefit equally from cross-linguistic facilitation, presumably due to differences in

inherent structural properties (e.g., how the argument structure is encoded). Across experimental trials, bilinguals indicated cumulative adaptation in the form of decreasing reading times for both structures, though more strongly for ditransitives. However, priming was not shown to have longer-lasting effects, since participants did not increase their innovative productions from pretest to posttest for either structure. As for the role of individual French contact (*French Score*), it was shown to affect overall production of innovations, with lower *French Scores* in participants leading to more innovative instances. However, it did not lead to stronger adaptation in online processing or in production.

In sum, Study 2 presents evidence that cross-linguistic structural priming can provide a pathway for innovations to enter a bilingual's grammar, but this is strongly modulated by structure-specific properties. It also shows that adaptation occurs in online processing, but adaptation in production seems to be more constrained, potentially requiring more exposure over longer periods of time. Finally, individual degree of contact matters, but only in specific processes, such as in the overall production of innovations (no adaptation).

Findings from Study 3: Cross-linguistic priming of reciprocal innovations in French

Study 3 (Karkaletsou et al., 2025b) extended Study 2 to French reciprocal structures lacking the obligatory reflexive marker *se* (e.g., **Les deux amis rencontrent dans le parc* 'The two friends meet in the park'). Unlike innovative monotransitives and ditransitives, innovative reciprocals are seen as a more extreme grammatical case, since the *se*-omission alters the argument structure of the verb more strongly compared to the omission of the argument markers in mono- and ditransitive structures. This might make the innovation less likely to occur and, potentially, less likely to enforce adaptation in Canadian bilinguals. The same participants were tested as in Karkaletsou et al. (2025a).

Results revealed significant cross-linguistic priming in online processing, with participants reading innovative reciprocals faster after structurally similar English primes than after alternative primes. However, this effect was present only in the first experimental block (i.e., first half of the experiment), while there was no priming in the second block. Cumulative adaptation over the course of the task was also found, with reading times decreasing across the two blocks. Together, these findings suggest that, initially, bilinguals were facilitated in their processing of the innovation through cross-linguistic exposure. However, as the task proceeded, they showed adaptation by repeatedly being exposed to the French innovation during the experimental session, which made the effect of the English primes gradually weaker. However, similarly to Study 2, there was no increase in the production of innovations post-priming, showing that participants did not adapt in this domain. Production patterns once again interacted with individual bilingual contact: bilinguals with lower *French Scores* showed an overall greater likelihood of producing innovations than bilinguals with higher *French Scores*.

Thus, Study 3 provides more evidence that bilinguals adapt to structural innovations in online processing, even when these innovations are structurally more challenging. However, adaptation in production appears harder to occur. Individual contact seems to affect overall production of innovations but does not influence adaptation processes.

4.2 Discussion of findings based on overarching RQ1 and RQ2

In this section, I discuss all key findings on the basis of the first two research questions which asked whether bilingual adaptation occurs across perception (acceptability judgments), online processing and production (RQ1), as well as whether it is modulated by structure type and individual language contact (RQ2). Since RQ3 targets the implications of these results with respect to theories of contact-induced language change, it will be discussed later in Section 4.3.

Bilingual adaptation in perception, online processing and production (RQ1)

The three main studies of the thesis have shown that Canadian bilinguals adapt to English-like structural innovations in French. However, adaptation was primarily and consistently observed only in implicit measures, reflected either in cumulatively decreasing response times during within-French acceptability judgments (Study 1), or in cumulatively decreasing reading times during cross-linguistic priming (Studies 2 and 3). This pattern aligns with previous research demonstrating that speakers adapt to innovative structures due to exposure-driven structural facilitation in online comprehension (Fraundorf & Jaeger, 2016; Jacob et al., 2025; Kaschak & Glenberg, 2004).

In contrast, adaptation in offline acceptability judgments and production was either harder to detect or non-existent. For instance, in Study 1 (Karkaletsou et al., 2024), group-level syntactic satiation effects were generally not observed (cf. Do et al., 2016; Snyder, 2000, 2022). Following Do et al.'s argumentation, this pattern might be attributed to the fact that all French structural innovations tested have a grammatical counterpart in English. If bilinguals map French innovations onto their English equivalent structures, they might not perceive them as fully ungrammatical, in which case syntactic satiation would not be expected to occur. However, the additional acceptability judgment study on double-framing (DF) in French (Section 3.1) revealed a comparable pattern, despite the fact that the DF innovation does not have an English grammatical equivalent. Moreover, even in the absence of group-level adaptation in acceptability ratings, Study 1 detected syntactic satiation effects at the individual level, albeit for only a limited number of speakers.

A similar pattern emerged in production. In Studies 2 (Karkaletsou et al., 2025a) and 3 (Karkaletsou et al., 2025b), participants did not produce more structural innovations after priming than before priming, despite repeated exposure to French innovations and their structurally similar English primes during the priming task (in line with Baroncini et al., 2025;

Hopp & Jackson, 2023). At the individual level, however, some speakers increased their innovative productions post-priming. Taken together, these findings suggest that adaptation is harder to detect when more explicit measures are employed, such as offline acceptability ratings and (written) production. This interpretation is further supported by previous priming research reporting mixed or inconclusive evidence for bilinguals' adaptation to innovations in production paradigms (cf. Baroncini et al., 2025; Fernández et al., 2017; Hopp & Jackson, 2023; Kootstra & Şahin, 2018).

One explanation for this asymmetry across domains could be that explicit tasks place greater demands on speakers' metalinguistic awareness. In offline acceptability judgments, participants are required to explicitly evaluate sentences that they often perceive as ungrammatical, as is the case for structural innovations. This may inhibit observable adaptation even when repeated exposure to the innovation facilitates more implicit processes, such as processing or response speed. Similarly, in production tasks, speakers must actively generate a linguistic form while simultaneously inhibiting alternatives that are perceived as non-standard or more marked. In this sense, adaptation in production and explicit judgment may be masked by speakers' awareness of grammatical constraints, rather than being absent altogether. Such constraints could be amplified in the Canadian context, where English influence on French can be socially salient and often associated with concerns about language quality (e.g., Walsh, 2014). Hence, even in a high-contact environment like Canada, such sociolinguistic pressures may discourage speakers – especially more French-dominant ones – from overtly accepting or producing English-like structural innovations in French, particularly in experimental settings that engage more controlled aspects of language use.

In sum, these findings suggest that bilinguals are overall less likely to show adaptation to structural innovations in offline acceptability judgments and production, potentially due to internalized norms of correctness, sociolinguistic pressures, or the greater cognitive demands

of generating or evaluating innovative structures. By contrast, adaptation at an online, more implicit level of performance appears to be more robust. Thus, RQ1 can be answered as follows: bilinguals adapt across different domains of linguistic performance, but the extent and nature of this adaptation varies significantly (cf. Regulez & Montrul, 2023).

Bilingual adaptation as a function of structure type and individual degree of contact (RQ2)

Overall, structure type was found to modulate bilinguals' adaptation to structural innovations. This effect is most clearly illustrated in Study 2 (Karkaletsou et al., 2025a), which revealed differential patterns for the two innovations under investigation, namely ditransitives and monotransitives. First, priming effects were structure-dependent, with cross-linguistic facilitation from English observed only for ditransitive innovations. Second, across-trial adaptation in reading times was present for both structures but was significantly stronger for ditransitive than for monotransitive innovations. These findings, together with the presence of cross-linguistic priming and adaptation effects for innovative reciprocals in Study 3 (Karkaletsou et al., 2025b), indicate that adaptation in online processing does not occur uniformly across all omission-based innovations with a grammatical English equivalent. Instead, adaptation appears to be conditioned by structure type (see Fernández et al., 2017 for similar findings in production priming).

More specifically, such differential patterns may be attributed to structure-specific properties related to how argument structure is represented. As discussed in Karkaletsou et al. (2025a), in monotransitives, the omitted markers *à* and *de* occur only with a restricted set of verbs and are therefore assumed to be stored as part of the lexical entry of these verbs. This is not the case for ditransitives and reciprocals, where the omitted markers *à* and *se*, respectively, are not necessarily verb-specific, as they can co-occur with all verbs that potentially yield ditransitive or reciprocal meanings. Hence, these results show that bilinguals can adapt, at least

in online processing, even to more extreme innovations (i.e., reciprocals without *se*), as long as other structural properties facilitate such adaptation.

In this respect, the present findings extend previous views on the role of structure type in cross-linguistic priming. Fernández et al. (2017), for instance, argue that structural innovations are more easily primed across languages when they receive stronger structural support in the target language, such as the availability of a closely related grammatical structure. While this explanation accounts for differential priming effects in production, the present results point to a complementary set of properties that appear to modulate adaptation at a more implicit level. Specifically, they suggest that more fine-grained lexico-syntactic properties of argument structure representation can modulate the emergence and strength of adaptation in online processing, beyond the presence of a similar grammatical structure in the target language.

With respect to production, structure type was found to strongly modulate overall production patterns rather than adaptation per se. Canadian bilinguals were more likely to produce innovative monotransitives (103 instances in the pretest vs. 104 in the posttest) than innovative ditransitives (12 vs. 18) or reciprocals (36 vs. 57). This distribution reflects a continuum of familiarity with, and potentially susceptibility to, each innovation, suggesting that monotransitives are generally easier to produce than the other two structures (cf. Mougeon et al., 2005). At the same time, a numerical – though non-significant – increase in innovative productions from pretest to posttest was observed only for ditransitives and reciprocals, but not for monotransitives. This indicates that individual participants tended to show adaptation to specific structures only (Fernández et al., 2017), mirroring the structure-specific effects observed in online processing.

Adaptation was also observed in response times in Study 1 (Karkaletsou et al., 2024), following a trajectory comparable to that reported in Studies 2 and 3. This tendency was evident

across all innovations. However, differences between structures emerged at the level of individual adaptation in acceptability ratings (i.e., syntactic satiation). Specifically, more participants showed adaptation to monotransitive innovations (n = 15) than to reciprocal (n = 10) or ditransitive innovations (n = 4). Crucially, participants who adapted their ratings did not do so consistently across different structures. Thus, innovation type appears to play a role also at the individual level, replicating findings on structure-specific syntactic satiation in both monolinguals (Snyder, 2000, 2022) and bilinguals (Do et al., 2016). Interestingly, this pattern contradicts the results from online processing, where monotransitives indicated weaker adaptation effects than ditransitives. This discrepancy suggests that structure type may modulate adaptation differently across domains of linguistic performance, with distinct structural properties becoming relevant depending on the task. In acceptability judgments, for instance, speakers may rely more strongly on sociolinguistic properties than on lexico-syntactic properties of the structures, leading them to adapt more readily to innovations that are assumed to be more established in their input, such as monotransitives compared to ditransitives and reciprocals.

In addition to structure type, the role of individual language contact was also examined. The degree of individual contact with French, operationalized through the composite *French Score*, was shown to affect baseline acceptability and production patterns, but not the emergence or strength of priming and/or adaptation (in line with Baroncini et al., 2025; Hsin et al., 2013; contradicting Baroncini & Torregrossa, 2025; van Dijk & Unsworth, 2023). Specifically, in Study 1, *French Score* modulated overall acceptability judgments and response times, with bilinguals with lower *French Scores* rating innovations higher and responding more slowly than bilinguals with higher *French Scores* (Higby, 2016; Jacob et al., 2025; Kupisch, 2012; Montrul et al., 2015; Montrul & Bowles, 2009; also see study in Section 3.1). However, *French Score* did not predict whether participants would show syntactic satiation at the

individual level. Similarly, in Studies 2 and 3, *French Score* predicted the overall likelihood of producing innovations, with speakers with lower *French Scores* producing more innovative instances across all structure types (cf. Fernández et al., 2017; Kootstra & Şahin, 2018; Mougeon et al., 2005 for similar effects of contact on production). Yet, *French Score* did not modulate adaptation either in online processing or in production (cf. Baroncini et al., 2025; Kootstra & Şahin, 2018).

Overall, structure type emerged as a key factor shaping adaptation, primarily influencing the presence of priming effects and the strength of adaptation in online processing. In acceptability judgments and production, its influence was more indirect, reflected in the number of participants adapting to specific innovations rather than others. By contrast, individual differences in language contact affected baseline acceptability and production of innovations but did not play a determining role in adaptation processesß

4.3 Implications (RQ3)

The third research question addressed whether cumulative exposure and adaptation to structural innovations can contribute to longer-term contact-induced language change processes. In the following sections, I discuss the implications of the findings across all studies in relation to this question, with particular emphasis on the role of cross-linguistic structural priming and adaptation as psycholinguistic mechanisms that may support the emergence, entrenchment, and potential conventionalization of innovative structures in bilingual grammars (Section 4.3.1). I then briefly consider methodological implications arising from this thesis (Section 4.3.2).

4.3.1 Implications for theories and mechanisms of contact-induced language change

Cross-linguistic structural priming as a psycholinguistic mechanism underlying contact-induced language change

In the studies of this thesis, cross-linguistic structural priming emerges as a robust psycholinguistic mechanism facilitating bilinguals' adaptation to structural innovations. This is shown through both immediate priming effects and cumulative adaptation effects (i.e., cumulative priming), primarily in online processing measures (see Jacob et al., 2025).

The immediate priming effects observed in Studies 2 and 3 demonstrate that consistent exposure to structurally similar English primes can temporarily increase the activation and availability of French structural innovations, enabling bilinguals to process them more efficiently than they otherwise would. The cumulative adaptation effects indicate that repeated exposure to the French innovations across experimental trials further facilitates their processing, making them gradually more accessible and integrated in bilinguals' grammars. Similarly, Study 1 shows that repeated within-language exposure to the innovations led speakers to adapt by responding faster over time. Crucially, both cross-linguistic priming and adaptation have been shown to be structure-dependent, with some structural innovations being more susceptible to these processes than others.

Further, Study 3 provides more insights into the interplay between immediate cross-linguistic priming and across-trial adaptation. Investigating these processes across experimental blocks (and not continuously across trials) shows that immediate priming tends to occur at earlier stages of encountering the innovation, when the structure is probably entirely novel to the speakers and, thus, cross-linguistic support is needed. However, such structural support from the other language seems to be followed, and perhaps overridden with time, by within-language adaptation due to repeated exposure to the innovation itself, which gradually reduces the effect and strength of cross-linguistic facilitation.

Taken together, these findings confirm claims from the literature that cross-linguistic structural priming is not merely a short-lived phenomenon, but a mechanism that has longer-lasting effects on speakers' mental representations, thus creating the conditions under which structural innovations become cognitively more available to bilinguals (e.g., Fernández et al., 2017; Jacob et al., 2025; Kaan et al., 2019; Kaan & Chun, 2018; Kootstra & Doedens, 2016; Kootstra & Şahin, 2018). By creating and strengthening links between structurally related syntactic representations across languages, cross-linguistic priming initiates a trajectory of adaptation that may, under specific sociolinguistic circumstances, contribute to the emergence, entrenchment and potential conventionalization of innovative grammatical patterns in bilingual grammars, leading to longer-term language change (Arslan et al., 2025; Baroncini et al., 2025; Fernández et al., 2017; Jacob et al., 2025; Kootstra & Muysken, 2017, 2019; Kootstra & Şahin, 2018).

From this perspective, implicit learning and adaptation offer a plausible psycholinguistic link between short-term exposure effects and longer-term processes of language change (e.g., Chang, 2008). Implicit learning accounts assume that repeated prediction errors lead to gradual adjustments in abstract syntactic representations, which accumulate with repeated exposure and persist beyond the immediate processing context. The present findings are compatible with this view in that adaptation effects emerged cumulatively, particularly in domains tapping into more implicit aspects of linguistic performance, such as online processing. Although the nature of the studies in this thesis does not allow direct inferences about diachronic language change, the observed adaptation patterns nonetheless illustrate how structural innovations can become increasingly accessible in bilingual grammars through repeated exposure, even in the absence of overt increasing acceptance or production. In this sense, adaptation can be understood as a mechanism that makes structural innovations

cognitively more available, thereby creating the conditions under which they may subsequently stabilize and spread in the community.

A related implication concerns the role of individual bilingual contact, assessed through *French Score*, in these processes (Filipović & Hawkins, 2025; Hawkins & Filipović, 2024). Across all three main studies, *French Score* did not determine whether bilinguals showed adaptation in either of the domains tested. This indicates that higher individual contact does not necessarily make speakers more likely to adapt to structural innovations short-term and thus does not play a fundamental role in the underlying adaptation mechanisms themselves. However, *French Score* consistently modulated baseline performance: bilinguals with lower French contact rated innovations higher and produced more innovative forms overall. This pattern suggests that, even though individual contact does not directly boost adaptation, it still shapes speakers' general susceptibility to innovations (also see Kootstra & Şahin, 2018). In other words, individual contact influences how available or acceptable innovations are for bilinguals, thereby shaping the linguistic environment in which adaptation processes unfold.

Adaptation to structural innovations as a path toward contact-induced language change

A further implication of the findings concerns how the observed priming and adaptation patterns map onto broader processes associated with contact-induced language change. Across Studies 1-3, bilinguals showed evidence of adaptation to structural innovations in more implicit processes (i.e., response and reading times), and these patterns can be meaningfully interpreted as reflecting different stages in the emergence and consolidation of structural innovations in bilingual grammars.

The immediate cross-linguistic priming effects observed in Studies 2 and 3 can be seen as simulating an early stage of entrenchment (cf. Jacob et al., 2025; also see De Smet, 2017; Lantto, 2021; Schmid, 2015). When bilinguals process an innovative French structure that corresponds to a grammatical structure in English, they appear to rely on equivalent

English representations to facilitate processing. This increased activation indicates that exposure to structurally similar English primes can temporarily strengthen the French innovation within speakers' grammar systems. In this view, cross-linguistic priming provides a psycholinguistic mechanism by which a novel structure may become available in a bilingual's grammar. Such a mechanism is particularly relevant for structural innovations that are initially rare or marginal in the input, as the cross-linguistic boost helps compensate for low frequency or total absence of the structure in the target language.

Cumulative within-language adaptation, reflected in decreasing processing times across trials, corresponds to a subsequent stage in this trajectory. Once an innovative structure has been activated through cross-linguistic priming, repeated exposure to that structure allows for further strengthening. The fact that participants in Studies 2 and 3 became increasingly efficient in processing French innovations over the course of the experiment suggests that, once initial cross-linguistic activation has occurred, the structure entrenches further within the system of the target language. This also aligns with the pattern observed in Study 1, where response times decreased across trials despite the absence of cross-linguistic input, pointing to a general sensitivity of the bilingual processor to repeated within-language exposure.

Overall, these two processes (i.e., initial cross-linguistic priming and within-language adaptation) offer a psycholinguistic account of how individual-level entrenchment may develop. From a language change perspective, this is crucial because individual-level entrenchment is a prerequisite for the broader establishment of innovations in the community. If speakers can rapidly adapt to innovative structures, the cognitive cost of processing, accepting or even producing these structures decreases (consistent with accounts that assume gradual adjustment of abstract representations through repeated exposure), thereby increasing the likelihood that such innovations might persist over time. As Study 3 suggests, even more extreme structural innovations can be accommodated by the bilingual system once they

consistently appear in the input, highlighting the flexibility of bilingual grammars in integrating structurally non-standard, innovative patterns.

Although the production data across Studies 2 and 3 showed that short-term exposure does not necessarily translate into increased production of innovations at the group level, the presence of individual-level increases for some participants indicates that production-based entrenchment may begin to emerge but requires more sustained exposure over longer periods of time to become detectable. This distinction between rapid adaptation in online processing and slower, more constrained adaptation in production highlights that entrenchment unfolds gradually and differently across various domains of linguistic performance (perception, online processing, production).

Finally, the combined findings also speak to the dynamics of conventionalization. Within-language cumulative adaptation, especially when observed across multiple individuals, is consistent with the initial stages of community-level stabilization of structural innovations (De Smet, 2017; Lantto, 2021; Schmid, 2015; also see Jacob et al., 2025). Once bilingual speakers repeatedly encounter and process an innovation with increasing efficiency, the structure becomes a more accessible option in their grammars. Under the right sociolinguistic conditions, such accessibility can facilitate the spread of the innovation within the bilingual community, laying the foundation for its conventionalization, which can then contribute to longer-term grammatical change over time.

In sum, the present studies offer empirical evidence for how cross-linguistic structural priming and bilingual adaptation, particularly in online processing, can initiate and support the pathway from individual adaptation to community-level language change. Immediate cross-linguistic priming may trigger the earliest steps of (individual) entrenchment, while cumulative within-language adaptation reflects the gradual consolidation of innovations that, over time, may lead to their conventionalization, ultimately fostering language change processes.

4.3.2 Methodological considerations

Methodologically, the present work contributes to research on contact-induced language change by combining multiple experimental measures that capture different dimensions of bilingual adaptation. By integrating acceptability judgments, online processing through self-paced reading, and production tasks, the studies were able to trace how structural innovations are perceived on a more metalinguistic level, processed, and produced. This triangulation approach proved essential because each measure revealed a distinct facet of adaptation: while more implicit measures consistently indicated adaptation, acceptability judgments and production tasks captured more stable patterns. Had the studies relied on only one of these measures, the resulting picture of adaptation would have been substantially more limited. The combination of measures therefore offers a more complete view of how bilingual adaptation to innovations manifests on different levels of linguistic performance (cf. Regulez & Montrul, 2023).

A second methodological contribution concerns the decision to test various types of structural innovations within the same contact setting. By consistently investigating three omission-based argument structure phenomena, the studies were able to identify how structural properties modulate susceptibility to priming and adaptation. This comparative perspective revealed that the magnitude and stability of adaptation differ across phenomena (cf. Fernández et al., 2017). Such insights would have remained inaccessible in a single-structure design. Moreover, the additional study on DF (Section 3.1) demonstrated that extending this approach to different types of innovations which mix typologies instead of copying, can capture further variation across structural types and contact settings. Together, these methodological choices highlight the importance of cross-structural comparison for understanding the mechanisms and limits of adaptation in bilinguals.

Finally, this work introduces a methodological innovation in the incorporation of individual bilingual contact assessed through *French Score*. This composite measure – integrating across-time and current French exposure and use, and French proficiency – offers a continuous, multidimensional representation of bilingual experience that moves beyond categorical group comparisons. By including the *French Score* as a fixed predictor in all studies, the analyses were able to detect graded effects of individual contact on speakers' overall acceptability and production of innovations. This approach captures within-community variation with greater ecological precision and avoids oversimplified classifications of bilingualism (Baum & Titone, 2014; De Bruin, 2019; Marian & Hayakawa, 2021). The *French Score* thus provides a suitable tool for investigating how bilingual contact shapes the emergence, entrenchment, and potential conventionalization of structural innovations, offering a methodological pathway that future work on language contact and change can build upon.

Chapter 5. Conclusion

The present thesis set out to investigate how Canadian French-English bilinguals adapt to structural innovations in French, and what such adaptation reveals about the psycholinguistic mechanisms that may underlie contact-induced language change. By examining bilinguals' perception (acceptability judgments), online processing, and production across several types of innovations, the studies collectively demonstrate that bilingual adaptation is a multidimensional phenomenon shaped primarily by structural properties and, to a lesser extent, by individual bilingual contact.

Across all empirical studies, a consistent pattern emerged: bilinguals reliably adapted to innovations at an implicit level of performance, most notably through decreasing response and reading times with repeated exposure during the tasks. These cumulative adaptation effects were found both within French and in cross-linguistic priming contexts, thereby supporting claims that repeatedly encountered input can facilitate the processing and perception of innovative structures. In contrast, adaptation in explicit measures, such as acceptability judgments and offline production, was limited or absent at the group level. When present, adaptation in these domains emerged only at the level of individual participants, and inconsistently across different innovation types. This divergence highlights a central conclusion of the thesis, namely that bilingual grammars exhibit robust adaptation in implicit processes, whereas explicit evaluative and production-based domains remain more resistant to innovative language use and, by extension, change.

A second major contribution of the thesis concerns the role of structure type. The innovations examined here differed systematically in their degree of grammatical markedness and the lexico-syntactic properties of the omitted element. These structural properties strongly conditioned the emergence and strength of adaptation. Concretely, while ditransitives and

reciprocals benefited from both cross-linguistic priming and cumulative adaptation, monotransitives consistently showed weaker or absent priming effects despite being more established in current Canadian French. This reinforces the conclusion that adaptation to different structural innovations is not a uniform process, but rather follows distinct trajectories shaped by structure-specific lexico-syntactic characteristics.

Individual bilingual experience, measured through the *French Score*, further clarified how contact conditions shape the linguistic landscape in which adaptation occurs. Although *French Score* did not influence whether bilinguals adapted in the first place, it consistently affected baseline performance: speakers with lower French contact rated structural innovations more favorably and produced more innovative forms overall. This suggests that, while individual contact does not directly modulate adaptation mechanisms, it determines the degree to which innovations are already familiar or acceptable to bilinguals, thereby influencing the conditions under which adaptation may take place.

Overall, these findings yield important implications for understanding the mechanisms and processes of contact-induced language change. Immediate cross-linguistic priming appears to reflect early stages of entrenchment by increasing the temporary activation of innovative structures in French, especially when they are modeled on existing syntactic structures in English. Cumulative adaptation within French, in turn, reflects gradual consolidation as bilinguals repeatedly encounter these structures in their input. Although the production data show that short-term exposure may not be sufficient to yield community-wide establishment, the processing patterns suggest that innovations can become increasingly entrenched at the individual level, forming a necessary precursor to eventual conventionalization, and, ultimately, longer-term language change.

Methodologically, this thesis highlights the importance of integrating multiple experimental approaches and of comparing structurally diverse innovations across different

types of bilinguals within the same contact situation. Together, the studies provide a comprehensive account of how different bilinguals in terms of their individual degree of language contact and experience adapt to structural innovations. Moreover, they provide psycholinguistic evidence for how such adaptation may contribute to the pathways through which contact-induced language change emerges and evolves.

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