Linguistic alignment in second language acquisition: A methodological review

Kim, YouJin; Michel, Marije

Link to publication in University of Groningen/UMCG research database
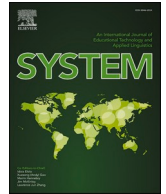
Linguistic alignment in second language acquisition: A methodological review

YouJin Kim [a], Marije Michel [b],[*]

[a] Department of Applied Linguistics and ESL, 25 Park Place, Suite #1500, Georgia State University, Atlanta, GA, 30303, USA
[b] Department of European Languages and Cultures, Groningen University, Oude Kijk in 't Jatstraat 26, 9712 EK, Groningen, the Netherlands

ABSTRACT

Linguistic alignment is defined as the development of aligned representations drawing on an automatic psycholinguistic priming mechanism that acts on every level of linguistic representation (e.g., auditory, semantic, syntactic) (Branigan et al., 2014). Building on first language (L1) alignment research, research on the occurrence of alignment and alignment-driven language learning in second language (L2) contexts has been on the rise (Kim et al., 2019; McDonough et al., 2015; McDonough & Kim, 2009). In this article, we reviewed 54 L2 linguistic alignment studies published between 2001 and 2021. The methodological aspects of these studies are reviewed in terms of the alignment types (auditory, semantic, syntactic), target linguistic features, medium of alignment, modality of primes, time on alignment treatment, task types, and operationalization of learning measures in L2 alignment research. The findings show that syntactic alignment in L2 English is the most widely researched. Additionally, both computer-human interaction in a controlled experimental context and face-to-face oral interactions are the most frequent types of alignment settings. We discuss methodological implications and highlight future directions in light of expanding alignment foci and communication modalities.

1. Introduction

In human interaction, people often naturally start copying each other's behavior including posture (e.g., Lakin et al., 2003; McDonough, Kim, Uludag, Liu, & Trofimovich, 2022/this issue), gestures, gaze (Bergmann & Kopp, 2012; Hadelich & Crocker, 2006; Oben, 2018), and language (Bock, 1995; Gries, 2005; McDonough, 2006; McDonough & Kim, 2009). In linguistic research over the past twenty-five years, this phenomenon has received ample attention from various subdisciplines taking cognitive as well as socio-cultural perspectives. It has been referred to, among other terms, as social convergence (Matras & Sakel, 2007), sociocognition (Atkinson et al., 2007), speech accommodation (Giles & Powesland, 1975), (joint) attention (Schmidt, 1990; Tomasello, 1988), persistence (Bock & Griffin, 2000), and priming (Dell & Ferreira, 2016). Psycholinguistic and sociolinguistic theories alike assign a pivotal role to "the influence of recent experience with language on current processing of language" (Kootstra & Muysken, 2017, p. 215).

Human communication builds on the premise of successful dialogue or mutual understanding between interlocutors (Grice, 1957). Accordingly, dialogue is a collaborative effort to achieve common ground (Horton, 2005) and to create shared representations of the communicative situation (Branigan et al., 2007; Zwaan & Radvansky, 1998). In their seminal work, Pickering and Garrod (2004, 2006,

2021) argue that for successful communication two interlocutors in a dialogue need to have shared cognitive representations. That is, they need to achieve alignment with each other, for example, by making similar linguistic choices. They also argue that using similar utterances in similar contexts will support convergence in communication and will thus make interaction smooth (Pickering & Garrod, 2021). According to psycholinguistic accounts, alignment draws on the well-documented processes of priming (see Pickering & Ferreira, 2008, for a comprehensive review): the largely unconscious repetition of structures (words or other linguistic representations at morphosyntactic, phonetic, pragmatic levels) that have been used in the conversation due to automatic activation of those structures (cf. Pickering & Garrod, 2004). Pickering and Garrod (2021) acknowledge that priming and alignment require "interlocutors to have similar linguistic and non-linguistics knowledge" (p. 130). However, this raises the question of how alignment might work in conversations when this is not the case, that is, when the interlocutors do not have similar linguistic knowledge (i.e., between L2 users). This question forms the heart of the current paper, as we review and present studies on dialogic alignment where this basic premise is not given because one or both of the interlocutors are L2 speakers of the language of conversation (cf., Costa et al., 2008, for a theoretical overview).

Given that our main interest lies in the field of Second Language Acquisition (SLA) and processing, where alignment and priming have been investigated in the context of L2 learning and teaching (Jackson, 2018; Trofimovich & McDonough, 2011), the current review paper includes studies that target language learning (e.g., Muylle et al., 2020). See the systematic review by Jackson (2018), the special issue edited by Kootstra and Muysken (2017) and the conceptual review by Hartsuiker and Bernolet (2017) for work with another focus such as cross-linguistic priming.

Initially, research into L2 alignment was greatly influenced by work on L1 alignment. Only over the past two decades have SLA research methods been applied increasingly to investigate alignment in L2 contexts. To move this domain forward, a systematic review of previous L2 alignment research is needed to identify methodological gaps and future directions. Accordingly, as a first step, the purpose of this systematic review is to explore (a) the methodological aspects of L2 alignment research, and (b) how alignment-driven L2 learning was examined in these studies. In the following sections, we will provide a brief historical overview of the developments of empirical linguistic alignment studies within SLA. By including a review of the different constructs and definitions that have dominated the field, we set the ground for the following systematic review of 54 publications published between 2001 and 2021 that we will present in this paper. As a result, the discussion will identify strands and gaps in the existing work and will provide directions for future research.

2. Literature review

In reviewing earlier literature, we will use the terms *priming* and *alignment* following the terminology that was used in the specific reviewed publication. Most psycholinguistic studies and early L2 pedagogic work employed *priming*, while other strands and later SLA papers preferred *alignment*. Strictly speaking, there are, however, conceptual differences between those terms as we will explain.

2.1. Defining alignment

In one of the earliest publications, Bock (1995) refers to priming as the repetition of a linguistic structure that was present in previous utterances – later elaborated by Bock and Griffin (2000) by the notion that it is 'pragmatically unmotivated repetition' (p. 177). The distinction between alignment and priming, both terms used frequently and at times interchangeably, is important. In fact, the critical review by Pickering and Ferreira (2008) names three distinct concepts: alignment, priming, and entrainment. While *alignment* refers to the overall phenomenon that occurs when interlocutors align their mental representations when in conversation, *priming* pertains to the underlying psycholinguistic activation of representations, for example, at the syntactic level. Finally, *entrainment* is used to denote the observable behavior of interactants making similar linguistic choices. According to Pickering and Garrod (2004, 2006), linguistic alignment is thought to facilitate mental alignment and vice versa.

In SLA, researchers (e.g., Marsden et al., 2013; McDonough, 2006; McDonough & Kim, 2009; McDonough & Trofimovich, 2011) have begun to examine this tendency using the construct 'priming', which is defined as 'the phenomenon in which prior exposure to specific language forms or meanings either facilitates or interferes with a speaker's subsequent language comprehension or production', (Trofimovich & McDonough, 2011, p. 3) or put more simply: the phenomenon in which speakers are inclined to repeat a structure from recent discourse (cf. Jackson, 2018).

Following Costa et al. (2008), the term alignment has caught ground in more recent SLA studies (e.g., Kim et al., 2020; Michel & Cappellini, 2019) as the overarching term to refer to the phenomenon as a whole as well as the underlying distinct concepts (convergence of the mental model that manifests itself as lexical entrainment likely to be caused by priming; cf. Michel & Smith, 2018). Indeed, most reviewed studies do not make a distinction, and therefore, in this paper we will use linguistic alignment as "the development of aligned representations via an automatic psycholinguistic priming mechanism that acts on every level of linguistic representation" (Branigan et al., 2014, p. 14). Alignment thus covers the cognitive and social aspects of the phenomenon including the alignment of situational models, its linguistic and non-linguistic manifestation (i.e., reuse of language, gesture), and the underlying priming processes.

Besides the psycholinguistic perspective of alignment, the more social view on alignment has been advocated by Atkinson and colleagues (Atkinson, 2002, 2010; Atkinson et al., 2007). By referring to the work by Watson-Gegeo (2004) on language socialization and related to Lantolf's (2000) neo-Vygotskyan sociocultural theory, they define alignment as "the complex means by which human beings effect coordinated interaction, and maintain that interaction in dynamically adaptive ways [… given that] language is crucially a form of social action" (Atkinson et al., 2007, pp. 169–170). Following these perspectives, alignment is the adaptive behavior of

humans working together in their mind-body-world ecologies. In other words, alignment to our interlocutors is a naturally emerging social reaction to the dynamic changes in the social and physical environment induced by the interaction with another human being (or plural) to 'remain on the same page'. Research within this sociocognitive approach has investigated alignment mostly using qualitative methods including multimodal interaction analysis and conversation analysis. See, for example, Atkinson (2010), where he shows how learning and SLA are linked by alignment and engagement in the interactional space of embodied cognition.

2.2. L2 linguistic alignment

L1 alignment research, taking various theoretical perspectives, has greatly influenced L2 alignment research. More cognitively-oriented accounts draw on extensive lab-based research, which has shown that alignment in L1 processing emerges naturally during authentic interaction and affects all communication levels (phonology, lexicon, morphosyntax, gestures, and eye-gazes) – see reviews by Pickering and Ferreira (2008) and Raissi et al. (2020), and special issues by Dell and Ferreira (2016) and Pickering and Branigan (2019), as well as the recent comprehensive theoretical account in Pickering and Garrod (2021). Psycholinguistic experiments suggest that L1 alignment draws on largely automatic and resource-free processes outside a speaker's awareness, that is, it is largely implicit in nature (Dell & Ferreira, 2016; Pickering & Branigan, 1999) – although beliefs about the interlocutor's communicative abilities and intentions might influence the extent of alignment (cf., Branigan et al., 2010; Branigan et al., 2011; Schoot et al., 2019). A prominent view on priming builds on the idea of residual lexicalist activation (Pickering & Branigan, 1998), roughly explained as: items of recent discourse are more active in explicit memory and thus processed faster and more easily than alternatives (Pickering & Ferreira, 2008). For SLA, the implicit learning account might be more important. As argued by Bock and Griffin (2000), the use of a specific structure leaves a cognitive trace in our memory systems which facilitates its quick and easy retrieval from implicit memory (even after a long time) when a speaker finds themselves in a similar situation (see also Chang et al., 2000).

In the past fifteen years, research into L2 alignment has received increasing attention (cf. review by Jackson, 2018), and different types of alignment have been identified and examined including auditory alignment (Jung et al., 2017; Trofimovich et al., 2013), semantic/lexical[1] alignment (Crossley, 2013), and syntactic alignment (Kim & McDonough, 2016; McDonough & Kim, 2009). Crucially, as L2 interaction often involves controlled lexical and morphosyntactic retrieval processes (Kormos, 2006), one cannot assume that L2 alignment occurs on similar grounds and in similar ways as in an L1. In their seminal contribution, Costa et al. (2008) discuss what happens when one or both interlocutors lack full competence in the language of conversation. On the one hand, incomplete target language knowledge and controlled processing might interfere with automatic and both explicit and implicit alignment (Costa et al., 2008). On the other hand, when combining the lexicalist residual activation and the implicit learning accounts, Hartsuiker and Bernolet (2017) view alignment as a process that promotes L2 development moving from mere (lexical) imitation, via explicit memory of specific forms, to gradual implicit abstraction of target language structures. With a focus on structural priming, Shin and Christianson (2012, p. 957) explain: "Unlike mere repetition of lexical forms or specific sentences, structural priming can thus be a possible source of L2 development as structural learning rather than item learning."

In Atkinson's 'sociocognitive' account, alignment is not just one aspect of learning but rather the core of social life and therefore a prerequisite for L2 acquisition (Atkinson, 2010; Atkinson et al., 2007). Accordingly, alignment is a form of situational learning within the Zone of Proximal Development (Vygotsky, 1978), wherein learners are (consciously) trying to align and also decrease social distance with the target language community. Indeed, employing the interlocutor as a model and re-using recently heard forms is fundamental to elaborating one's target language repertoire when learning a language.

Remarkably, Costa et al. (2008) highlight that some L2 speakers might also consciously avoid alignment, for example, because they are aware of their limitations and are reluctant to use a structure they do not yet (fully) grasp. Furthermore, in conversations between language learning peers, interlocutors might not trust their partner as a source for target language use and therefore decide not to align with them (cf., Michel & O'Rourke, 2019). Similarly, L1 speakers in conversation with an L2 partner may more-or-less strategically refrain from aligning to erroneous forms and instead provide the corrected form (i.e., a recast, cf. Michel & Cappellini, 2019, p. 192). Finally, Hartsuiker and Bernolet (2017) state that instruction at times might block priming, that is, L2 speakers might deliberately not align to an utterance used in the discourse (even by L1 speakers) because they have learned in class that this form is prescriptively incorrect.

This short review highlights that it is unlikely that alignment functions the same in L1 and L2. Over the years, research into L2 alignment has explored many avenues as synthesized, for example, in the comprehensive review on L2 structural priming by Jackson (2018). Accordingly, empirical findings of mainly psycholinguistic studies suggest that the proficiency of L2 learners, the combined effects of L1 and L2 frequency of linguistic target structures, and the characteristics of a structure itself influence the way alignment manifests. In addition, it seems that in an L2 there is a larger role for strategic choices (rather than implicit processes) than in L1 (cf., Michel & O'Rourke, 2019). While the earlier empirical work has helped to increase our understanding, Jackson (2018) called for more research investigating (a) long-term effects of alignment as implicit L2 learning; (b) more empirical work in authentic dialogic contexts (including pedagogic settings) to compare with findings from controlled experimental set-ups; and (c) investigations into social factors affecting alignment in instructional settings. In addition, Rasenberg et al. (2020) ask for (d) more alignment research addressing the

---

[1] Deliberately simplifying the complex relationship between semantic and lexical priming/alignment, in the remainder of this paper, we will use these two words interchangeably given that some of the studies we review use 'semantic priming' while others prefer 'lexical alignment'. The underlying concept they refer to is the phenomenon that previously heard/read words could facilitate the subsequent processing and producing of lexical items (McDonough & Trofimovich, 2009).

multimodality of communication. Furthermore, although there has been a book-length introduction to L2 alignment research methods (McDonough & Trofimovich, 2009), to the best of our knowledge no published work has systematically reviewed methods in L2 alignment research.

3. Purpose of the study and research questions

Considering the increasing amount of L2 alignment research in the past 20 years, the aim of the present paper is to provide a systematic review of research methods of L2 alignment studies that focus on the occurrence of alignment and/or the subsequent L2 learning. The studies that we included in our review could be subsumed under the heading of alignment in (instructed) SLA. That is, we focus on those studies that examined alignment in the context of L2 processing and acquisition, where alignment was investigated as a means of demonstrating L2 processing mechanisms or language learning, and/or where the elicitation of alignment was targeted by a pedagogic intervention. As the purpose of the special issue that this article is part of is to promote methodological advancement, we will highlight methodological aspects of the reviewed work to summarize and to push forward the research agenda. Our review is guided by the following overarching research question:

RQ: What characterizes L2 alignment research in SLA contexts conducted over the past two decades?

We thereby explore the following subquestions:

a. To what extent have different alignment types, target languages and linguistic features been studied?
b. To what extent have different mediums of alignment and modalities of primes been employed?
c. What is the length of alignment treatment sessions, and what types of tasks were used to elicit alignment?
d. How has short-term and long-term alignment-driven L2 learning been measured in previous L2 alignment research?

4. Methods for the systematic review

The current systematic review follows practices in synthetic secondary research in Applied Linguistics. We conducted searches using two databases: Linguistics and Language Behavior Abstracts (LLBA) and Google Scholar. We included articles and book chapters that were published between January 2001 and May 2021 which focused on three types of alignment/priming, that is, auditory, semantic/lexical, and structural/syntactic. The keywords used were as follows: alignment, priming, interactive alignment, linguistic alignment, auditory priming, lexical priming, semantic priming, syntactic priming, and bilingual priming. As discussed in the previous section, alignment has been used in a variety of research domains including L1 acquisition, L2 acquisition, and bilingual/multilingual processing, and we define L2 linguistic alignment as 'a speaker's tendency to produce a previously spoken or heard structure" (McDonough, 2006, p. 179). Our final sample consists of 54 research studies. Table 1 shows the chronological distribution of this sample.

Coding scheme categories were adapted from Plonsky and Kim (2016). As shown in Table 2, a total of ten categories were implemented for the study: Alignment type, target language features, research goals, participants, medium of data collection, modality of primes, time on alignment tasks, alignment tasks, operationalization of learning outcomes, and findings of the study. Based on the categories, two coders coded 20% of the data independently, and the exact agreement was 95%.

5. Results

The first research subquestion focuses on different types of alignment, target languages, and target linguistic features examined in previous linguistic alignment research. As shown in Table 3, most L2 linguistic alignment studies examined syntactic alignment (65%), followed by auditory (9%) and semantic/lexical (9%) alignment. Five studies that we coded as integrative alignment focused on lexical and structural alignment (Michel & Cappellini, 2019; Peng et al., 2020; Wang & Wang, 2015), auditory and syntactic alignment (Trofimovich et al., 2013), and auditory and semantic alignment (Gor & Cook, 2020). Four studies that did not fit with one of our four categories were coded as "other" (Marsden et al., 2013; Michel & Stiefenhöfer, 2019; Trofimovich & Kennedy, 2014; Uzum, 2010). Uzum (2010) examined L2 learners' alignment in CMC contexts from a sociocognitive perspective and focused on several linguistic domains: (a) fluency and speed, (b) accuracy, (c) lexical and grammatical choices, (d) content agreement, (e) negotiation of meaning, and (f) tone of conversation. Marsden et al. (2013) and Michel and Stiefenhöfer (2019) investigated alignment of verb inflections in L1 and L2 French and Spanish subjunctive mood, respectively. Trofimovich and Kennedy (2014) viewed alignment as a sociocognitive phenomenon and examined interactive alignment based on native-speaking listeners' ratings.

We also explored different target languages and target features examined in L2 alignment studies (see Table 4). Out of 54 studies, 15 studies targeted languages other than English. In terms of target features, for auditory alignment, vocabulary and word stress were researched, while semantic/lexical alignment research mainly looked into the processing of vocabulary meaning. More diverse target features were examined in syntactic alignment research. The top four widely studied features were dative constructions (e.g., McDonough, 2006), questions (e.g., Kim et al., 2020), relative clauses (e.g., McDonough et al., 2015) and passive constructions (e.g., Kim & McDonough, 2008). These constructions have been examined more commonly than others because priming mechanisms are claimed to be effective for linguistic targets that are developmentally advanced and thus difficult to teach explicitly (Kim et al., 2020). Furthermore, they have paired alternative options which carry similar meanings (e.g., double object dative vs. a prepositional dative;

Table 1
L2 linguistic alignment research articles from 2001 to 2021.

Year	2002	2005	2006	2008	2009	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
# of studies included in the analysis	1	3	2	3	1	4	2	4	2	8	3	3	4	7	4	3	54
%	1.9	5.6	3.7	5.6	1.9	7.4	3.7	7.4	3.7	14.8	5.6	5.6	7.4	13.0	7.4	5.6	

Table 2
Coding scheme categories.

Category	Description
Alignment type	Syntactic, semantic/lexical, auditory, integrated, other
Target language features	Various linguistic targets (e.g., relative clauses, passives, stress patterns)
Research goals	Description of goals
participants' background	L1 (Dutch, Korean, Chinese, etc.), age group (children, adolescents, adults)
Medium of data collection	Human-computer interaction, face-to-face human interaction, synchronous computer-mediated human-human communication
Modality of primes	Written, spoken, multimodal
Time on alignment tasks	Total amount of time on alignment tasks
Alignment tasks	(Interactive) oral production, (interactive) written production
Operationalization of learning outcomes	Oral production test, written production test, reaction time, receptive test, etc.
Findings of the study	Description of findings

Table 3
Types of linguistic alignment.

	Auditory alignment	Semantic/lexical alignment	Syntactic alignment	Integrative alignment	Other	Total # of studies
K	5	5	35	5	4	54
%	9%	9%	65%	9%	8%	

direct questions vs. indirect questions; wh-inversion questions vs. interlanguage forms of questions; accurate stranded prepositions in relative clauses vs. interlanguage forms of relative clauses). In the syntactic alignment literature, English is the dominant target language (74% or 26 studies out of 35), and only a few studies examined languages other than English (e.g., Chinese in Wang et al., 2021; Esperanto in McDonough & Trofimovich, 2015 and McDonough & Fulga, 2015; German in Jackson & Ruf, 2017, 2018).

The second subquestion focused on the medium of alignment and the modality of prime provision. Table 5 reports results regarding the medium of alignment. Three interactional mediums for linguistic alignment were identified: face-to-face human interaction, human-computer interaction, and computer-mediated human-human interaction. Face-to-face human interaction and human-computer interaction are the most popular mediums in L2 alignment research. For instance, a large number of structural priming studies were based on face-to-face interaction, which involve researcher-participant interactions while carrying out collaborative oral production tests (e.g., Kim & McDonough, 2008; McDonough & Chaikitmongkol, 2010). In these studies, the researcher often acted as a confederate who provided primes containing target grammar forms. Learner-learner interaction, either face-to-face interaction (McDonough et al., 2015) or computer-mediated human-human interaction (Michel & Stiefenhöfer, 2019), has been increasingly implemented. For the "other" category, we identified studies that are based on corpus data (Gries, 2005) or individual written production tasks (e.g., Gries & Wulff, 2005; Peng et al., 2020; Wang & Wang, 2015; Zhang, 2019).

We also examined the modality of primes and identified three categories: written, oral, and multimodal (see Table 6). Some studies provide primes in multimodal forms by using more than one mode, which we call a multimodal form of primes. Not surprisingly, all auditory priming studies provided primes orally. While all three modes were used in lexical/semantic priming research, there were slightly more written primes. Syntactic priming research relied mostly on oral primes (22 studies), but written primes (14 studies) were also used, which contrasts with a handful of multimodal primes. For the small set of studies on integrated and other primes, both oral and written modes were used equally.

The third subquestion focused on the treatment during L2 alignment research, that is, the total duration of alignment treatment phases as well as the types of tasks that were implemented to elicit alignment. As summarized in Table 7, one single alignment session for data collection was found to be the most common regardless of alignment types. The time on alignment tasks ranges from 14 min to 300 min ($M = 65.38$, $SD = 55.33$), while many studies do not report the duration of alignment sessions.

Regarding research instruments (e.g., tasks) that were used during alignment treatment sessions, studies implemented meaning-oriented tasks, often using pictures. Because it is pertinent to control the number of primes and targets and their sequences while controlling linguistic input, these meaning-oriented tasks are tightly controlled and predetermined. For instance, during picture-description/matching tasks, participants listen to primes which entail target structures (e.g., questions, passive constructions) and then demonstrate their understanding of the meaning of a sentence (e.g., choosing a corresponding photo or objects in photos) (e.g., Chun & Kaan, 2020; Conroy & Antón-Méndez, 2015; Jackson & Ruf, 2017; Kim et al., 2019; Kim & McDonough, 2008; McDonough, 2006; Shin & Christianson, 2012). Afterwards they are asked to describe pictures using lexical cues provided (target). Another popular task type is

Table 4
Target languages and target features examined in the sample studies.

	Target languages		Target features	
Auditory alignment	English	5	Vocabulary	4
	Spanish	1	Word stress	2
Lexical/Semantic alignment	English	4	Vocabulary	5
	German	1		
Syntactic alignment	English	26	Dative constructions	7
	German	2	Questions	7
	Chinese	2	Relative clauses	6
	Dutch	1	Passives	3
	Esperanto	2	"ba" construction (Chinese)	2
	Spanish	1	Stranded prepositions	2
	Artificial language	1	Word order (XVS in German)	2
			Transitive constructions	2
			Verb particle	1
			Phrasal verb constructions	1
			Nominal clause	1
			Progressive	1
Integrated alignment	English	3	Vocabulary	1
	Russian	1	Stress patterns	1
	Chinese	1	Various lexical and syntactic structures	3
	French	1		
	German	1		
Other	English	2	Various interactional features	2
	French	1	Verb inflection	1
	Spanish	1	Subjunctive mood	1

Note: Some studies targeted multiple target languages (Michel & Cappellini, 2019; Trofimovich, 2005). Thus, the total counts do not match with the exact number of studies.

Table 5
Medium of linguistic alignment.

	Auditory Alignment	Lexical/ Semantic Alignment	Syntactic Alignment	Integrated Alignment	Other	Total
Face-to-face human interaction	3		16	1	1	21
Human- Computer interaction	2	2	14	1	1	20
Computer- mediated human-human interaction		2	3	1	2	8
Other		1	4	2		7
Total	5	5	37	5	4	56

Note: Two studies (Kim et al., 2019, 2020) compared FTF and SCMC, so these studies were counted twice in the syntactic alignment column.

"an information exchange task" based on task input, during which target forms are elicited (e.g., Kim et al., 2020; McDonough et al., 2016; Trofimovich et al, 2013).

Other studies elicited aligned production during guided interaction tasks with materials that were seeded with a target structure. For example, in Michel and Stiefenhöfer (2019), students of Spanish watched a movie and engaged in follow-up peer text chat tasks related to its content. In the experimental condition, the instructional material included model sentences with the Spanish subjunctive mood for one text chat partner only, while creative production of the subjunctive by both participants was taken as an indicator of alignment to the material and each other.

Finally, the fourth subquestion addresses how previous research operationalized alignment-based learning and/or the occurrence of alignment. For auditory alignment, researchers examined the response latency (i.e., the length of time between the offset of the stimulus word and the onset of participants' response) (e.g., Trofimovich, 2005) or the production of target features, such as stress patterns (Jung et al., 2017; Trofimovich et al., 2014). In terms of learning outcomes, researchers scored pretests and posttests which elicited the production of target features for accuracy. For instance, Jung et al. (2017) scored students' production of stress patterns using a sentence-read-task. For semantic/lexical alignment, researchers have shown the lexical overlap between two participants (e.g., Michel & Smith, 2018) and examined reaction times (Bird & Williams, 2002; Guediche et al., 2020).

For syntactic alignment, the production of target grammar following primes has been analyzed (e.g., Jackson & Ruf, 2017; Kim & McDonough, 2008; Shin & Christianson, 2012) and often compared to a non-primed condition (e.g., Conroy & Antón-Méndez, 2015; Kim et al., 2019, 2020; McDonough & Mackey, 2006). When analyzing the production of target grammar, researchers report the occurrence of constructions, generally not focusing on accuracy (Kim et al., 2019, 2020; McDonough & DeVleeschauwer, 2012;

Table 6
Modality of primes.

	Auditory	Semantic/Lexical	Syntactic	Integrated	Other
Oral	5	1	22	2	2
Written		3	14	2	2
Multimodal		1	3	1	
Other			1		
Total	5	5	40	5	4

Note: For syntactic alignment, several studies used both spoken and written primes separately, so the total number is higher than the actual number of studies.

Table 7
The length of alignment treatment sessions.

	Auditory	Semantic/lexical	Syntactic	Integrated	Other
# of sessions					
One session	3	2	23	3	3
Two sessions	1	1	6	1	
More than two sessions		2	2		1
Not reported	1		4	1	
Total time on alignment tasks					
Less than 30 min			4	1	1
Between 31 min and 59 min	1	2	6	1	1
Between 1 h and 2 h	3	1	9	1	
Longer than 2 h			3		
Not reported	1	2	13	2	2

McDonough et al., 2015). While 18 out of 35 syntactic alignment studies examined the occurrence of alignment during alignment sessions only, 17 studies provided either a posttest or a post-priming session to examine the impact of alignment in language acquisition. Alignment-driven learning was operationalized as the production of target structures on the posttest or during post-priming activities (e.g., proportion scores, production rates). Posttest items are tightly controlled in a way that they can elicit target structures, but they are also meaning-oriented. For instance, Conroy and Antón-Méndez (2015) used a picture description task which asked students to describe items in pictures to elicit stranded prepositions (e.g., "A mattress is something you sleep on." p. 221).

6. Discussion

The goal of the current paper was to survey the methodological characteristics of previous L2 linguistic alignment research. We reviewed a total of 54 empirical publications examining L2 linguistic alignment. In this section, we will discuss some of the methodological trends reported in the previous section and the findings of the studies. In SLA contexts, McDonough (2006) was among the first to investigate how (what she called then) priming could be an interaction-driven language-learning tool. She hypothesized that priming may elicit learners' use of forms and structures that they tend to avoid, are infrequent in the input, or are incomplete in learners' interlanguage systems. In the past two decades, more researchers have provided ample evidence of aligned L2 production, from the early priming studies (e.g., Kim & McDonough, 2008; McDonough, 2006) to more recent work (e.g., Jackson & Ruf, 2017; Weber et al., 2019). Similarly, an increasing amount of more pedagogically-oriented research has shown that alignment can promote L2 learning in different modalities (Michel & Stiefenhöfer, 2019; Kim et al., 2020; Zhang, 2019).

6.1. Types of alignment, target languages and linguistic features

Our first subquestion was interested in the different types of alignment as well as the various target languages and linguistic targets used. Most research into L2 alignment has examined syntactic structures, with some studies targeting semantic/lexical and auditory alignment and only a handful examining integrated alignment addressing alignment at several levels. For example, researchers provided evidence of aligned L2 production of passives (Kim & McDonough, 2008, 2016), double-datives (McDonough, 2006), wh-questions (McDonough & Chaikitmongkol, 2010; McDonough & DeVleeschauwer, 2012; McDonough & Kim, 2009; McDonough & Mackey, 2006), and complex nominal and verbal morphology (Marsden et al., 2013; McDonough & Fulga, 2015), as well as stress patterns (Jung et al., 2017; Trofimovich et al, 2013), among others. These target forms were often chosen because they are developmentally difficult to acquire through explicit instruction, and there are alternative linguistic choices with a similar meaning (passive vs. active; wh-inversion questions vs. interlanguage forms). Considering that syntactic alignment has a shorter empirical tradition than auditory and semantic priming in general (McDonough & Trofimovich, 2009), in L2 research, syntactic priming research has received the most noticeable attention.

In terms of target languages and linguistic targets, L2 alignment research does not differ much from general tendencies in SLA, that is, English is the most widely researched language (Andringa & Godfroid, 2020). Accordingly, a handful of (English) syntactic

structures have been examined, and we still have little understanding of L2 alignment in other languages that are, for example, morphologically richer (e.g., containing case, gender, number marking, verbal agreement) or syntactically freer (e.g., having more flexible word order) than English. In particular, when focusing on morphosyntactic alignment, such linguistic differences potentially affect the number and form of adequate alternatives that a language learner has at their disposal. Consequently, it might affect the nature and amount of alignment that takes place – be it implicit and happening automatically or based on an explicit strategic choice. We noticed a recent trend that an increasing amount of research has started to focus on languages other than English. For example, Michel and Cappellini (2019) examined and compared German, French, and Chinese. The findings show that there seemed to be more syntactic alignment in German written chats (e.g., 50% or more alignment to prepositional phrases and constructions with the copula *be*), while more lexical alignment took place in Chinese-French video-based teletandem conversations. The authors indicate that working with these different languages calls for different tools, for example, those that allow for lemma-based comparisons at the lexical level (cf., Cappellini, Holt, & Hsu, 2022/this issue, for a first attempt at doing so), because exact lexical overlap is less likely in morphologically rich languages. Another methodological solution could be to rely on Latent Semantic Similarity (cf. Wang, Gan, & Boland, 2022/this issue) to analyze lexical alignment based on similarity, instead of exact word-by-word overlap.

6.2. Medium of alignment context

The second subquestion examined the medium of different types of linguistic alignment and the modality in which primes were provided. We differentiated between three interactional mediums for linguistic alignment and found that the majority of studies use face-to-face human interaction, while there is a growing body of digitally mediated (human-computer or computer-mediated human-human) interaction. Traditionally, alignment research has often followed a tightly controlled psycholinguistic experimental design, and participants respond to stimuli on a computer (computer-human interaction). However, the findings of the current study showed that face-to-face interaction is the most widely adopted alignment context. Albeit most of the research targets oral interaction, an increasing number of studies have begun to focus on written (text-chat) interaction (Kim et al., 2019, 2020), and some even included video-based oral interaction (Michel & Cappellini, 2019). Similarly, a growing number of studies explored alignment to an input text (e.g., Wang et al., 2021; Wang et al., 2022/this issue).

To be more specific, building on McDonough and Trofimovich (2011), the majority of the early SLA work examined whether alignment occurred during oral interaction – often elicited by a scripted interlocutor – and to what extent such alignment behavior promoted short-term and long-term benefits for L2 learning (McDonough & Chaikitmongkol, 2010; McDonough & Kim, 2009). More recently, research conducted during oral interaction has started to take a wider look at alignment in less controlled communication contexts and taking various social and task factors into consideration. For example, Dao et al. (2018) demonstrated that a picture story task induced more correct alignment of various target structures than a map task during task-based interaction (see also Michel, Appel, & Cipitria, 2022/this issue). Along the same lines, the L2 data of Sinclair et al. (2019), who investigated tutor-student adaptive behavior, suggest that tutors tend to adjust the complexity of their utterances to their students' L2 proficiency, while students with higher proficiency more flexibly aligned to their tutor in terms of their lexical choices and dialogue style (see also Sinclair & Fernández, 2023/this issue, for a follow-up study).

Providing evidence for more strategic behavior, Chun and Kaan's (2020) data showed that social factors, such as a speaker's accent, influence the extent to which L2 learners align syntactically to their partner. The Korean L2 speakers of English in their study aligned differently to syntactic patterns provided by American, Indian, and Korean accented speech. Also the order of presenting the accented speech (e.g., American before Korean and vice versa) influenced the magnitude of the priming effect. This contrasts with L1 alignment where partner factors only seem to affect alignment when they have communicative value (cf. Ostrand & Ferreira, 2019).

Increasing attention to face-to-face interaction allows for the examination of alignment in a conversation context. However, to date, most research on alignment has explored dialogues between two speakers in rather controlled settings (e.g., task input/prompts guide learner production). Authentic interaction, however, often includes more than two interlocutors. In the future, it will be essential to explore the occurrences of alignment behavior in (small) groups, and such contexts will require careful considerations of various conversational factors (e.g., distance and power relationships between interlocutors). Gaining more insights into alignment in conversations that do not follow a typical pattern of turn-taking will remind us that conversation is inherently social and cognitive in nature (Atkinson, 2010; Atkinson et al., 2007; Branigan et al., 2005; Roever & McNamara, 2006).

6.3. Modality of primes and L2 alignment

The findings on the modality of primes were closely related to the mode of conversation. We found that most research has examined oral interaction, while work involving writing and multimodal conversations is scarce. As stated above, most of the (earlier) L2 alignment studies utilized the oral mode, often engaging learners in conversation with a scripted confederate. Studies investigating auditory priming, pioneered by Trofimovich and colleagues (e.g., 2005, 2013; Trofimovich et al., 2013; Trofimovich et al., 2014), have consistently demonstrated that presenting auditory primes positively impacts L2 learners' production rate and/or accuracy of L2 target words, including pronunciation and stress patterns. This facilitatory effect is mediated by quality of the prime (e.g., same or different voice), instruction/task (e.g., focus on form vs. focus on meaning), and individual differences (e.g., length of residence). The classroom-based study by Trofimovich (2013) showed that auditory in combination with structural priming seems to be even more robust. Similarly, priming in the context of exact task repetition seems to be more effective than when tasks are only repeated at the procedural level (e.g., Jung et al., 2017).

The aforementioned seminal work by McDonough and colleagues targeting various syntactic features mostly drew on the oral mode, yielding persistent evidence that L2 priming positively affects subsequent production (see Jackson, 2018, for an extensive review). Specifically important for SLA are the findings of Shin and Christianson (2012), who provided evidence that primed production could be linked to implicit learning and the building up of abstract structural representations. Their data were slightly in discordance with McDonough and Fulga (2015), who showed that participants could only be primed on novel patterns in Esperanto if they had detected these patterns, indicating that some level of awareness and a mental representation of a form is needed before L2 alignment can take place. More recently, Dao et al. (2018) departed from targeting specific structures and instead tried to identify the amount of alignment in task-based peer interaction. Results suggest that alignment is prominent in L2 conversations but that over 60% occurs within the same speaker, while task effects were also evident. Finally, Li and Qian (2021) have taken a unique perspective by investigating the idea that priming strength in an oral mode might serve as a measure of language aptitude. However, correlating priming outcomes with traditional measures of explicit and implicit aptitude (e.g., grammaticality judgment; LLAMA_B) their findings did not provide a clear picture and led to a conclusion highlighting the multidimensionality of language aptitude. Not least, this last study exemplifies that research on L2 alignment in the oral mode has started to explore new avenues, answering the calls by Jackson (2018) and Rasenberg et al. (2020).

To date, a fruitful strand of research into written L2 alignment has been initiated by Wang and Wang's (2015) work on so-called continuation tasks, where learners are asked to finish a text for which they have received the beginning. Building on Wang and Wang (2015), Peng et al. (2020) compared continuation tasks, where the text complexity of the input was kept in its original form vs. a simplified version, which matched the competence level of participating EFL learners. Findings revealed more alignment in complexity, and in general, greater accuracy and fluency in writings based on the simplified input text. The authors explain that appropriate-level texts might lead to greater learning even though the overall complexity is lower than in original texts. Similarly, Li et al., (2020) found that participants, who were repeating words from the input, showed higher short-term learning, while no effects on the quality of writing could be attested. Furthermore, Zhang (2019) found that continuation tasks, as compared to summary writing, increased learning gains and, in addition, positively affected motivation. These initial studies indicate that alignment with a source text can also be a means to promote L2 development.

Most recently, continuation task studies have started to explore proficiency effects in multimodal contexts, where input text was accompanied by video information and discussions with a low- vs. high-proficiency peer (Zhou & Wang, 2021). While video support did not seem to affect student performance, working with a high-level peer elicited more alignment with the input text and resulted in higher vocabulary gains. Interestingly, Wang et al. (2021) found that visual support using both pictures and video increased priming effects in learners of L2 Chinese, but only video input led to long-term use. Taken together, it seems that the written modality of continuation tasks facilitates alignment, which in turn potentially supports L2 learning. Considering the increasing demands of multimodality in communication, future work in various modes will shed further light on L2 alignment.

It has become apparent that recently, more alignment research has been taking place in digitally-mediated contexts, for example, writing in interaction, such as synchronous computer-mediated communication or text-chat. Kim et al. (2019) showed that even though both face-to-face and text-chat interactions designed to elicit aligned production of specific target structures led to the learning of those, text-chat was more successful than the face-to-face condition in eliciting alignment, which suggests that the degree of alignment in writing may differ from oral production. Thus, future research is warranted using written production. The degree of alignment effects varied depending on target structure (stranded prepositions vs. (in)direct questions) and were dependent on participants' prior knowledge of the structure – a finding that is in line with earlier accounts claiming that the process of comprehending or producing a syntactic structure is facilitated if learners have some prior knowledge of the target structures (McDonough & Trofimovich, 2015).

Michel and co-authors' work on text chat conversations shed light on the question of whether alignment was more implicit and automatic in nature or more strategically used by L2 learners. For example, combining different methodologies, such as corpus-based N-gram analyses and eye-tracking, Michel and Smith (2018) provided evidence that only about 30% of alignment to a partner's lexical phrases in text chat could be related to overt visual attention to these forms. Participants also reported many different reasons why they would or would not deliberately align to a peer or a tutor during text-chat interactions (Michel & O'Rourke, 2019) (e.g., partner's proficiency level, need for rapport building, spelling).

While specific task designs and conditions triggered primed production during text chat (Kim et al., 2019, 2020; Michel & O'Rourke, 2019), free conversation comparing text-based German interaction with video-based Chinese-French teletandems yielded substantial amounts of alignment in both modalities, with more syntactic alignment in text chat and more lexical alignment in video-based oral interaction (Michel & Cappellini, 2019). Such studies showcase innovative methodologies which have set the ground for investigations of alignment in novel contexts.

6.4. Time on alignment tasks, task types and alignment-driven L2 learning

The third subquestion was interested in the range of time during alignment phases, and what types of tasks were used to elicit alignment. Our review revealed that most experimental research used one single session of various duration (e.g., 14 min up to 300 min) to induce alignment during the experimental task. More pedagogically oriented set-ups tend to rely on longer and more sessions. For example, Michel and O'Rourke (2019) and Michel and Smith (2018) asked participants to engage in alignment activities during three or six sessions of 20–45 min each. These time differences might be induced by the fact that in lab-based studies, conditions are neatly controlled, and even a small amount of exposure potentially shows effects of alignment. Classroom-based studies, on the other hand, by nature include more variations. Longer interventions might be needed to elicit enough instances of target structures, which would then potentially allow for the detection of effects.

Additionally, the task types used differ greatly. Psycholinguistic lab-studies rely on strictly controlled set-ups with item-by-item presentation of targets, often by a computer, while empirical classroom studies mostly implement alignment in meaning-oriented interactionist tasks. Both types of studies provide valuable insights into the existence and value of priming and alignment in SLA. The challenge for the future will be to design studies where those two types of research are combined, that is, where psycholinguistic lab-studies are implemented in adjusted form in classrooms, and where classroom-based free conversation tasks are adapted for a lab-context. Drawing on the data of such a series of lab-class-lab-class etc. interventions will increase the ecological validity of psycho-linguistic findings and the generalizability of classroom-based studies.

The final, fourth, subquestion focused on how short-term and long-term alignment-driven L2 learning has been measured in L2 alignment research. Again, we see large variability, with a divide in studies that examined only alignment sessions and those which implemented additional post-alignment sessions or posttests to determine alignment-driven learning or long-term alignment effects. Most L1 alignment research has focused on the occurrence of alignment without investigating long-term effects, and it is encouraging to see a growing amount of L2 alignment research demonstrating evidence of alignment-driven L2 learning, particularly those studies conducted in classroom contexts (e.g., McDonough et al., 2015). As reported above, although posttest items are meaning-oriented (e.g., picture description), they are generally designed to elicit target structures in a tightly controlled manner, lacking their communicative purposes. If future alignment studies target more authentic conversations in diverse digitalized contexts, post-alignment and posttest items should mirror such contexts. Furthermore, future work should aim to explore alignment in a more naturalistic language use context. First attempts to do so are presented in the special issue this paper belongs to, where new methodologies (e.g., Michel et al., 2022/this issue; Sinclair & Fernandez, 2022/this issue) and tools (e.g., Cappellini et al., 2022/this issue) are explored to allow for analyses of larger scale naturalistic data.

7. Conclusion

This paper provides a systematic review of research into alignment in SLA over the past 20 years. More specifically, we have chosen to focus on L2 alignment that is associated with potential L2 learning. Inevitably, by adopting strict selection criteria, we have excluded some studies that have made important contributions to the field, in particular, in the productive area of cross-linguistic priming research. Therefore, we would like to highlight that the review presented in this article should not be considered to be based on an exhaustive list of L2 alignment research. Some important design factors are not reviewed in this article in detail, such as task design features and data coding schemes. Future systematic research may focus on these issues to offer more insights into research design in L2 alignment research. At times, categorization within our analysis was not straightforward. For example, we have chosen to subsume 'verb inflections' under the "other" category, as we did not use a separate category for morphology. We hope that with growing numbers of studies investigating target languages other than English and various linguistic features, there will be more research into various types of alignment in the future. Furthermore, the current review did not report the synthesis of the findings of previous research. A meta-analysis which quantitatively synthesizes the magnitude of alignment and the degree of learning effects presented in previous L2 alignment research would certainly contribute to our understanding of the role of alignment in L2 learning.

We close this review with a call for more alignment research with a pedagogical focus (a) that examines languages other than English, including multilingual contexts, ideally, with young and adolescent learners; (b) that crosses modalities both in the input as well as expected output, which could reveal the dynamic interplay of language and other means of communication (e.g., head movements and gestures); (c) that explores interactions with more than two speakers, such as small group conversations which are typical in instructed contexts; (d) that expands the linguistic repertoire of alignment research by focusing on areas other than auditory, lexical/semantic, and structural/syntactic (e.g., pragmalinguistic features); (e) that implements longitudinal designs tracking how aligned L2 production over time might impact L2 development; and (f) that bridges designs where lab-based and classroom-based empirical investigations complement either one's methodological shortcomings and therefore strengthens the insights we gain from future work into L2 alignment. We would argue that the expansion of L2 alignment research topics would warrant the development of new research methodologies, and sharing some of the novice approaches to researching L2 alignment is one of our goals for the current special issue.

8. Coda: contributions to this special issue

The above review serves as an introduction to the special issue for which we as guest editors brought together eight original research papers on 'Linguistic alignment in Second Language Acquisition: Occurrences, learning effects, and beyond'. Given that the special issue comes with an epilogue (Jackson, 2023/this issue) that discusses these contributions in detail, we provide a short overview to each paper here by highlighting how it addresses some of the limitations and the directions for future research that we discussed above.

8.1. Novel approaches to L2 alignment in oral interaction

Drawing on multilingual Spanish/Catalan-English corpus-data, Sinclair and Fernandez (2022/this issue) investigate the alignment of code-switching in spoken dialogues between a tutor and an L2 learner. Their findings reveal that speakers tend to copy their interlocutor's code-switching behavior, which can be related to lexical overlap and turn-taking asymmetry. The authors argue that L2 proficiency induces conscious choices by both the tutor (aligning to lower L2 level students) and the learner (at higher proficiency levels) to go along with the code-switching of the interlocutor.

Another unique and new approach to L2 alignment is presented by Tekin, Trofimovich, Chen, and McDonough (2022/this issue), who focus on perceived linguistic, socio-affective, and behavioral dimensions of L2 interaction and their relationship to perceived communicative success. Their data show that alignment in collaboration was the strongest predictor for perceived success - a finding that leaves room for speculation on how this insight might be implemented in L2 instruction.

McDonough et al. (2022/this issue) also take a closer look at the perceptions of interactional partners in L2 dialogues but go beyond oral/written modalities as they investigate the relationship between perceptions and behavior matching. Findings identified hand behavior matching as a significant predictor of perceived partner motivation, while other nonverbal behaviors need more research before we can start to understand the multimodality of spoken interaction. To the best of our knowledge, this is the first study that focuses on non-verbal aspects in the context of L2 alignment.

8.2. Multimodal alignment in digital contexts

Two papers in the special issue answer the call for research on languages other than English - both in the context of video-based teletandem interaction (Cappellini et al., on French; Michel et al., on Spanish; both 2022/this issue). In their methodological exploration, Cappellini et al. introduce new tools for semi-automatic detection of alignment at the syntactic and lemma-based lexical level, and a novelty alignment of facial expressions. Findings reveal intricate patterns and relationships of L2 alignment in these settings with limited cross-modal alignment.

Additionally, Michel et al. (2022/this issue), introduce a novel methodology, as they aim to disentangle alignment at syntactic and lexical levels from coincidental overlap in Spanish-English teletandem conversations. Their findings comparing real and random pairs of video-based interactions confirm that L2 alignment takes place in contexts where half of the exchange is in English and the other half in Spanish. Furthermore, they identified task effects that appeared to be more or less conducive to L2 alignment.

In the written exchanges Coumel, Ushioda, and Messenger (2022/this issue) investigated, Spanish L2 learners were using text chat with an English language tutor. Their findings on focused tasks eliciting three specific target structures (genitives, passives, datives) demonstrate that all three structures were open to alignment, but they differed in the extent to which they were aligned to, which in part was related to learners' prior knowledge of the structures. Importantly, conscious decisions to re-use the tutor's input increased aligned structure use as well as the learning of those structures.

8.3. Innovative designs to investigate alignment in integrated skills tasks

The final two papers focus on alignment in integrated skills tasks, that is, reading-to-speaking (Kormos et al., 2022/this issue) and reading-to-writing continuation tasks (Wang et al., 2022/this issue). Kormos et al. investigated how input modality influences alignment between source text and oral production. Results revealed that when input was presented in a reading-only mode, participants chose to use significantly more 5-grams of the input text, than when participants received input in a reading-while-listening mode. In both modes, alignment between the input and output text was substantial when looking at small lexical items (uni- and bigrams) but decreased as item bundles became larger.

A slightly different approach was taken by Wang et al. (2022/this issue), who compared alignment in multi-turn (i.e., short input-short writing-short input-short writing …) vs. single-turn (larger input text – writing a longer piece of text) continuation tasks. They found the former elicited more alignment and greater changes in L2 lexical use and discussed the implications for L2 writing instruction.

To conclude, L2 alignment has been found to be a helpful language learning mechanism over the past two decades. Considering how communication medium and mode have been expanded in the current digital world, future research needs to address such changes in their research design. We hope that our systematic review, together with the papers introduced above, serves as a guideline for future research. For a more extensive review of each article, we invite scholars to read the epilogue by Jackson (2023/this issue).

Author statement

YouJin Kim and Marije Michel conceptualized the study together. YouJin Kim coded the data and drafted the methods, results and discussion sections. Marije Michel drafted the literature review, discussion, and coda sections. Both authors revised the manuscript together.

References

Andringa, S., & Godfroid, A. (2020). Sampling bias and the problem of generalizability in applied linguistics. *Annual Review of Applied Linguistics, 40*, 134–142. https://doi.org/10.1017/S0267190520000033

Atkinson, D. (2002). Toward a sociocognitive approach to second language acquisition. *The Modern Language Journal, 86*(4), 525–545. https://doi.org/10.1111/1540-4781.00159

Atkinson, D. (2010). Extended, embodied cognition and second language acquisition. *Applied Linguistics, 31*(5), 599–622. https://doi.org/10.1093/applin/amq009

Atkinson, D., Churchill, E., Nishino, T., & Okada, H. (2007). Alignment and interaction in a sociocognitive approach to second language acquisition. *The Modern Language Journal, 91*(2), 169–188. https://doi.org/10.1111/j.1540-4781.2007.00539.x

Bergmann, K., & Kopp, S. (2012). Gestural alignment in natural dialogue. *Proceedings of the Annual Meeting of the Cognitive Science Society, 34*(34), 1326–1331. https://escholarship.org/uc/item/73z0q063.

Bird, S. A., & Williams, J. N. (2002). The effect of bimodal input on implicit and explicit memory: An investigation into the benefits of within-language subtitling. *Applied PsychoLinguistics, 23*(4), 509–533. https://doi.org/10.1017/S0142716402004022

Bock, K. (1995). Sentence production: From mind to mouth. In J. L. Miller, & P. D. Eimas (Eds.), *Speech, language, and communication* (pp. 181–216). Academic Press. https://doi.org/10.1016/B978-012497770-9/50008-X.

Bock, K., & Griffin, Z. M. (2000). The persistence of structural priming: Transient activation or implicit learning? *Journal of Experimental Psychology: General, 129*(2), 177–192. https://doi.org/10.1037/0096-3445.129.2.177

Branigan, H., Garrod, S., & Pickering, M. (2014). Alignment (interactive) in language development. In P. J. Brooks, & V. Kemple (Eds.), *Encyclopedia of language development* (pp. 14–17). SAGE Publications Inc. https://doi.org/10.4135/9781483346441.

Branigan, H. P., Pickering, M. J., & McLean, J. F. (2005). Priming prepositional-phrase attachment during comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 31*(3), 468–481. https://doi.org/10.1037/0278-7393.31.3.468

Branigan, H. P., Pickering, M. J., McLean, J. F., & Cleland, A. A. (2007). Syntactic alignment and participant role in dialogue. *Cognition, 104*(2), 163–197. https://doi.org/10.1016/j.cognition.2006.05.006

Branigan, H. P., Pickering, M. J., Pearson, J., & McLean, J. F. (2010). Linguistic alignment between people and computers. *Journal of Pragmatics, 42*(9), 2355–2368. https://doi.org/10.1016/j.pragma.2009.12.012

Branigan, H. P., Pickering, M. J., Pearson, J., McLean, J. F., & Brown, A. (2011). The role of beliefs in lexical alignment: Evidence from dialogs with humans and computers. *Cognition, 121*(1), 41–57. https://doi.org/10.1016/j.cognition.2011.05.011

Cappellini, M., Holt, B., & Hsu, Y. Y. (2022). Multimodal alignment in telecollaboration: A methodological exploration. *System, 110*. https://doi.org/10.1016/j.system.2022.102931. E-pub ahead of print.

Chang, F., Dell, G. S., Bock, K., & Griffin, Z. M. (2000). Structural priming as implicit learning: A comparison of models of sentence production. *Journal of Psycholinguistic Research, 29*(2), 217–230.

Chun, E., & Kaan, E. (2020). The effects of speaker accent on syntactic priming in second-language speakers. *Second Language Research, 38*(2), 189–212. https://doi.org/10.1177/0267658320926563

Conroy, M. A., & Antón-Méndez, I. (2015). A preposition is something you can end a sentence with: Learning English stranded prepositions through structural priming. *Second Language Research, 31*, 211–235.

Costa, A., Pickering, M. J., & Sorace, A. (2008). Alignment in second language dialogue. Language. *Language & Cognitive Processes, 23*(4), 528–556. https://doi.org/10.1080/01690960801920545

Coumel, M., Ushioda, E., & Messenger, K. (2022). Learning multiple L2 syntactic structures via chat-based alignment: What is the learners' prior knowledge and conscious decisions? *System, 110*. https://doi.org/10.1016/j.system.2022.102869 (E-pub ahead of print).

Crossley, S. A. (2013). Assessing automatic processing of hypernymic relations in first language speakers and advanced second language learners: A semantic priming approach. *The Mental Lexicon, 8*(1), 96–116. https://doi.org/10.1075/ml.8.1.05cro

Dao, P., Trofmovich, P., & Kennedy, S. (2018). Structural alignment in L2 task-based interaction. *International Journal of Applied Linguistics, 169*(2), 293–320. https://doi.org/10.1075/itl.17021.dao

Dell, G. S., & Ferreira, V. S. (2016). Thirty years of structural priming: An introduction to the special issue. *Journal of Memory and Language, 91*, 1–4. https://doi.org/10.1016/j.jml.2016.05.005

Giles, H., & Powesland, P. F. (1975). *Speech style and social evaluation*. Academic Press.

Gor, K., & Cook, S. V. (2020). A mare in a pub? Nonnative facilitation in phonological priming. *Second Language Research, 36*(1), 123–140. https://doi.org/10.1177/0267658318769962

Grice, H. P. (1957). Meaning. *Philosophical Review, 66*(3), 377–388. https://doi.org/10.2307/2182440

Gries, S. T. (2005). Syntactic priming: A corpus-based approach. *Journal of Psycholinguistic Research, 34*(4), 365–399. https://doi.org/10.1007/s0936-005-6139-3

Gries, S., & Wulff, S. (2005). Do foreign language learners also have constructions?: Evidence from priing, sorting, and corpora. *Annual Review of Cognitive Linguistics, 3*, 183–200.

Guediche, S., Baart, M., & Samuel, A. G. (2020). Semantic priming effects can be modulated by crosslinguistic interactions during second-language auditory word recognition. *Bilingualism: Language and Cognition, 23*(5), 1082–1092. https://doi.org/10.1017/S1366728920000164

Hadelich, K., & Crocker, M. W. (2006). Gaze alignment of interlocutors in conversational dialogues. In *Proceedings of the 2006 symposium on Eye tracking research & applications* (p. 38). https://doi.org/10.1145/1117309.1117322

Hartsuiker, R. J., & Bernolet, S. (2017). The development of shared syntax in second language learning. *Bilingualism, 20*(2), 219–234. https://doi.org/10.1017/S1366728915000164

Horton, W. S. (2005). Conversational common ground and memory processes in language production. *Discourse Processes, 40*(1), 1–35. https://doi.org/10.1207/s15326950dp4001_1

Jackson, C. N. (2018). Second language structural priming: A critical review and directions for future research. *Second Language Research, 34*(4), 539–552. https://doi.org/10.1177/0267658317746207

Jackson, C. N., & Ruf, H. T. (2017). The priming of word order in second language German. *Applied PsychoLinguistics, 38*(2), 315–345.

Jackson, C. N., & Ruf, H. T. (2018). The importance of prime repetition among intermediate-level second language learners. *Studies in Second Language Acquisition, 40*(3), 677–692.

Jung, Y., Kim, Y., & Murphy, J. (2017). The role of task repetition in learning word-stress patterns through auditory priming tasks. *Studies in Second Language Acquisition, 39*(2), 319–346.

Kim, Y., Jung, Y., & Skalicky, S. (2019). Linguistic alignment, learner characteristics, and the production of stranded prepositions in relative clauses: Comparing FTF and SCMC contexts. *Studies in Second Language Acquisition, 41*(5), 937–969.

Kim, Y., & McDonough, K. (2008). Learners' production of passives during syntactic priming activities. *Applied Linguistics, 29*(1), 149–154.

Kim, Y., & McDonough, K. (2016). Prime repetition and Korean EFL learners' comprehension and production of passives. *International Review of Applied Linguistics, 54*, 319–346. https://doi.org/10.1515/iral-2015-0028

Kim, Y., Skalicky, S., & Jung, Y. (2020). The role of linguistic alignment on question development in face-to-face and synchronous computer-mediated communication contexts: A conceptual replication study. *Language Learning, 70*(3), 643–684.

Kootstra, G. J., & Muysken, P. (2017). Cross-linguistic priming in bilinguals: Multidisciplinary perspectives on language processing, acquisition, and change. *Bilingualism: Language and Cognition, 20*(2), 215–218.

Kormos, J. (2006). The structure of self-repairs in the speech of Hungarian learners of English. *Acta Linguistica Hungarica, 53*(1), 53–76. https://doi.org/10.1556/ALing.53.2006.1.3

Kormos, J., Suzuki, S., & Eguchi, M. (2022). The role of input modality and vocabulary knowledge in alignment in reading-to-speaking tasks. *System, 108*. https://doi.org/10.1016/j.system.2022.102854 (E-pub ahead of print).

Lakin, J. L., Jefferis, V. E., Cheng, C. M., & Chartrand, T. L. (2003). The chameleon effect as social glue: Evidence for the evolutionary significance on nonconscious mimicry. *Journal of Nonverbal Behavior, 27*(3), 145–162.

Lantolf, J. P. (2000). *Sociocultural theory and second language learning*. Oxford University Press, ISBN 0 19 442160 0.

Li, S., & Qian, J. (2021). Exploring syntactic priming as a measure of implicit language aptitude. *Studies in Second Language Acquisition, 43*(3), 574–605.

Li, Q., Yao, K., & Ge, Z. (2020). Vocabulary alignment in the continuation task of translation. *Chinese Journal of Applied Linguistics, 43*(4), 455–468.

Marsden, E., Altmann, G., & St Claire, M. (2013). Priming of verb inflections in L1 and L2 French: A comparison of 'redundant' versus 'non-redundant' training conditions. *International Review of Applied Linguistics in Language Teaching, 51*(3), 271–298. https://doi.org/10.1515/iral-2013-0012

Matras, Y., & Sakel, J. (2007). Investigating the mechanisms of pattern replication in language convergence. *Studies in Language, 31*(4), 829–865.

McDonough, K. (2006). Interaction and syntactic priming: English L2 speakers' production of dative constructions. *Studies in Second Language Acquisition, 28*(2), 179–207. https://doi.org/10.1017/S0272263106060098

McDonough, K., & Chaikitmongkol, W. (2010). Collaborative syntactic priming activities and EFL learners' production of *wh*-questions. *Canadian Modern Language Review, 66*(6), 817–841. https://doi.org/10.3138/cmlr.66.6.817

McDonough, K., & DeVleeschauwer, J. (2012). Prompt-type frequency, auditory pattern discrimination, and EFL learners' production of *wh*-questions. *Studies in Second Language Acquisition, 34*(3), 355–377. https://doi.org/10.1017/S0272263112000113

McDonough, K., & Fulga, A. (2015). The detection and primed production of novel constructions. *Language Learning, 65*(2), 326–357. https://doi.org/10.1111/lang.12103

McDonough, K., Kielstra, P., Crowther, D., & Smith, G. (2016). Structural priming in L2 speech production: Examining relationships among English L2 speakers' production, cognitive abilities, and awareness. In A. Mackey, & E. Marsden (Eds.), *Advancing methodology and practice: The IRIS repository of instruments for research into second languages* (pp. 112–131). Routledge.

McDonough, K., & Kim, Y. (2009). Syntactic priming, type frequency and EFL learners' production of *wh*-questions. *The Modern Language Journal, 93*(3), 386–398. https://doi.org/10.1111/j.1540-4781.2009.00897.x

McDonough, K., & Mackey, A. (2006). Responses to recasts: Repetitions, primed production, and linguistic development. *Language Learning, 56*(4), 693–720. https://doi.org/10.1111/j.1467-9922.2006.00393.x

McDonough, K., Neumann, H., & Trofimovich, P. (2015). Eliciting production of L2 target structures through priming activities. *Canadian Modern Language Review, 71*(1), 75–95. https://doi.org/10.3138/cmlr.2023

McDonough, K., & Trofimovich, P. (2009). *Using priming methods in second language research.* Routledge.

McDonough, K., & Trofimovich, P. (2011). *Using priming methods in second language research.* Routledge. https://doi.org/10.4324/9780203880944

McDonough, K., & Trofimovich, P. (2015). Structural priming and the acquisition of novel form-meaning mappings. In T. Cadierno, & S. W. Eskildsen (Eds.), *Usage-based perspectives on second language learning* (pp. 105–123). De Gruyter Mouton.

McDonough, K., Kim, Y. L., Uludag, P., Liu, C., & Trofimovich, P. (2022). Exploring the relationship between behavior matching and interlocutor perceptions in L2 interaction. *System, 109.* https://doi.org/10.1016/j.system.2022.102865 (E-pub ahead of print).

McDonough, K., Kim, Y. L., Uludag, P., Liu, C., & Trofimovich, P. (2022). Exploring the relationship between behavior matching and interlocutor perceptions in L2 interaction. *System, 109.* https://doi.org/10.1016/j.system.2022.102865 (E-pub ahead of print).

Michel, M., & Cappellini, M. (2019). Alignment during synchronous video versus written chat L2 interactions: A methodological exploration. *Annual Review of Applied Linguistics, 39*, 189–216. https://doi.org/10.1017/S0267190519000072

Michel, M., & O'Rourke, B. (2019). What drives alignment during text chat with a peer vs. a tutor? Insights from cued interviews and eye-tracking. *System, 83*, 50–63. https://doi.org/10.1016/j.system.2019.02.009

Michel, M., & Smith, B. (2018). Measuring lexical alignment during L2 chat interaction: An eye-tracking study. In S. M. Gass, P. Spinner, & J. Behney (Eds.), *Salience in second language acquisition* (pp. 244–267). New York, NY: Routledge.

Michel, M., & Stiefenhöfer, L. (2019). Priming Spanish subjunctives during synchronous computer-mediated communication: German peers' classroom-based and homework interactions. In M. Sato, & S. Loewen (Eds.), *Evidence-based second language pedagogy* (pp. 191–218). Routledge.

Michel, M., Appel, C., & Cipitria, S. (2022). Lexical and syntactic alignment during English-Spanish teletandem meetings. *System, 111.* https://doi.org/10.1016/j.system.2022.102930 (E-pub ahead of print).

Muylle, M., Bernolet, S., & Hartsuiker, R. J. (2020). The role of case marking and word order in cross-linguistic structural priming in late L2 acquisition. *Language Learning, 70*(S2), 194–220. https://doi.org/10.1111/lang.12400

Oben, B. (2018). Gaze as a predictor for lexical and gestural alignment. In G. Brone, & B. Oben (Eds.), *Eye-tracking in interaction: Studies on the role of eye gaze in dialogue* (pp. 233–262). John Benjamins. https://doi.org/10.1075/ais.10.

Ostrand, R., & Ferreira, V. S. (2019). Repeat after us: Syntactic alignment is not partner-specific. *Journal of Memory and Language, 108*, Article 104037. https://doi.org/10.1016/j.jml.2019.104037

Peng, J., Wang, C., & Lu, X. (2020). Effect of the linguistic complexity of the input text on alignment, writing fluency, and writing accuracy in the continuation task. *Language Teaching Research, 24*(3), 364–381.

Pickering, M. J., & Branigan, H. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language, 39*(4), 633–651. https://doi.org/10.1006/jmla.1998.2592

Pickering, M. J., & Branigan, H. (1999). Syntactic priming in language production. *Trends in Cognitive Sciences, 3*(4), 136–141. https://doi.org/10.1016/S1364-6613(99)01293-0

Pickering, M. J., & Branigan, H. (2019). Special issue on structural priming in less-studied languages and dialects: Introduction. *Journal of Cultural Cognitive Science, 3*(1), 1–4. https://doi.org/10.1007/s41809-019-00051-3

Pickering, M. J., & Ferreira, V. S. (2008). Structural priming: A critical review. *Psychological Bulletin, 134*(3), 427–459. https://doi.org/10.1037/0033-2909.134.3.427

Pickering, M. J., & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences, 27*(2), 169–190. https://doi.org/10.1017/S0140525X04000056

Pickering, M. J., & Garrod, S. (2006). Alignment as the basis for successful communication. *Research on Language and Computation, 4*, 203–228. https://doi.org/10.1007/s11168-006-9004-0

Pickering, M. J., & Garrod, S. (2021). *Understanding dialogue.* Cambridge University Press, ISBN 978-1-108-46193-1.

Plonsky, L., & Kim, Y. (2016). Task-based learner production: A substantive and methodological review. *Annual Review of Applied Linguistics, 36*, 73–97. https://doi.org/10.1017/S0267190516000015

Raissi, R., Hedayat, N., & Kazemirad, F. (2020). Syntactic priming effects and their underlying mechanisms in language production and comprehension. *Theory and Practice in Language Studies, 10*(11), 1370–1375.

Rasenberg, M., Özyürek, A., & Dingemanse, M. (2020). Alignment in multimodal interaction: An integrative framework. *Cognitive Science, 44*(11), Article e12911. https://doi.org/10.1111/cogs.12911

Roever, C., & McNamara, T. (2006). *Language testing: The social dimension.* Oxford, UK: Blackwell Publishing, 978-1-4051-5545-4.

Schmidt, R. W. (1990). The role of consciousness in second language learning. *Applied Linguistics, 11*(2). https://doi.org/10.1093/applin/11.2.129

Schoot, L., Hagoort, P., & Segaert, K. (2019). Stronger syntactic alignment in the presence of an interlocutor. *Frontiers in Psychology, 10*, 685. https://doi.org/10.3389/fpsyg.2019.00685

Shin, J. A., & Christianson, K. (2012). Structural priming and second language learning. *Language Learning, 62*(3), 931–964. https://doi.org/10.1111/j.1467-9922.2011.00657.x

Sinclair, A. J., McCurdy, K., Lucas, C. G., Lopez, A., & Gašević, D. (2019). *Tutorbot corpus: Evidence of human-agent verbal alignment in Second Language learner dialogues.* International Educational Data Mining Society.

Sinclair, A. J., & Fernández, R. (2023). Alignment of code switching varies with ability in second language learner dialogue. *System, 113.* https://doi.org/10.1016/j.system.2022.102952 (E-Pub ahead of print).

Tekin, O., Trofimovich, P., Chen, T. H., & McDonough, K. (2022). Alignment in second language speakers' perceptions of interaction and its relationship to perceived communicative success. *System, 108.* https://doi.org/10.1016/j.system.2022.102848 (E-pub ahead of print).

Tomasello, M. (1988). The role of joint attentional processes in early language development. *Language Sciences, 10*(1), 69–88. https://doi.org/10.1016/0388-0001 (88)90006-X

Trofimovich, P. (2005). Spoken-word processing in native and second languages: An investigation of auditory word priming. *Applied PsychoLinguistics, 26*(4), 479–504. https://doi.org/10.1017/S0142716405050265

Trofimovich, P. (2013). Interactive alignment: Implications for the teaching and learning of second language pronunciation. In J. Levis, & K. LeVelle (Eds.), *Proceedings of the 4ᵗʰ Pronunciation in Second Language Learning and teaching conference* (pp. 1–9). Ames, IA: Iowa State University.

Trofimovich, P., & Kennedy, S. (2014). Interactive alignment between bilingual interlocutors: Evidence from two information-exchange tasks. *Bilingualism: Language and Cognition, 17*(4), 822–836.

Trofimovich, P., & McDonough, K. (Eds.). (2011). *Applying priming methods to L2 learning, teaching and research: Insights from psycholinguistics*. Amsterdam: John Benjamins.

Trofimovich, P., McDonough, K., & Foote, J. A. (2014). Interactive alignment of multisyllabic stress patterns in a second language classroom. *Tesol Quarterly, 48*(4), 815–832.

Trofimovich, P., McDonough, K., & Neumann, H. (2013). Using collaborative tasks to elicit auditory and structural priming. *Tesol Quarterly, 47*(1), 177–186. https://doi.org/10.1002/tesq.78

Uzum, B. (2010). An investigation of alignment in CMC from a sociocognitive perspective. *CALICO Journal, 28*(1), 135–155.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wang, M., Shen, H., Boland, J. E., & Wei, H. (2021). Visual context modulates L2 long-term structural priming for the Chinese ba construction. *The Modern Language Journal, 105*(2), 526–551.

Wang, C., & Wang, M. (2015). Effect of alignment on L2 written production. *Applied Linguistics, 36*(5), 503–526.

Wang, M., Gan, Q., & Boland, J. E. (2022). Effect of interactive intensity on lexical alignment and L2 writing quality. *System, 108*. https://doi.org/10.1016/j.system.2022.102847 (E-pub ahead of print).

Watson-Gegeo, K. A. (2004). Mind, language, and epistemology: Toward a language socialization paradigm for SLA. *The Modern Language Journal, 88*(3), 331–350. https://doi.org/10.1111/j.0026-7902.2004.00233.x

Weber, K., Christiansen, M. H., Indefrey, P., & Hagoort, P. (2019). Primed from the start: Syntactic priming during the first days of language learning. *Language Learning, 69*(1), 198–221.

Zhang, L. (2019). Alignment effects of the continuation task on L2 Chinese writing. *Chinese as a Second Language Research, 8*, 227–247. https://doi.org/10.1515/caslar-2019-0009

Zhou, X., & Wang, C. (2021). Effects of interactive alignment on L2 vocabulary learning by Chinese EFL learners. *Language Teaching Research, 13621688211004629*.

Zwaan, R. A., & Radvansky, G. A. (1998). Situation models in language comprehension and memory. *Psychological Bulletin, 123*(20), 162–185. https://doi.org/10.1037/0033-2909.123.2.162