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RELATIVE CLAUSES

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29.1 Introduction

Relative clauses (RCs) are among the most studied phenomena in linguistics, as they involve complex syntactic structures and serve as a window on the workings of the human language faculty. They show interesting differences across languages and present intriguing complications in first language (L1), second language (L2) and heritage language acquisition. This chapter departs from the basic notion of a clausal modifier that relates to a constituent of a sentence, the latter usually being a noun phrase known as the head of the RC, and it provides a brief overview of both syntactic and semantic variation. Given the wealth of research on RC acquisition, a broad variety of experimental methods have been employed, including written and oral production, grammaticality and truth-value judgments, and more recently corpus analyses, as well as online measures such as self-paced reading, event-related potentials (ERPs), and eye-tracking. In acquisition research, RCs have been analyzed in order to shed light on competing models and fundamental hypotheses of language learning. Such studies have furthered our understanding of crosslinguistic influence, avoidance phenomena, the availability of Universal Grammar beyond a purported critical period in childhood, and the psycholinguistics of L2 sentence processing. L2 research into RC phenomena continues to furnish valuable insights into aspects of the structures themselves, such as filler-gap dependencies and subject-object asymmetries. Overall, the literature points to the possibility of successful acquisition of these complex forms, supporting theories that posit a fully functioning language faculty at work in adult L2 acquisition.

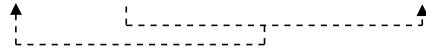
29.2 Typological variation in syntax and semantics

While most, perhaps all, human languages, have clausal modifiers of nouns, there is considerable variation in the forms that such modification can take, due to fundamental typological differences as well as more subtle variation in the morphosyntactic tools independently available in each language. Moreover, different types of relativization can be available in the same language, creating a rich array of linguistic elements in play in contexts of L2 acquisition. Before examining interactions between languages, it is essential to consider some of the more notable forms of variation, both in terms of syntactic structure and semantic interpretation.

Structurally, a classic exemplar of an RC contains a relativized NP that binds a variable in an embedded clause, and in many languages this NP combines with a determiner to form a DP. In the

following example, relevant relationships are shown within the complex DP that functions as the object of the main verb.

- (1) Charlotte loved [the *delicious curry that her father cooked [x] yesterday*].



Here, the RC is in italics; the relativized NP is *delicious curry*. The NP binds a variable *x* in the embedded clause, and this binding relation is key to understanding the nature of the construction in all its manifestations. In a restrictive RC such as (1), the determiner forms a referential expression by merging with the complex NP comprising both the relativized NP and the RC.

In English, the RC is postnominal, but in many languages, it may be prenominal, as illustrated below in Mandarin (adapted from Xiong et al., 2019, p. 238).

- (2) Tuijian yisheng de jiaoshou denghou huanzhe.
 recommend doctor REL professor wait for patient
 “The professor who recommended the doctor waited for the patient.”

These last two examples illustrate externally headed post- and prenominal RCs, but in some languages the relativized NP can appear inside the relative clause, as shown here in Navajo, where the internal head may appear between a time adverbial and the verb (Andrews, 2007, p. 212).

- (3) [(T'édáá) ashkii aláá'-áá] yádooftih.
 last.night boy 3sG.IMP.snore-REL.PAST FUT.3SG.speak
 “The boy who was snoring last night will speak.”

Another typological pattern involves the repetition of the external head inside the clausal modifier, leading to what is known as a double-headed RC, seen here in Kombai (L. de Vries, 1993, p. 78).

- (4) [[doü adiyano-no] doü] deyalukhe.
 sago give.3PL.NONFUT-CONN sago finished.ADJ
 “The sago that they gave is finished.”

Although previous research has treated the double-headed RC as a typological curiosity which surfaces, at least as an optional strategy, in several unrelated languages such as Bundeli, Japanese, and Tibetan, Cinque (2020) argues at length that all syntactic variations in the world’s languages are actually derived from a single, universal, double-headed structure. The impressive breadth of crosslinguistic analysis in Cinque’s monograph makes it required reading for current research on RCs, although the central claim relies on previously aired syntactic assumptions that remain controversial.¹

Three other forms whose basic descriptions have led to continuing debate in the literature include free, correlative, and adjoined RCs. Free relatives are also known as headless, as the nominal head is not overtly expressed. In example (5), the relative pronouns *who* and *what* may be understood as ‘the person who’ or ‘the thing that’.

- (5) I know {who/what} is arriving tomorrow.

Free relatives are widespread in the world’s languages and have been subject to competing analyses. Bresnan and Grimshaw (1978) argue that the relative pronoun takes the place of the relativized NP

outside the RC, while Andrews (2007) shows that at least in some cases it is best analyzed as a preposed NP internal to the RC.

Correlatives, as found in languages such as Hindi and Turkish, are positioned to the left of the main VP, the latter containing a resumptive (or “correlative”) pronoun or copy of the relativized NP. The following example is from Bambara (Bird, 1968, p. 43).

- (6) n ye tyè min ye, ò be fini fère. (*preposed*)
 [I COMPL man REL saw] D3 IMPF cloth:DEF sell
 “The man I saw, he sells the cloth.”

The distinction between correlatives and adjoined RCs has been a subject of much discussion. Adjoined RCs appear outside the main clause relativized NP, either at the left or right periphery of the matrix, as shown in these examples from Hindi (adapted from Srivastav, 1991, pp. 639–640).

- (7) a. [Jo laRkii kaRii hai] vo lambii hai
 WH girl standing is DEM tall is
 b. Vo laRkii lambii hai [jo khaRii hai]
 DEM girl tall is WH standing is
 “The girl who is standing is tall.”

However, it is clear these patterns are not simply a product of optional attachment before or after the main clause: Srivastav (1991) convincingly demonstrates that left- and right-adjoined RCs have distinct patterns of syntactic integration and semantic interpretation. Cinque (2020, Ch.2) argues that neither correlatives nor adjoined RCs are, strictly speaking, independent variations, as correlatives always contain one of the forms exemplified here in (1–5), and adjoined RCs may be analyzed as either correlatives or extraposed RCs.

In addition to basic syntactic patterns of RCs, languages also differ in which syntactic functions in the RC may be subject to relativization. To be clear, any NP in the main clause, whether a subject, object, indirect object, etc., may contain an RC. But within that RC, there appears to be a Noun Phrase Accessibility Hierarchy (NPAH) (Keenan & Comrie, 1977), such that if a language allows relativization of a particular function, it will necessarily allow relativization of all functions of a higher order.

- | | |
|--------------------------|--|
| (8) 1: subject | The girl who kissed the boy was happy. |
| 2: direct object | The boy who the girl kissed was happy. |
| 3: indirect object | The boy who the girl gave the flower to was happy. |
| 4: object of preposition | I met the girl that the boy was talking about. |
| 5: genitive | I love the girl whose hair is blue. |
| 6: object of comparative | The boy who Emily is taller than is Ken. |

Another point of variation across languages is the linkage to the head noun by means of relative pronouns (which surface only in postnominal or correlative RCs), complementizers (either clause-initial or clause-final), or the possibility of having no overt linking element. English contains all three possibilities.

- (9) a. You know the girl who I saw yesterday.
 b. You know the girl that I saw yesterday.
 c. You know the girl I saw yesterday.

Languages that do not utilize relative pronouns often make use of resumptive pronouns in the RC, a strategy that can even be seen in languages with relative pronouns as RC complexity increases. Languages that systematically use resumptives include Persian, Yoruba, and, as exemplified in (10), Hebrew (Borer, 1984, p. 220).

- (10) raʔiti ʔet ha-yeled she-/ʔasher rina ʔohevet ʔoto
 saw-I ACC the-boy that Rina loves him
 “I saw the boy that Rina loves.”

Regarding syntactic analysis, the conventional account of restrictive, externally headed RCs, following the seminal work of Chomsky (1977), has assumed movement of a *wh*-pronoun or an abstract operator to Spec-CP, as shown below.²

- (11) [_{DP} D [_{NP_{rel}} [_{CP} wh_i /OP_i (C) [_{TP} ...t_i...]]]]

This analysis has informed much of the L2 research on relative clauses; however, it has engendered considerable debate in the theoretical syntax literature, as it cannot be applied over all typological variants and fails to capture certain reconstruction effects.³

Turning to semantic considerations, one fundamental distinction is between restrictive and nonrestrictive (or appositive) RCs.⁴ While restrictive RCs delimit the reference of the relativized NP and thus contain essential information, nonrestrictive NPs add extra information about the NP without affecting reference. Nonrestrictive RCs are often set apart by pauses (or by commas in writing). In (12a), having lower cholesterol is predicated of those Japanese women who drink green tea, but in (12b), it is predicated of Japanese women in general.

- (12) a. Japanese women who drink green tea have lower cholesterol. (*restrictive*)
 b. Japanese women, who drink green tea, have lower cholesterol. (*nonrestrictive*)

Some linguists consider nonrestrictives to be “orphans”, and not part of the syntactic representation of the sentence at all (Andrews, 2007; Fabb, 1990). However, restrictives and nonrestrictives share similar structure, and in some languages, they may be syntactically identical and semantically ambiguous (Kuno, 1973, p. 235). While earlier work sometimes analyzed nonrestrictives as adjuncts, more recent accounts either treat them as parentheticals or propose alternative means of syntactic integration (see the discussion between Ott, 2016 and Griffiths & de Vries, 2019).

The above summary captures some of the basic variation between and within languages, but ignores a multitude of permutations within each pattern, involving, for example, relativization morphology (which can include bound morphemes, classifiers, or demonstrative elements instead of relative pronouns), variations concerning determiners or definiteness markers, case-marking on the head or on the whole RC, finite and infinitival RCs, constraints on movement in the case of *wh*-pronouns, right-extraposition of the RC in many languages, possibilities of stacking, etc. For more detailed overviews, see, for example, Andrews (2007), Lehmann (1986), or M. de Vries (2018), and for advanced discussion, see especially Cinque (2020) and the references therein.

29.3 Methods

Research on the acquisition of RCs has made use of an impressive range of testing methods. The following overview provides a small window into this experimental toolshed. Several studies mentioned here are discussed in more detail in the next section in terms of their theoretical motivation and findings.

Production tasks have encompassed both free and elicited production and have included both written and oral expression. In one pioneering study, Schachter (1974) examined restrictive relatives in the L2 English of several different L1 groups of L2 English learners, by combing through 50 written compositions for each group. Free production may result in ample comparative data, but this choice is not without problems, as some learners may avoid complex sentences, and the researcher has little control over the number of different types of RCs for comparison. Other studies have opted for the greater oversight afforded by elicited production tasks, which can manipulate the types and tokens of RCs across participants. For example, Lee-Ellis (2011) conducted an oral elicited production task with Korean Heritage speakers in the United States, using picture stimuli whose conditions controlled for gap position (subject vs. object), animacy (\pm animate), and the topicality of head nouns (\pm topicalization).

The inverse of tasks that furnish language output is the whole array of tasks based on language input. Such methodology can involve act-out tasks, as well as judgments of grammaticality or acceptability, and interpretations of reference involving picture-selection or perceptions of truth value. In early L1 acquisition work, researchers such as Tavakolian (1978) and Hamburger and Crain (1982) asked children to act out sentences with RCs to show whether they had the intended interpretation or whether they simplified the sentence and systematically misunderstood the meaning. In L2 acquisition research, there have been many examples of grammaticality judgment tasks (GJTs). For example, Hawkins and Chan (1997) presented a GJT involving grammatical and ungrammatical RCs to L1 Cantonese and L1 French learners of L2 English. Stimuli were simultaneously presented in written form and aurally via a tape-recorder. Participants were asked to write the letter A if they judged the sentence to definitely correct, B for probably correct, C if they thought it was probably incorrect, and D if they believed it to be definitely incorrect. For C and D judgments, they were asked to correct the part of the sentence they thought was problematic.

Acceptability judgment tasks (AJTs) tap learners' knowledge of appropriate or felicitous forms. Borgonovo et al. (2015) investigated the acquisition of mood in Spanish relative clauses by L1 English speakers, using an AJT for one of their tasks. Learners of Spanish were given scenarios in English, followed by two sentences in Spanish, one with an indicative RC verb (suggesting a specific referent) and one in the subjunctive (suggesting a nonspecific referent). Participants were asked whether each sentence was appropriate given the description in the scenario.

Participants may be asked to show their interpretation of reference in sentences that they hear or read by selecting among pictures or by indicating whether the sentence is true in the context of a single picture. One example of a picture-selection task is in O'Grady et al. (2003), in which participants were presented with three pictures, each of which contained two figures. They heard noun phrases such as *the woman who sees the man* (in Korean) and had to circle with a pencil the one figure whom this phrase accurately described. In a more recent instantiation of this method, participants in Xia et al. (2022) read sentences such as *Show me the king who the boy pushed* on a laptop computer, and then had to press a key to indicate which of four pictures matched the sentence.

A truth-value judgment task (TVJT) was used by Chen (2022) in order to test whether L1 Chinese learners of L2 Japanese could acquire a different range of interpretation for reflexive anaphors inside the head NP of RCs. In Chinese, the anaphor can refer to either the RC subject or the matrix subject, but in Japanese it can only refer to the matrix subject. Participants saw a single picture of a hat with a picture of the owner on it, together with a test sentence on a computer screen, and they had to select either 'match' or 'mismatch', depending on whether they thought the picture was a possible referent for Japanese sentences containing the phrase "self's hat" (see Section 29.4.3 for further discussion with an example).

The various behavioral methods discussed above remain part of the modern experimental repertoire, but over the last two decades there has been an increase in the use of computer-assisted techniques of investigation. One such approach involves the use of corpus-search software to retrieve

naturally occurring data. As part of Diessel's (2009) investigation of the L1 acquisition of RCs in English and German, he used the CHILDES database to retrieve longitudinal data from two English children: this search provided him with 55 one-hour recordings from 'Adam', age 2;3-5;2 (180 RCs), and 210 30-minute recordings from 'Abe', age 2;4-5;0 (309 RCs). In another corpus-based study, Luzi (2012) examined production strategies for restrictive and nonrestrictive RCs in L2 Italian. She analyzed L2 Italian data from the Italian Certification Corpus (CO.CER.IT), after transcribing 96 recordings using the CHAT format (MacWhinney, 2000).

Other forms of computer-mediated methodology include various measures of RC processing in real time, such as self-paced reading/listening, ERPs, and eye-tracking. In self-paced reading tasks, participants press a button to reveal successive words or phrases in a sentence that they either read on a screen or hear through a speaker. One early, influential study that made use of self-paced reading was Juffs (1998), who used word-by-word, center non-cumulative presentation to deliver stimuli such as the following to L2 learners of English (p. 122).

(13) The bad boys /criticized almost every day / were playing /in the park.

The slashes indicate where reading times were measured and were not part of the visual presentation. Such ambiguous sentences can contain misleading cues, and recovery results in spikes in reading time, which reveal where exactly the participant has difficulty in the sentence. Self-paced reading lacks the prosody that typically distinguishes restrictive from nonrestrictive RCs, although inserting commas for pauses can compensate somewhat for the missing phonological input. Two more recent examples of self-paced reading in language-learning research are Kim and Christianson's (2017) investigation of how working memory capacity may affect the processing of globally ambiguous relative clauses in L2 English, and Hu et al.'s (2022) study of the processing of subject vs. object RCs by L1 Italian/L2 English learners of L3 Chinese.

Neurocognitive models of L2 processing have involved a variety of measures. Perhaps the most common method has been to record event-related potentials (ERPs) while participants read sentences. However, despite a lot of ERP research on native RC processing, and ample use of ERPs in L2 research, there have been very few ERP studies of RCs in L2 processing. Research that has applied ERP methodology specifically to RCs and bilingual populations includes Jessen and Felser's (2019) study of how L1 German-L2 English participants recover from garden paths with filler-gap dependencies, and Kasparian and Steinhauer's (2017) investigation of RC processing in contexts of L1 attrition by L1 Italian-L2 English residents of Canada. ERPs provide both time-sensitive information and insights into activity in particular brain regions. Structures like RCs with long-distance dependencies between an operator and a variable have often revealed a left anterior negativity (LAN) effect, which appears to be linked to working memory, and a P600 effect, which has been argued to reflect syntactic integration or reanalysis: the higher the positivity, the greater the processing difficulty. However, lack of reliability of the P600 effect and significant variation in NS responses suggest that claims of fundamental L1-L2 differences need to be interpreted with caution (Tanner et al., 2014; Tanner & Van Hell, 2014). As pointed out by Dekydtspotter et al. (2021), ERPs are only one aspect of the neurolinguistic activity detected by electroencephalography (EEG), and it is likely that future research may investigate RCs in terms of event-related spectral perturbations (ERSPs), which capture electrical rhythms at various frequencies that have been linked to sentence comprehension, phrase-structure building, syntactic processing load, and ambiguity resolution.

More recent research has also made increasing use of eye-tracking technology. For example, Cunnings and Fujita (2023) studied differences in reading times of subject and object relatives when the matrix subject and the overt noun within the RC were similar common nouns (*the boy, the girl*) or differed between common and proper (*the boy, Rebecca*), in variations of the stimulus below.

(14) The boy that {the girl/Rebecca} saw yesterday afternoon, walked through the park.

Participants read with both eyes, but only the movements of the right eye were measured. They fixated on a gaze trigger before each text appeared, and, as they read the onscreen sentences, three measures were taken at two regions of interest: the matrix verb and the RC (each including spillover regions). The first measure was “first-pass time”, which sums fixations within a region before the gaze leaves it; “regression path time”, which sums fixations in a region before the first fixation to the right; and “total viewing time”, which adds up all the fixations in a given region. When compared to self-paced reading, it is clear that eye-tracking has several advantages, perhaps most notably that the stimulus is not artificially segmented, participants are allowed to return to regions that cause difficulty, and the button-pushing in the middle of readings is eliminated. Other studies that have made use of eye-tracking as a window on RC processing in L2 populations include Hopp’s (2014) analysis of attachment preferences in L1 German learners of English, and Sung et al.’s (2016) investigation of subject and object RC parsing by L1 Japanese learners of Chinese.

29.4 A testing ground for theories of acquisition and processing

RC structures have been used to examine a broad range of theoretical questions concerning the nature of language acquisition by children and adults. One early and influential series of studies addressed whether young children have recourse to complex syntactic representations, and whether they demonstrate knowledge of Universal Grammar that they could not have gained from input alone. Subsequent research into heritage language acquisition has sought to shed light on whether the complex syntax required for RCs is maintained in cases of reduced input and attrition. Fundamental questions addressed in L2 studies include the nature of crosslinguistic influence, proposed stages of acquisition, knowledge of universals beyond a purported critical period, whether learners can successfully converge on the L2 grammar, and subject-object asymmetries. Examples of each of these lines of investigation will be examined below.

29.4.1 L1 acquisition and L1 attrition

A persistent question in L1 studies has been whether child grammar is in some way fundamentally different from adult grammar. Some researchers have argued that child knowledge of the abstract workings of syntax is basically the same throughout development, an idea that has been couched in terms of the Continuity Hypothesis (Roeper, 1992) or the Modularity Matching Hypothesis (Crain & Thornton, 1998). Others have argued that children have difficulties with complex syntax, either because such knowledge comes with biological maturation (Radford, 1988) or because it requires prolonged exposure to input (Vainikka, 1993). In one early study, Tavakolian (1981) asked children (aged 3–5;6) to act out sentences such as *The lion stands on the duck that bumps into the pig* using toy animals, to see whether semantic interpretation was in terms of the RC or if the input was restructured and simplified to derive a conjoined-clause interpretation (in which case *that* is processed as *and*, and the lion bumps into the pig). Tavakolian considered that children’s willingness to act out the conjoined interpretation was evidence that they lacked principles of recursion in their grammar. However, Hamburger and Crain (1982) argued that such sentences with one duck in isolation are infelicitous: restrictive RCs need to restrict something, so there ought to be at least one more duck. They replicated the experiment after adding an extra animal, and the children’s performance dramatically improved. In another set of experiments lending weight to arguments for continuity of syntactic knowledge, Crain and Nakayama (1987) examined children’s understanding of the principle of structure dependence, that is, the idea that grammatical rules make reference to abstract structures and not simply linear order. One experimenter showed pictures to each child (age range 3;2–5;11), while the

other experimenter manipulated a toy (Jabba the Hutt, from *Star Wars*). The child was promoted to put questions to the toy as follows:

- (15) Ask Jabba if the boy who is watching Mickey Mouse is happy.

A linear question formation strategy would result in extraction of the auxiliary from the RC subject: *Is the boy who _ watching Mickey Mouse is Happy?* No child produced sentences of this type either in this task or in a subsequent task that varied the auxiliaries and modals in the RC and in the matrix clause, suggesting that children understand abstract syntactic principles from the outset.

That children may quickly converge on adultlike forms is not a guarantee that they have entered into some kind of steady state of grammatical knowledge. In Polinsky's (2011) study on Heritage Russian speakers' knowledge of RCs, she sought to find out if divergent grammars in heritage adult RCs were a product of incomplete acquisition in childhood or attrition following years of reduced input. Russian RCs allow scrambling for constituents and involve the relative pronoun *kotoryj*, which carries the gender, number, and underlying case of the extracted element. The results of her picture-matching TJVT show that both monolingual and bilingual heritage children have adult competence when it comes to RCs, which points to attrition rather than incomplete acquisition in the adult population.

29.4.2 L2 research: Crosslinguistic influence

The issue of crosslinguistic influence (CLI), or transfer, has been fundamental to L2 research, although it is in evidence in all populations that hold two languages in the same mind, including early bilinguals, heritage learners, and dominant L2 users whose L1 has undergone attrition. One of the earliest and most influential studies of CLI in the L2 acquisition of RCs is that of Schachter (1974), who analyzed written L2 English compositions by L1 Arabic, Chinese, Japanese, and Persian learners. RCs in these L1s differ along various dimensions: prenominal vs. postnominal, complementizers vs. relative pronouns vs. subordinate affixes, and resumptive pronouns at various positions in the accessibility hierarchy. According to the kind of *a priori* comparison of languages prescribed by Lado's (1957) Contrastive Analysis Hypothesis (CAH) framework, transfer should have resulted in Chinese and Japanese learners producing the most errors, while Arab and Persian learners ought to have had less difficulty. However, percentage error rates revealed the opposite pattern. What Schachter's study showed was that Chinese and Japanese students had low error rates precisely because they were avoiding English RCs and resorting to conjunction or paraphrase. In fact, a traditional *a priori* comparison sheds light on the avoidance phenomenon, while simple post-hoc error analysis reveals little about transfer effects in such cases.

A key element of Lado's (1957) CAH was the prediction that similarity between analogous aspects of grammar should facilitate acquisition, while differences will lead to difficulty. The greater the disparity between forms, structures, or rules, the more challenging for acquisition. Interestingly, the exact opposite prediction has become canon in L2 phonology: similarity implies difficulty; greater difference leads to ease of acquisition (Flege, 1995). Lado's prediction has had mixed support in subsequent L2 research. In Hu and Liu's (2007) investigation of the acquisition of Chinese restrictive RCs by English and Korean learners, they found that the similarity between the basic forms of Korean and Chinese RCs (both prenominal) did not give the Korean learners an advantage; rather, the surface dissimilarity recognized by English learners led to faster restructuring of the grammar, including acceptance of resumptive pronouns, which are licensed in Chinese but in neither L1.

A fully acquired grammar does not have to be in place before there is evidence of CLI from the dominant language in bilingualism. Yip and Matthews (2007) give clear evidence of transfer from

Cantonese to English in RCs produced by their own three bilingual children, all of whom used pre-nominal relatives in English during early language development, as shown in the following example.

- (16) Where's the Santa Claus give me the gun? (Timmy 2;07;05)
[i.e., "Where's the gun Santa Claus gave me?"]

Although some argue for a view of CLI as primarily transfer from a single language system in the construction of an L2 or L3 (Schwartz & Sprouse, 2021), evidence from the transfer of RC structures indicates that CLI may occur between any two languages instantiated in the same mind regardless of order of acquisition. In addition to the above findings from childhood bilingualism, it also seems that a dominant L2 can influence an underused L1 in later life. Kasparian and Steinhauer (2017) administered a reading task with acceptability judgments to 24 Italian-English adult migrants with dominant L2, and a control group of 30 Italian monolinguals, while measuring ERP responses. L1 attriters had "nonnative" responses to the Italian stimuli in terms of both judgments and ERPs when the equivalent RC structures were ungrammatical in English. The authors conclude that "high levels of L2 proficiency and exposure may render a grammatical sentence in one's native language ungrammatical" (p.1).

29.4.3 L2 research: Syntactic, semantic, and prosodic knowledge

The syntactic complexity of RCs has made them an ideal set of structures to test hypotheses concerning whether L2 acquisition following a purported critical period is supported by continued knowledge of Universal Grammar (UG). (Similar argumentation applies for interrogatives in some languages: see Martohardjono and Franciotti, this volume.) Such studies bear on the basic question of whether adult L2 acquisition is fundamentally akin to or different from child language acquisition. Hawkins and Chan (1997) hypothesized that adult L2 learners can only access principles of UG previously instantiated in their L1 and are unable to acquire new functional features. They administered a GJT to Cantonese and French learners of English, predicting that the [\pm wh] feature that drives *wh*-movement should be available for French but not for Cantonese participants. They tested for acceptance of grammatical RCs, as well as knowledge of the restriction on resumptive pronouns (e.g., **The patient that I visited him was very sick*), and subjacency violations such as *wh*-islands (e.g., **This is the lady who(m) Richard told me when he will meet*) and complex-NPs (e.g., **This is the building which they heard the news that the government will buy*). L1 Cantonese participants did improve significantly with proficiency in recognizing *wh*-fronting and rejecting resumptives, challenging the notion of a deficit in adult L2 acquisition. However, there was an interesting pattern in that the L1 Cantonese beginners had accuracy rates of only 38% with resumptives but 71% with subjacency violations, while the advanced groups had an inverse pattern of 90% and 38%, respectively. Hawkins and Chan speculate that the beginners were more successful in rejecting sentences with subjacency violations not because of constraints on *wh*-movement, but because they lacked overt resumptives. As acceptances of gaps instead of resumptives increased, they became more tolerant of the subjacency test sentences. This analysis led the authors to suggest that even though accuracy on grammatical RCs increased dramatically, the learners may in fact have a different interlanguage grammar based on L1 principles. On this account, they interpret sentence-initial *wh*-phrases as base-generated topics in Spec-CP that bind a null resumptive *pro* in the gap position.

It is not clear how advanced the higher proficiency learners were in this study. They are described as university-level classroom learners, but they presumably had English outside the classroom in Hong Kong with input from other L2 speakers in a code-switching environment. Other studies examining knowledge of subjacency in *wh*-questions have shown quite clearly that advanced L1 Chinese learners of English can approach nativelike competence in their judgments (e.g., White & Juffs, 1998).

Another aspect of RC acquisition that requires learners to glean syntactic knowledge that cannot derive from the L1 is the distinct binding properties of anaphors inside RCs in Chinese and Japanese, as investigated by Chen (2022) using a TVJT. In Chinese, the anaphor can refer to the RC subject, but the Japanese anaphor *jibun* ‘self’ may not, as shown below.

- (17) Daisy_j-ga Mickey_k-ga arat-ta jibun_{j/*k}-no booshi-o yogoshi-ta.
 Daisy-NOM Mickey-NOM wash-PST self-GEN hat-ACC stain-PST
 ‘Daisy_j stained self’s_{j/*k} hat- that Mickey_k washed.’

On Chen’s (2022) analysis, an uninterpretable feature in the determiner (D) triggers the raising of the head NP in Chinese RCs, while there is no D in Japanese RCs, which are adjoined to a base-generated NP, hence the difference in binding possibilities. Chinese learners of Japanese were able to acquire the relevant syntactic knowledge, which Chen interprets as evidence against the deficit account of L2 acquisition espoused by Hawkins and Chan (1997).

Other research that points to successful acquisition of facets of grammar not available in the L1 concerns the acquisition of mood distinctions in RCs related to interpretations of specificity. Borgonovo et al. (2015) used a GJT and an AJT to tap L1 English learners’ awareness of the following type of mood variation in Spanish.

- (18) Busco unas tijeras que {cortan/corten} alambre.
 look-for.1SG some scissors that cut-IND/cut-SUBJ wire
 ‘I’m looking for some scissors that cut wire’

The indicative mood inside the RC implies that the speaker is looking for a specific pair of scissors, while the subjunctive suggests that any pair of scissors that can cut wire will do. The indicative presupposes the existence of the scissors that the speaker has in mind; the subjunctive carries no such presupposition (for further discussion of mood in SLA, see Dudley, this volume). The results did contain some variation, both for L2 learners and for NS controls, in that the association between subjunctive and nonspecificity was stronger than that between the indicative and specificity. But generally speaking, learners were able to select the appropriate mood, despite that lack of any such distinction in the L1.

One arguably under-researched aspect of L2 grammatical knowledge in the interpretation of RCs is the ability to infer syntactic structure from prosody. The vast majority of work on ambiguity in RCs has involved reading tasks, whether self-paced or using eye-tracking technology, that do not provide a window into how the reader is activating phonology while reading. A few studies, however, stand as important exceptions. Dekydtspotter et al. (2008) examined RC attachment to either the first noun phrase (NP1) or the second noun phrase (NP2) in French sentences such as (23).

- (19) Nous adorons le secrétaire du psychologue qui se promène (au centre ville).
 We adore the secretary of-the psychologist who REFL walk at-the center town
 ‘We adore the secretary of the psychologist who takes a walk (downtown).’

In languages such as French, native speakers generally prefer high attachment (HA) to NP1, such that the secretary takes the walk. Native speakers of English usually choose low attachment (LA) to NP2, such that the psychologist is the one having a stroll. In one of the experiments conducted by these authors, the test sentences were delivered aurally, varying the length of the RC and the intona-

tion contour. Short RCs excluded ‘downtown’ and had a prosodic break after *secrétaire*, favoring LA for native speakers, while long RCs included ‘downtown’, and had a prosodic break following *psychologue*, favoring HA. The English learners of French in this study appeared to have overcome their L1 bias: 57 of the learners in fact overgeneralized to a systematic HA preference, while 30 used intonational contour determine the locus of attachment. Given the complexity of the task and the difficulty of isolating prosodic cues, especially for beginner and low-intermediate learners, the authors conclude that the relevant phonological sensitivity shown by a significant number of participants is evidence that “a prosodic reflex is an integral part of interlanguage processing” (p. 476).

A more recent study by Goad et al. (2021) takes a similar approach, investigating the role of prosodic breaks and RC length in attachment preferences for Spanish learners of L2 English, with Spanish, like French, being reported as having a general HA preference. Goad et al. refine their analysis to incorporate not just RC length, but the tendency of languages to balance prosodic weight across “sister constituents” (Fodor, 1998). They found a significant change with proficiency level, as higher proficiency learners were increasingly able to associate the appropriate prosodic break with HA. That lower-level learners quite systematically preferred LA cannot be attributed to transfer, so the authors suggest that this might be due to a recency effect (Gibson et al., 1996). However, note that these findings arguably replicate those of Dekydtspotter et al. (2008), with less advanced learners arguably overgeneralizing to the general attachment preference of the L2 in advance of eventual sensitivity to intonational contours.

29.4.4 L2 research: *The NPAH and subject-object asymmetries*

Following Keenan and Comrie’s (1977) crosslinguistic evidence for the NPAH, Gass (1979) hypothesized that the relative order of typological frequency should be reflected in the order of L2 acquisition of RCs in any given language. Given that the underlying factors governing the NPAH are supposedly universal, this order of difficulty should hold across L1s. Gass analyzed L2 English data from three tasks – free compositions, sentence combining, and GJs – completed by learners from a range of L1s (Arabic, Chinese, French, Italian, Japanese, Persian, Portuguese, and Thai). The predicted acquisition sequence was SU > DO > IO > OPREP > GEN > OCOMP, which the results strongly supported. The only exception was the surprisingly high accuracy with the genitive across all L1 groups. One possible explanation might lie in language particular properties of genitive relatives in English, as the relative pronoun *whose* is the only such marker prominently coded for case and grammatical relation (Gass, 1979, p. 341).

While much research that followed in the wake of the NPAH proposal assumed that the grammatical relations themselves were the primitives that determine accessibility, Comrie (2007) makes clear that the original paper was deliberately noncommittal in this regard, and he suggests that the underlying determinants are likely to be psycholinguistic in nature. Over the last two decades, explanations have been offered for this hierarchy (either in its entirety or subparts of it) in terms of working memory and linear locality (e.g., Gibson & Wu, 2013), processing and syntactic prominence (e.g., J.A. Hawkins, 2004), and expectation-based theories (e.g., Hale, 2006).⁵

Perhaps the most enduring aspect of this line of research has involved the very top of the hierarchy, with subject relatives predicted to exhibit ease of processing with respect to object relatives. This has in fact turned into a vigorous debate that has continued for decades and shows little sign of diminishing. Lau and Tanaka (2021) provide an excellent review of research on subject-object asymmetries in RCs, at the end of which they supply comprehensive reference lists for research involving particular populations (e.g., NS, child L1, adult L2, Heritage, aphasic, autistic, and SLI studies, among others). They conclude that overall, across populations, previous research does point to a subject advantage, although the strong evidence from languages with postnominal RCs stands in contrast to the more mixed evidence from those with prenominal RCs and those with ergative-absolutive case-marking.

An important distinction within languages with prenominal RCs is between Korean and Japanese, which have SOV word order in main clauses, and Chinese, which is SVO. One account of the subject advantage in languages like English is that postnominal subject RCs [S [_{RC} VO]] show isomorphism with main clause word order [S [VO]] (Diessel & Tomasello, 2005). However, in Chinese, such isomorphism is found with prenominal object RCs [[_{RC} SV] O], and several studies, including Yip and Matthews' (2007) investigation of Cantonese-English bilingual development, found evidence for earlier emergence of object RCs in acquisition. Nevertheless, the results of the research on Mandarin and Cantonese reviewed in Lau and Tanaka (2021) is mixed: in studies of adult, NS processing, 14 showed a subject advantage (S > O), 22 showed an object advantage (O > S), and ten showed either no preference or were unclear; in studies of L2 acquisition, four were S > O, 11 were O > S, with four no preference / unclear.⁶ As argued by Tanaka and Cherici (2022), some of the confusion in these findings may be due to task effects relating to “comprehension-related confounds” in experimentation that has largely relied on real-time processing of input. Their own picture-based elicited production experiment reveals a clear subject preference at group levels and with no significant differences at the level of individual participants.

More generally, relative difficulty in the NPAH can be manifested differently depending on the task or population. Lau and Tanaka (2021, pp. 2–3) observe that this is operationalized in comprehension studies in terms of lower accuracy, longer processing time, or greater demands on working memory; whereas in production studies, difficulty is understood in terms of slower response time, greater error rate, or substitutions; and in L1/L2 acquisition studies, in terms of late emergence, delayed acquisition, or avoidance. To establish a foundation for future research, it seems crucial to go beyond the apparent confusion of previous results and to consider the effects of method and measurement as we strive for a clearer understanding of acquisition sequences of RC types across languages.

29.5 Conclusion

Despite the voluminous and ever-expanding literature on RCs, these selected studies are to a meaningful extent representative of empirical research in this area of syntax, and they afford us several insights into the workings of L2 acquisition. One significant finding across research frameworks, methods employed, and combinations of languages is that there is unambiguous evidence for crosslinguistic influence, or CLI, in childhood bilingualism, L2 acquisition, and L1 attrition in contexts of a dominant L2. This supports hypotheses of CLI that go beyond models of transfer only from previously acquired to newly acquired languages and is in line with theories that allow for more dynamic relationships between multiple languages in a single mind. Another observation is that studies that track learners into advanced proficiency almost always find a gradual convergence on the L2 grammar. That is, even when the relevant features, structures, or strategies are not instantiated in the L1, learners are able to take advantage of a fully functioning language faculty in acquiring new forms, which casts doubt on “deficit accounts” of L2 acquisition. With regard to order of acquisition of RCs that instantiate difference grammatical relations, the NPAH finds ample crosslinguistic support, and subject-object asymmetries are in evidence across a range of languages. That said, it is clear that several language-specific aspects of grammar are in play, and findings from languages with prenominal relatives or ergative case-marking continue as a topic of animated debate. In future research, it seems clear that close attention to method is imperative, given disparities in findings between studies of comprehension and production, perhaps in part due to the extra layers of processing in reading tasks. Regarding investigative scope, there remain significant gaps in the literature regarding the L2 acquisition of major clause types, such as double-headed, free, correlative, and adjoined RCs, and typological differences in morphology and movement. RCs are among the most complex and varied forms of syntactic structure, and acquisition research in this domain still has

much to reveal about the nature of human language in general, as well as what makes each human language distinct.

Notes

- 1 One contested feature of this cartographic approach to syntactic architecture is the postulation of unspecified functional projections (FPs) with empty heads whose specifier positions serve as landing sites; these play a central role in making possible Cinque's (2020) unified analysis.
- 2 For an accessible introduction to *wh*-movement in RCs, see Carnie (2013, p. 369 *ff.*).
- 3 Alternative proposals have been offered in terms of raising and matching analyses. For detailed discussion, see Cinque (2020), Hulsey and Sauerland (2006), and Salzmann (2017).
- 4 A third semantic type which has been much discussed in the semantics literature is maximalizing RCs, in which the RC does not modify the head, as such. The head acts as a degree variable within the RC, while an operation of maximalization applies at the level of CP. Maximalizing RCs remain to be investigated in terms of acquisition and will not be discussed further here.
- 5 A concise summary of these contrasting approaches is provided by Lin (2018).
- 6 For current purposes, data from Mandarin and Cantonese have been collapsed. See Lau and Tanaka (2021) for separate findings.

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