Lang. Teach. (2017), **50.1**, 65–79 © Cambridge University Press 2016
doi:10.1017/S0261444816000029X

Research Timeline

Laboratory studies on multilingual cognition and further language development

Cristina Sanz Georgetown University, Washington DC, U. S. A.
Cristina.Sanz@georgetown.edu

Jessica G. Cox Franklin & Marshall College, Lancaster PA, U. S. A.
jessica.cox@fandm.edu

Introduction

Multilingualism is now seen as the norm rather than the exception in an age of migration and supranational entities, and where minority language rights and the consequent educational policies have become more common. The field of applied linguistics reflects that transition: SECOND LANGUAGE ACQUISITION (SLA) research is slowly being replaced by research on MULTILINGUALISM, which includes third language (L3) acquisition. Indeed, there is a growing list of studies that are 'normalizing' third language acquisition by studying bilinguals learning a new language but not considering bilingualism a variable (e.g. Stafford, Sanz & Bowden 2012; Lado et al. 2014; Pérez-Vidal 2014; Cox & Sanz 2015). In this modern global context, researchers have produced empirical research on L3 acquisition that can be divided into three main categories depending on its focus: (a) classroom studies conducted in bilingual communities and schools with students learning a third language as part of the school curriculum (Cenoz 2013); (b) research on cross-linguistic influence investigating sources of transfer from L1 or L2 into the L3 (e.g. Sanz, Park & Lado 2014) and other possible directions for transfer (González Alonso et al. 2016); and (c) laboratory research – that is, studies outside of classroom or immersion contexts, in which dependent and independent variables can be tightly controlled by the researcher – conducted within a cognitive approach, the focus of this timeline. Despite its potential diminished ecological validity, this last strand is characterized by the robustness of its design and its improved overall validity, and by the manipulation of external conditions and the measurement of internal variables related to cognition.

Laboratory research on L3 development started with comparisons of monolinguals' and bilinguals' processing of a new language. Early work was conducted by cognitive psychologists interested in understanding the role of experience in the acquisition of new knowledge and looked at bilinguals as experienced (bilingual) learners compared to novices (monolinguals). They were also interested in the interaction between experience and explicit and implicit conditions, with results suggesting that experienced learners (1) habitually exert more effort when processing novel verbal stimuli; (2) use cognitive processing strategies that facilitate the

https://doi.org/10.1017/S0261444816000029X Published online by Cambridge University Press

construction of formal rules; and (3) are better able to shift strategies to restructure their language systems.

For linguists, however, this literature was limited in two important ways, both having to do with research methodology. First, these studies operationalized 'language learning' as ability to predict the grammaticality of stimuli consisting of strings of letters lacking any meaning (artificial grammars) while linguists take a functionalist approach that looks at language development as making form–meaning connections and view language as a vehicle of communication. From this perspective, a definition of grammar as rules that determine letter string-combinations appears as lacking. Also, sampling methods in terms of language background were not as strict as desired.

Researchers tried to solve these issues by carefully selecting their samples of monolingual and bilingual language learners and by including mini-grammars of natural languages in their designs; they also broadened the target structures to include morphosyntactic, phonological and lexical development. Importantly, these researchers manipulated learning conditions in ways that approximated real pedagogical conditions, i.e. explicit conditions included provision of grammar rules prior to or during practice, and implicit conditions presented opportunities to practice without explicit grammar instruction. Finally, and following contemporary trends in SLA research, research on L3 acquisition began to look at bilingualism as an individual difference itself related to other individual differences, mostly socio-cognitive in nature, such as working memory capacity, learning strategies and motivation. This move placed laboratory research on L3 acquisition squarely within interactionist approaches that try to capture the multiple relationships between internal and external variables. Naturally, variables intrinsically related to L3 development, such as age and level of L2 acquisition/bilingualism, were placed front and center.

Laboratory research on L3 acquisition began in the domain of phonology, with questions of bilingual advantages in phonetic production and perception. As in other domains, one chief debate has been whether any bilingual advantages are dependent on typological similarities to first language (L1) and/or second language (L2) or stem from a broader cognitive advantage that applies to entirely novel segments (Sanz et al. 2014). From the 1970s to the current day, this question continues to be of interest, as designs become more sophisticated to include variables such as age of acquisition of L2. To explain contradictory results, researchers have identified subclassifications of novel segments, such as those that are 'easy' or 'difficult' to learn. In addition, while early studies investigated learning without instruction, more recent studies have considered the role of instruction in learning. Since 2010, studies have also examined the question of segmenting speech stream into words.

Research on L3 lexical development was a natural offshoot of the study of phonetic perception and cognitive capacity, such as phonological short-term memory (PSTM). Some studies have found that a bilingual advantage in PSTM explains a bilingual advantage in word learning, while others do not support this conclusion. As in phonology and morphosyntax, studies have considered the role of type of instruction, and modality of instruction (aural, visual, or combined). Another common thread across domains has been whether bilingual advantages are limited to typological similarities with their L1 and/or L2, or are also present when learning entirely novel items. Research questions particular to lexical development include the type of stimulus in terms of concreteness and familiarity of the referent. Recent

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research has also expanded the timeframe of study to not include only immediate learning but also retention.

As for L3 morphosyntax, with the intention of finding explanations for the advantages in L3 morphosyntactic acquisition identified for bilinguals over monolinguals (Klein 1995), and to further probe into differences in deployment of attention as a potential explanation, Sanz developed, with Bowden and Stafford, a research program that investigates the interaction between language experience and input varying in degrees of explicitness, and that includes cognitive variables such as aptitude as possible moderating variables. The target is the use of word order, case, and number morphology in the assignment of semantic functions (or WHO does what to WHOM) in L3 Latin by native speakers of different L1s (English, Spanish, Chinese) and L2s (English, Spanish, Japanese, Arabic). Departing from previous studies that compared monolinguals with bi/multilinguals, *The Latin Project* delves into the role of prior experience on additional language learning by including bilinguals with different degrees of proficiency in their non-primary languages. *The Latin Project* has also incorporated an often-underrepresented population in multilingual acquisition research: older adults.

Although laboratory research on L3 acquisition started in the 1960s, the majority of the studies date from the 2000s, so the methodology is innovative and highly eclectic, with designs borrowed both from linguistics and psychology by way of SLA research. Cognitive L3 language acquisition research is complex and requires sophisticated designs with sampling, constructs, measurements, and analyses that present important challenges. Proficiency/degree of bilingualism is especially problematic because it includes a multiplicity of elements (e.g. productive and receptive skills) and is often measured with tests designed for monolinguals and not sufficiently fine-grained to evaluate highly skilled bilinguals; also, responses to self-rating questionnaires may be influenced by different factors (e.g. attitude towards the bilingual's minority language, for example). Regarding analyses, L3 acquisition and use are multifactorial phenomena that demand an interactive approach, which itself demands large samples, yet another challenge. The most popular quantitative procedures include analyses of variance (ANOVAs), correlations and regressions, but the next years will see an increase in publications that include linear growth analysis to investigate systematic change and inter-individual variability in this change, as well as the inclusion of new technologies such as eye-tracking and event-related potentials (Grey 2013: see timeline) as tools to understand the way previous language experience influences additional language learning. Latency, with accuracy, has been the dependent variable of choice in this strand of research. For further details, we refer the reader to Lado & Sanz's chapter on methods in multilingualism research in volume 10 of the *Encyclopedia of language and education*.

In conclusion, this timeline represents laboratory research on L3 acquisition following a cognitive approach. In accordance with the historical developments in SLA, bilingualism, and linguistics over the past decades, we have identified the following major trends:

A. Linguistic target
  A1. Isolated phonemes or syllables

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A2. Artificial grammar
A3. Isolated but meaningful words
A4. Semi-artificial language
A5. Miniature language

B. Type of instruction
B1. Inspired by cognitive psychology, where implicit is memorization and explicit is rule-search
B2. SLA/Processing Instruction-inspired, where explicit is grammar instruction and implicit is no grammar instruction

C. Role of individual differences (IDs)
C1. IDs related to bilingualism: age of acquisition, level of proficiency, number of languages known, typology of languages known
C2. Sociocognitive IDs: strategy, learning style, metalinguistic awareness
C3. Cognitive IDs: cognitive control, working memory, phonological memory

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CRISTINA SANZ is Professor of Spanish & Linguistics at Georgetown University, and director of summer, intensive, and School of Foreign Service Spanish programs. Her research looks into the interactions between learning contexts and individual differences in multilinguals. She is currently writing a Handbook for Teachers of Spanish with Wiley and editing a handbook on study abroad for Routledge. Her volume *Mind and context in adult SLA* received the 2006 MLA's Mildenberger Prize.

JESSICA G. COX is Assistant Professor of Spanish and Linguistics at Franklin and Marshall College in Lancaster, Pennsylvania. Her research interests lie at the intersection of bilingualism and individual differences in SLA, including L3 acquisition, aging, and type of instruction. She has also conducted research on language learning during study abroad. Her publications can be found in journals such as *The Modern Language Journal* and *Studies in Second Language Acquisition*.

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

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YEAR	REFERENCES	ANNOTATIONS	THEME
1967	Cohen, S. P., R. Tucker & W. E. Lambert (1967). The comparative skills of monolinguals and bilinguals at perceiving phoneme sequences. *Language and Speech* 10.3, 159–168.	An early paper that investigated whether children who went through bilingual education (in Canada) reaped benefits beyond L2. Bilinguals whose L1 was English, with either simultaneous L1 French or subsequent L2 French, outperformed all other groups in repetition of syllables, regardless of whether the phonemes came from English, French or neither. **Cohen et al.** interpret these findings in light of bilingual IDs, such as age of acquisition.	**A1, C1**
1971	Davine, M., G. R. Tucker & W. E. Lambert (1971). The perception of phoneme sequences by monolingual and bilingual elementary school children. *Canadian Journal of Behavioural Science* 3.1, 72–76.	In contrast to COHEN ET AL.'s (1967)[1] findings, but working with the same population, **Davine et al.** found that bilinguals were not advantaged in phoneme identification compared to monolinguals when the phonemes were not part of their L1 or L2 inventories. On these grounds, **Davine et al.** argue that bilinguals do not have a non-specific language-learning advantage.	**A1, C1**
1986	Nation, R. & B. McLaughlin (1986). Novices and experts: An information processing approach to the 'good language learner' problem. *Applied Psycholinguistics* 7.1, 41–56.	The first in a series of studies comparing novice and experienced language learners, this one compares the performance of multilingual, bilingual and monolingual subjects on two tasks that involved learning an artificial grammar under implicit and explicit learning conditions. Multilingual subjects showed superior performance to that of the other two groups, but only under implicit conditions. This evidence is interpreted as indicating that multilingual subjects have strategies that help them allocate processing resources more efficiently than less experienced learners.	**A2, B1, C2**
1986	Werker, J. F. (1986). The effect of multilingualism on phonetic perceptual flexibility. *Applied Psycholinguistics* 7.2, 141–155.	**Werker**'s study confirmed and broadened DAVINE ET AL.'s (1971) results: even trilinguals did not have an advantage for phonemes not in their inventories. **Werker** foresees a new direction for the field when he ponders in the discussion whether, bi or trilinguals' LEARNING, rather than uninstructed perception, would differ from that of monolinguals.	**A1**

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1990	Nayak, N., H. Hansen, N. Krueger & B. McLaughlin (1990). Language-learning strategies in monolingual and multilingual adults. *Language Learning* 40.2, 221–244.	A follow-up to NATION & MCLAUGHLIN's (1986) study, this study investigated the hypothesis that experienced language learners have different language acquisition strategies than novice learners. Multilingual and monolingual subjects learned a miniature linguistic system under instructions to 'memorize' or instructions to 'discover rules'. Although there was no clear evidence that multilinguals were superior in language learning abilities overall, multilingual subjects were found to be more able to adjust their learning strategies according to the requirements of the task.	**A2, B1, C2**
1995	Papagno, C. & G. Vallar (1995). Verbal short-term memory and vocabulary learning in polyglots. *The Quarterly Journal of Experimental Psychology A* 48.1, 98–107.	Polyglots who spoke Italian and 1–2 additional languages fluently had advantages (compared to non-polyglots who had studied only one foreign language in school) in (PSTM) and in paired-associates vocabulary learning. Specifically, they were advantaged at learning nonwords; groups were equally successful at learning words. The authors concluded that polyglots' advantage in nonword learning is due to their advantage in PSTM.	**A1, C3**
1997	van Hell, J. & A. Mahn (1997). Keyword mnemonics versus rote rehearsal: Learning concrete and abstract foreign words by experienced and inexperienced learners. *Language Learning* 47.3, 507–546.	**van Hell & Mahn** moved from earlier studies' use of artificial words to natural, but unknown words, considering whether experienced and inexperienced language learners differed in learning outcomes based on instructional conditions. For experienced learners, rote practice yielded more words recalled than keywords did; for inexperienced learners, type of instruction did not affect recall.	**A3, B1**
2003	Gibson, M. & B. Hufeisen (2003). Investigating the role of prior foreign language knowledge: Translating from an unknown into a known language. In J. Cenoz, B. Hufeisen & U. Jessner (eds.), *The multilingual lexicon*. New York, NY: Kluwer Academic Publishers, 87–102.	Moving from isolated words to authentic but simple language, **Gibson & Hufeisen** had monolinguals and multilinguals who were studying English or German translate a text from Swedish, an unfamiliar but genetically related language. Multilinguals were more accurate in their translations than bilinguals or monolinguals. The authors conclude that this is due to their increased metalinguistic resources available.	**A5, C2**

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

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2003	Williams, J. & P. Lovatt (2003). Phonological memory and rule learning. *Language Learning* 53.1, 67–121.	Building on Papagno & Vallar's (1995) study of phonological memory (PM) in L3 learning, in two separate experiments, the authors investigated the role of PM in inducing determiner-noun agreement rules in a semi-artificial language. Phonological short-term memory, vocabulary learning, and memory for determiner-noun combinations early in the experiment predicted learning. However, knowledge of other gender languages, not related to memory but to experience, also predicted learning.	**A4, C3**
2005	Williams, J. N. (2005). Learning without awareness. *Studies in Second Language Acquisition* 27.2, 269–304.	Using a semi-artificial language consisting of English noun phrases with novel determiners, **Williams** tested for learning an instructed cue (distance) and an uninstructed cue (animacy). Accuracy at testing correlated with number of gender-marking languages known, but not with total number of languages known, suggesting the bilingual or multilingual advantage here was limited to transfer of agreement-type structures.	**A4, C1**
2008	Kaushanskaya, M. & V. Marian (2008). Age-of-acquisition effects in the development of a bilingual advantage for word learning. In H. Chan, H. Jacob & E. Kapia (eds.), *Proceedings of the 32nd Boston University Conference on Language Development*, Somerville, MA: Cascadilla Press, 213–224.	Early bilinguals (AoO = 3),[2] late bilinguals (AoO = 12) and monolinguals learned words that were phonologically unfamiliar. Early bilinguals outperformed monolinguals and late bilinguals (who did not differ) immediately following training. One week later, the trend remained but was no longer a significant difference.	**C1**
2008	Lado, B. (2008). The role of bilingualism, type of feedback, and cognitive capacity in the acquisition of non-primary languages: A computer-based study. Ph.D. dissertation, Georgetown University.	In this study from *The Latin Project*, **Lado** investigated the interactions between provision of explicit feedback, level of L2 proficiency, and cognitive capacity (working memory span) in L3 morphosyntactic learning. Results showed advantages for bilinguals over monolinguals even at intermediate L2 proficiency. However, in more challenging conditions (without explicit feedback), the bilingual advantage was limited to those with near-native L2 proficiency.	**A5, B2, C1, C3**

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

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2009	Kaushanskaya, M. & V. Marian (2009a). The bilingual advantage in novel word learning. *Psychonomic Bulletin& Review* 16.4, 705–710.	**Kaushanskaya & Marian** used semi-artificial lexical items made of English and non-English phonemes to see if bilinguals had a general learning advantage compared to monolinguals (similar to the question COHEN ET AL. (1967) and DAVINE ET AL. (1971) asked of L3 phonology). They did, both in recognition and recall. The authors suggest that the bilingual advantage may come from more efficient encoding, increased memory capacity, or enhanced inhibitory control.	**A4**
2009	Kaushanskaya, M. & V. Marian (2009b). Bilingualism reduces native-language interference during novel-word learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 35.3, 829–835.	A continuation of KAUSHANSKAYA & MARIAN'S (2009a) previous report, the authors tested whether modality of instruction would differentially affect bilingual versus monolingual learning. Whether training was unimodal (aural only) or bimodal (aural and visual), bilinguals outperformed monolinguals immediately following training, in recognition and recall. For bimodal training only, bilinguals additionally retained their advantage one week later.	**A4**
2010	Kempe, V., P. J. Brooks & A. Kharkhurin (2010). Cognitive predictors of generalization of Russian grammatical gender categories. *Language Learning* 60.1, 127–153.	Bridging the gap from lexical item to noun phrase morphology, **Kempe et al.** trained participants in the gender of Russian diminutive nouns and tested them on trained and untrained items. They differentiated between learners as monolingual, bilingual with transparent gender marking, or bilinguals with non-transparent gender marking (including no grammatical gender). Proficiency in gender-transparent languages predicted gender categorization of novel transparent nouns, i.e. generalization from the items seen in training rather than a broad bilingual advantage.	**A4, C1**
2010	Stafford, C. A., C. Sanz & H. Bowden (2010). An experimental study of early L3 development: age, bilingualism and classroom exposure. *International Journal of Multilingualism* 7.2, 162–183.	Also from *The Latin Project*, this study investigated the learning processes and outcomes of early- and late-onset Spanish/English bilingual adults' initial learning of L3 Latin. Results indicated that, overall, there were no significant differences between the groups at first; however, the Late Bilinguals maintained their gains. Also, results showed that aging has a role in explaining the variance observed in initial L3 learning, particularly when a target structure is morphologically complex and memory cannot be supported by existing L1/L2 knowledge.	**A5, C1**

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

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2011	Bartolotti, J., V. Marian, S. R. Schroeder & A. Shook (2011). Bilingualism and inhibitory control influence statistical learning of novel word forms. *Frontiers in Psychology* 2. doi: 10.3389/fpsyg.2011.00324.	**Bartolotti et al.** used an artificial grammar based on Morse Code to test for bilingual advantages at segmenting a 'speech' stream into words when transfer is impossible. Participants were first trained to segment a stream in which the cues of silent pauses and transitional probability aligned; in that condition, more proficient bilinguals outperformed less proficient bilinguals. In a second phase, in which the two cues diverged, cognitive control (rather than level of bilingualism) predicted successful learning.	**A2, C1, C3**
2011	Lin, H.-J. (2011). Language learning strategies in adult L3 acquisition: Relationship between L3 development, strategy use, L2 levels, and gender. In C. Sanz & R. P. Leow (eds.), *Implicit and explicit language learning: Conditions, processes, and knowledge in SLA and bilingualism*. Washington, DC: Georgetown University Press, 207–217.	Also part of *The Latin Project*, this study investigated the relationship between strategies reported by 90 L1 Mandarin speakers of three different L2 English levels and L3 development. As in previous studies (Nation & McLaughlin 1986; Nayak et al. 1990) factors such as L2 proficiency, sex, and type of language tests influenced the relationship between learning strategies and L3 development.	**A5, C1, C2**
2011	Yoshida, H., D. N. Tran, V. Benitez & M. Kuwabara (2011). Inhibition and adjective learning in bilingual and monolingual children. *Frontiers in Psychology* 2. doi: 10.3389/fpsyg.2011.00210.	As did Bartolotti and colleagues (2011), **Yoshida et al.** investigated the possibility of a link between enhanced attentional control in bilinguals (as compared to monolinguals) and a bilingual advantage in learning nonce words. Specifically, the researchers tested 3-year-old children on non-linguistic control and novel adjective learning, finding a bilingual advantage on both tasks. Crucially, they also found that for all children, scores on the cognitive control task correlated positively with scores on vocabulary learning – the first study to find empirical evidence of such a relationship, and the opposite finding of Bartolotti and colleagues (2011).	**A4, C3**

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2012	Bartolotti, J. & V. Marian (2012). Language learning and control in monolinguals and bilinguals. *Cognitive Science* 36.6, 1129–1147.	Here, **Bartolotti & Marian** used a novel method for this subfield, eye-tracking, to answer the fine-grained question of whether the bilingual advantage might be due to enhanced inhibition of L1. Participants learned new names for familiar objects and then had to pick the correct object out of an array that included phonological competitors. Eye-tracking results showed that bilinguals were less distracted by English competitors, although the two groups did not differ in accuracy or reaction time.	**A3, C3**
2012	Kaushanskaya, M. (2012). Cognitive mechanisms of word learning in bilingual and monolingual adults: The role of phonological memory. *Bilingualism: Language and Cognition* 15.3, 470–489.	Returning to PAPAGNO & VALLAR's (1995) and WILLIAMS & LOVATT's (2003) work on the role of PM in bilingual advantages at L3 learning, **Kaushanskaya** taught bilinguals and monolinguals new words: some that were phonologically familiar and some that were unfamiliar. Although bilinguals had higher PM than monolinguals, they out-performed even the high-PM monolinguals at learning novel words, regardless of phonological familiarity. Therefore, increased PM does not account for the bilingual advantage at word learning.	**A2, C3**
2012	Kaushanskaya, M. & K. Rechtzigel (2012). Concreteness effects in bilingual and monolingual word learning. *Psychonomic Bulletin Review* 19.5, 935–941.	Here, **Kaushanskaya & Rechtzigel** built on KAUSHANSKAYA's (2012) work by investigating a different property of the linguistic target form: concreteness of the word. The bilingual advantage at word learning was greater for concrete than abstract words, suggesting that semantic processing may play a role in the bilingual advantage.	**A3**
2012	Tremblay, M.-C. & L. Sabourin (2012). Comparing behavioral discrimination and learning abilities in monolinguals, bilinguals and multilinguals. *Journal of the Acoustical Society of America* 132.5, 3465–3474.	**Tremblay & Sabourin** took on WERKER's (1986) question of how bilingual LEARNING of novel phonetic contrasts might be different from that of monolinguals. They first replicated WERKER's finding that there were no differences in perceptual ability between groups (here, multilingual, bilingual, and monolingual); however, following instruction, multilinguals outperformed monolinguals.	**A1, C1**

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2013	Antoniou, M., C. T. Best & M. D. Tyler (2013). Focusing the lens of language experience: Perception of Ma'di stops by Greek and English monolinguals and bilinguals. *The Journal of the Acoustical Society of America* 133.4, 2397–2411.	**Antoniou et al.** went beyond WERKER (1986) and TREMBLAY & SABOURIN's (2012) research on phonetic perception of bilinguals to consider the role of bilinguals' language mode in determining how non-native sounds are categorized. Bilinguals did indeed categorize Ma'di stops according to the language mode they were assigned to, yielding intermediate performance compared to the Greek and English monolinguals.	**A1**
2013	Bradley, K. A. L., K. E. King & A. E. Hernandez (2013). Language experience differentiates prefrontal and subcortical activation of the cognitive control network in novel word learning. *NeuroImage* 67, 101–110.	Building on YOSHIDA ET AL.'s (2011) and BARTOLOTTI & MARIAN's (2012) work linking cognitive control to L3 acquisition, monolingual English and bilingual Spanish-English speakers studied German vocabulary flashcards for two hours and learned them to at least 90% accuracy. They then completed an animacy task during functional magnetic resource imaging (fMRI) scanning. Bilinguals did not differ from monolinguals in accuracy in the animacy task, but they did have faster responses than monolinguals. Additionally, bilinguals activated more localized areas of cognitive control areas during this task, whereas monolingual activation was broader.	**A3**
2013	Brooks, P. J. & V. Kempe (2013). Individual differences in adult foreign language learning: The mediating effect of metalinguistic awareness. *Memory & Cognition* 41.2, 281–296.	Continuing KEMPE ET AL.'s (2010) work on L3 grammatical gender, participants learned Russian vocabulary and morphosyntax through various activities but without explicit instruction. In testing, participants who had more knowledge of another gender-marking language had an advantage in accuracy of gender marking in Russian. Moreover, the total number of languages known (regardless of language typology) predicted accuracy in case marking. Neither measure of language expertise was related to vocabulary learning or to metalinguistic awareness of the target structures, which the authors interpreted to suggest that any bilingual advantage is more implicit in nature, rather than explicit.	**A5, C1, C2**

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

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2013	Grey, S. (2013). A neurocognitive investigation of bilingual advantages at additional language learning. Ph.D. dissertation, Georgetown University.	This is the first study to compare bilinguals' and monolinguals' morphosyntactic learning using tools from neurocognition. The study compared early balanced Mandarin-English bilinguals to monolinguals learning a Romance-like language (Brocanto2). Participants were exposed to an instructed (with metalinguistic information and meaningful examples) or uninstructed (with meaningful examples and no metalinguistic information) condition at two different points (low and high experience). Grey's behavioral (accuracy) results do not show marked differences between bilinguals and monolinguals; however, ERP data reveal differential reliance on neurocognitive mechanisms for bilinguals and monolinguals at different points in the learning curve.	**A3, B2**
2014	Antoniou, M., E. Liang, M. Ettlinger & P. C. Wong (2014). The bilingual advantage in phonetic learning. *Bilingualism: Language and Cognition*. doi: 10.1017/S1366728914000777.	Continuing the substrand considering instructed phonetic learning (TREMBLAY & SABOURIN 2012), participants (monolingual English speakers and bilingual Mandarin-English speakers) were exposed to word-picture pairs and then tested on the word meanings. Half of the words were English-like and half were Mandarin-like. Bilinguals outperformed monolinguals on both types of words. In Experiment 2, Korean-like words and Korean-English participants were added. Again, bilingual groups outperformed monolinguals. For the Mandarin-like words, there was no difference between bilingual groups but for the Korean-like words, Korean-English bilinguals outperformed Mandarin-English bilinguals. The authors conclude that bilinguals may have a general advantage for learning 'easy' phonetic contrasts but not 'difficult' ones.	**A3, C1**
2014	Blumenfeld, H. K. & A. M. Adams (2014). Learning and processing of nonverbal symbolic information in bilinguals and monolinguals. *Frontiers in Psychology* 5. doi: 10.3389/fpsyg.2014.01147.	Similar to NAYAK ET AL.'s (1990) AGL (artificial grammar) with symbolic referents, **Blumenfeld & Adams** trained participants to match non-linguistic tones to symbols. Bilinguals and monolinguals performed equivalently on recall. However, bilingual processing seems to differ from that of monolinguals, since vocabulary size did not predict recall for bilinguals, whereas it did for monolinguals.	**A1**

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

Year	References	Annotations	Theme
2014	Grey, S., J. N. Williams & P. Rebuschat (2014). Incidental exposure and L3 learning of morphosyntax. *Studies in Second Language Acquisition* 36.4, 611–645.	Although this study was not interested in the role of experience per se, it investigated learning of semi-artificial L3 morphosyntax (word order and case marking) under an incidental exposure condition, and specifically retention of any knowledge gained. Participants were L1 English/L2 Spanish learners. Results suggest that incidental exposure can lead to learning of L3 structures and that such learning is durable and undergoes improvement. Furthermore, reportable rule knowledge (i.e. explicit knowledge) may also play an important role.	**A4**
2014	Kan, P. F., N. Sadagopan, L. Janich & M. Andrade (2014). Effects of speech practice on fast-mapping in monolingual and bilingual speakers. *Journal of Speech, Language and Hearing Research* 57, 929–941.	**Kan et al.** continued VAN HELL & MAHN's (1997) work on the role of instruction in L3 vocabulary learning, here by manipulating the amount of practice (oral repetitions) in learning novel words for monolinguals and bilinguals. Words were either phonologically similar to L1, L2, or neither. Bilinguals had an advantage over monolinguals in comprehension of all new word types, but the bilingual advantage in production of new words was limited to those that were similar to L1 or L2.	**A3, C1**
2014	Kan, P. F. & N. Sadagopan (2014). Novel word retention in bilingual and monolingual speakers. *Frontiers in Psychology* 5. doi: 10.3389/fpsyg.2014.01024.	Here, **Kan & Sadagopan** report on the retention of the novel words learned by participants in KAN ET AL. (2014) after one week with no exposure. Bilinguals did not differ from monolinguals in retention of any word type; however, bilinguals' scores on the three word types were intercorrelated at retention, whereas monolinguals' scores were not.	**A3, C1**
2014	Kaushanskaya, M., J. Yoo & S. Van Hecke (2014). Word learning in adults with second-language experience: Effects of phonological and referent familiarity. *Journal of Speech, Language, and Hearing Research* 56, 667–678.	Continuing KAUSHANSKAYA's research on interactions between bilingual experience and linguistic features of novel words, the authors here found that higher levels of L2 experience predicted greater vocabulary learning only for unfamiliar phonology paired with familiar referents. Specifically, the index of bilingualism that was related was L2 speaking proficiency, not age of acquisition.	**A3, C1**

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

YEAR	REFERENCES	ANNOTATIONS	THEME
2014	Wang, T. & J. R. Saffran (2014). Statistical learning of a tonal language: The influence of bilingualism and previous linguistic experience. *Frontiers in Psychology* 5. doi: 10.3389/fpsyg.2014.00953.	**Wang & Saffran** continue research (begun by BARTOLOTTI ET AL. 2011) on whether bilingual advantages in phonetic learning and segmentation come from transfer or broader processing with an artificial tonal language. Monolinguals (English or Mandarin speakers) and bilinguals (with knowledge of a tonal language or not) listened to a continuous speech stream with instructions to pay attention to patterns in the language. Bilinguals with and without prior experience with tonal languages had an advantage in segmenting the stream into words (as compared to both monolingual groups). Thus, the experience of bilingualism, rather than the experience with tonal languages, facilitated success.	**B1, C1**
2015	Cox, J. (2015, *FirstView*). Explicit instruction, bilingualism, and the older adult learner. *Studies in Second Language Acquisition*. doi: 10.1017/S0272263115000364.	Following LADO (2008), STAFFORD ET AL. (2010), and LIN (2011)'s investigations in *The Latin Project*, **Cox** added two new dimensions: First, the participants were older adult learners (60+), an understudied group in all of multilingualism research. Second, the operationalization of explicit instruction differed from LADO's in that it consisted of pre-practice grammar explanation, not explicit feedback. Bilinguals had an advantage on interpretation tests regardless of type of instruction; bilingual advantages on the grammaticality judgment test and production test were limited to those with explicit instruction.	**A5, B2, C1**
2015	Nair, V. K. K., B. Biedermann & L. Nickels (2015). Consequences of late bilingualism for novel word learning: Evidence from Tamil-English bilingual speakers. *International Journal of Bilingualism*. doi: 10.1177/1367006914567005.	Whereas KAUSHANSKAYA & MARIAN (2008) investigated the role of L2 age of acquisition in L3 word learning via presentation of novel words with their translation equivalents, **Nair et al.** taught participants new words in conjunction with pictures of their referents. This methodology comes closer to classroom experiences of foreign language learning. Perhaps for that reason, **Nair et al.** found an advantage for late bilinguals as compared to monolinguals, although early bilinguals still scored highest.	**A3, C1**

https://doi.org/10.1017/S026144481600029X Published online by Cambridge University Press

YEAR	REFERENCES	ANNOTATIONS	THEME
2015	Patihis, L., J. S. Oh & T. Mogilner (2015). Phoneme discrimination of an unrelated language: Evidence for a narrow transfer but not a broad-based bilingual advantage. *International Journal of Bilingualism* 19.1, 3–16.	**Patihis et al.** replicated ANTONIOU ET AL.'s (2014) finding that bilinguals are only advantaged at 'difficult' novel phonetic contrasts, such as those of Korean consonants if the distinction is familiar to them. The same pattern held for trilinguals.	**A3, C1**
2015	Riestenberg, K. J., H. S. Jan, L. Maimone & C. Sanz (2015). Cross-linguistic effects of Arabic experience on L3 learning and explicit knowledge. *Arizona Working Papers in Second Language Acquisition & Teaching* 22, 1–25. http://slat.arizona.edu/arizona-working-papers-second-language-acquisition-teaching.	This study from *The Latin Project* paradigm investigates L2 Arabic/L3 Latin learning by native speakers of English. The interest is the roles of both previous experience and of explicit knowledge in explaining the posited advantage of experienced learners, as well as the potential role of amount of L2 exposure in modulating these relationships. The study replicates the findings in Sanz et al. (2015), showing that learners in the early stages of L3 development start with an L1-based strategy; results also suggest that amount of L2 exposure may mediate transfer in L3 acquisition, and the important role for explicit knowledge in adult language learning, at least among classroom learners.	**C1**
2016	Kaushanskaya, M. (2016). What can errors tell us about differences between monolingual and bilingual vocabulary learning? *International Journal of Bilingual Education and Bilingualism*. doi: 10.1080/13670050.2016.1170760.	Continuing to consider possible explanations for WHY bilinguals seem to be advantaged at novel word learning, **Kaushanskaya** considered two possible error patterns that could shed light on the question: surface errors between phonologically similar words (building on KAUSHANSKAYA 2012) and deeper semantic errors. Results showed that both groups made both types of errors immediately after the learning phase and in a one-week delayed posttest. However, at the immediate posttest only, bilinguals made more errors of the semantic type than monolinguals did, suggesting that bilinguals processed more deeply during learning than monolinguals did. In this study, this finding is confounded with the fact that bilinguals scored higher than monolinguals on posttests. The author suggests having both groups reach the same criterion for future studies to be able to disentangle successful vocabulary learning from bilingual advantages.	**A3, B1**

[1]Authors' names are shown in small capitals when the study referred to appears in this timeline.
[2]AoO = age of onset.