

20 Variables Affecting L2 Pronunciation Development

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Introduction

John Austin, a renowned British philosopher of language, once noted in one of his lectures on language that “the uttering of the sentence is the doing of an action, which [...] would not *normally* be described [...] as ‘just’ saying something” (Austin 1975: 5, original emphasis). Central to this statement is the idea that language is not simply a cognitive system of mental representations and rules (e.g., Chomsky 1957), but rather a tool used by individuals to accomplish real goals or actions through interaction. Along with Grice and Searle, other fellow philosophers of language, Austin laid the foundations for what later Herbert Clark (1992) termed a “language-as-action” tradition in linguistics. The view of language as action, according to Clark, presupposes that language is used by *participants* (real people who often have defined roles, such as a test-taker, customer, or employer) in order to accomplish certain interactive *social processes* (real-world goals, such as completing a business transaction, making a case in court) as part of *collective actions* (contextualized instances of language use).

The language-as-action view provides a fitting framework for discussing pronunciation. Pronunciation lies at the core of oral language expression, identifying individual speakers and speaker communities. Pronunciation is also central to language use in social, interactive contexts because pronunciation embodies the way that the speaker and the hearer work together to establish and maintain common ground for producing and understanding each other’s utterances. Last but not least, pronunciation, as a way of speaking, is intimately linked to the particular places, times, and situations of language use, such that, for instance, giving a public lecture at a university, discussing a hockey match at a bar, or sharing bad news with a loved one in a hospital would involve different ways of speaking.

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In this chapter, we adopt Clark's (1992) view of language as action to discuss several influences on second language (L2) pronunciation development (variables). Such influences are categorized according to the three properties thought to describe language use: participants, social processes, and collective actions. We synthesize current scholarship and scholarly debates with respect to each factor described and then outline possible avenues for future research. We conclude by discussing some viable theoretical views of L2 pronunciation development, particularly those that embrace the multidimensional nature of pronunciation learning. Our overall objective is to show that L2 pronunciation learning, a challenging and exciting area for researchers, teachers, and learners alike, is a complex and multidimensional phenomenon.

Participants

The first cluster of variables we discuss in relation to L2 pronunciation development fits well within the "participants" category described by Clark (1992). According to Clark, language use is quintessentially a human activity, with individuals often having defined roles in various episodes of language use (e.g., teacher, student, employer, bystander, etc.). As participants involved in language use, individuals therefore bring to the interaction a number of person-specific factors, or variables that reflect in some way their individual differences or capacities (e.g. age, aptitude, perception ability). Several of these person-specific variables or individual differences that can impact L2 pronunciation development are discussed here.

Age

One of the most widely discussed (and hotly debated) factors in relation to L2 pronunciation development is learners' age. The idea that L2 learning (and learning L2 pronunciation in particular) might depend on learners' age dates back to the writings of Penfield and Roberts (1959). These researchers were among the first to propose that in order for a child to learn a language to native-like mastery, exposure to that language must occur within a certain developmental "window" described as a critical or a sensitive period. This idea was later taken up by Lenneberg (1967), who speculated that a critical period for language, which was biologically determined through brain maturation, ended around the age of puberty. The critical/sensitive period for language learning, of the kind proposed by Lenneberg, thus involves a certain biologically determined period of sensitivity to language followed by a decline in the capacity to learn it (see Bornstein 1987 for more on critical/sensitive periods).

To date, researchers have gathered an extensive body of evidence supporting the basic assumption underlying the notion of a critical/sensitive period – that learning an L2 beyond early childhood appears to result in often incomplete, non-nativelike mastery of the language. With respect to L2 pronunciation, for example, there is ample evidence that children, while often initially slower at L2 learning,

eventually outperform adults on a variety of tasks, and that even the most successful adult learners are seldom fully native-like in their L2 pronunciation (e.g., Abrahamsson and Hyltenstam 2009; Aoyama et al. 2008; Bongaerts et al. 1997; Flege, Yeni-Komshian, and Liu 1999).

At the heart of the sensitive period controversy is whether L2 “age effects” are determined by a biologically-driven critical/sensitive period or instead arise as a consequence of other factors. Some researchers, like Lenneberg, support the notion of a biologically-determined critical/sensitive period for L2 learning. For example, Pulvermüller and Schumann (1994) attribute older children’s and adults’ diminishing ability to learn an L2 to a gradual decline in neuronal plasticity in specific areas of the brain (see also Jacobs 1988). Others, however, refute the existence of a biologically-determined critical/sensitive period, instead linking age effects to a variety of social-educational factors (e.g. Jia and Aaronson 2003; Flege, Yeni-Komshian, and Liu 1999; Moyer 1999) or cognitive variables (e.g. Hakuta, Bialystok, and Wiley 2003). Still others hypothesize that age effects do not necessarily reflect age-bound neurobiological limitations alone but arise as a consequence of the act of prior learning itself, such that speech perception and production become specialized for the processing of native language (L1) input (Baker et al. 2008; McCandliss et al. 2002).

An examination of the literature on child–adult differences reveals a number of plausible interpretations of L2 age effects, including those with neurobiological, linguistic, social, attitudinal, experiential, and cognitive underpinnings (see Birdsong 2009 and DeKeyser 2012). In our view, one of the most promising (and empirically testable) interpretations for age effects in L2 pronunciation learning relates to differential involvement of memory systems in child versus adult L2 pronunciation learning (DeKeyser 2012; Paradis 2009; Ullman 2005). The two memory systems in question are declarative memory, responsible for the learning of form-meaning relationships stored in the lexicon, and procedural memory, responsible for the learning of grammar and pronunciation. The information stored in declarative memory is generally explicit (open to conscious awareness), whereas procedural memory is responsible for implicit learning (learning without awareness). For instance, it has been proposed that adolescent and adult L2 learners mostly rely on analytical, declarative, explicit learning mechanisms in learning aspects of L2 morphosyntax, whereas children have access to procedural, implicit learning mechanisms (Abrahamsson and Hyltenstam 2008; DeKeyser, Alfi-Shabtay, and Ravid 2010). Recent evidence from L2 pronunciation research is compatible with this interpretation (Archila-Suerte et al. 2012; Saito in press). In fact, based on this and similar evidence, DeKeyser (2012) recently suggested that the core question to guide current and future research on L2 age effects is “whether there is a specific period of decline in the ability for implicit language learning” (2012: 446). With respect to L2 pronunciation development, therefore, it remains to be shown whether and to what extent adult learners rely on implicit learning and whether pronunciation teaching activities could harness implicit learning strategies (for preliminary evidence, see Trofimovich, McDonough, and Neumann, 2013; Trofimovich, McDonough, and Foote, in press).

Cross-language perceptual similarity

One of the most salient influences on L2 pronunciation development can be traced to learners' L1. It is a common observation that L2 learners' perception errors and foreign accents are in large part specific to their L1. In previous research, L1-based influences on L2 pronunciation development have been studied through typological L1–L2 comparisons, for example, by comparing the status of particular phonemic and phonetic categories cross-linguistically (for a review, see Davidson 2011). However, L1 effects on L2 pronunciation arguably also reflect an *individual* learner's ability to perceive similarities or differences across the two languages. The assumption here is that L1 influences on L2 pronunciation are ultimately a matter of perception, or the degree to which aspects of L2 pronunciation (e.g. individual segments or prosodic patterns) are filtered through and recognized in terms of the learners' L1 (Strange 2007).

From this vantage point, one way to characterize L1 effects on L2 pronunciation is through the construct of cross-language perceptual similarity. Cross-language similarity refers to how perceptually similar or dissimilar listeners treat specific aspects of pronunciation in their L1 and L2. There is evidence that the degree of perceived similarity (or dissimilarity) between L1 and L2 sounds may determine how L2 sounds are perceived and produced (Baker and Trofimovich 2005; Guion et al. 2000; Strange et al. 2011). For example, Japanese learners of L2 English may perceive and produce English /r/ more accurately than English /l/ (Flege, Takagi, and Mann 1995) because they are more likely to perceptually differentiate English /r/, but not /l/, from Japanese /r/ (Aoyama et al. 2004). In this situation, cross-language dissimilarity renders one L2 segment (English /r/ in this case) easier to learn than another (English /l/).

As the above example suggests, L2 perception and production appear to depend on the perceived distance between L1 and L2, such that (depending on the particular relationship between L1 and L2) cross-language similarity can either help or hinder L2 perception and production. This idea has been central to two influential models of L2 speech learning – the Perceptual Assimilation Model (Best and Tyler 2007) and the Speech Learning Model (Flege 2002). Both models hold that perception and production of specific aspects of L2 pronunciation depend on L2 learners' ability to detect cross-language differences at the level of pronunciation. Both models also assume that only a perceptual measure of cross-language similarity – as opposed to those based on comparisons of acoustic properties, sound categories, prosodic units, or distinctive features – qualifies as a direct and predictive measure of L2 perception and production difficulty (Strange 2007). Directly estimating cross-language perceptual similarity, for example, involves having L2 learners comparing target L2 vowels to vowels in the learners' L1 using perceptual identification or similarity rating tasks (e.g., Strange et al. 2011).

In the past two decades, explorations of cross-language perceptual similarity, usually carried out within the conceptual framework of either or both of the above models, have received careful attention in L2 pronunciation research, with the specific aim of determining the perceptual difficulty and learnability of different L2

pronunciation features. For example, in an early study, Bohn and Flege (1990) demonstrated that the perceptual relationship between English /æ/ and German vowels, established in a cross-language perceptual identification experiment, explained native German listeners' difficulty in discriminating the English /æ/-/ɛ/ contrast (as in *bat-bet*). In a seminal study a decade later, Guion et al. (2000) argued that the perceptual similarity between English and Japanese consonants both explained and predicted which English consonants are most difficult for Japanese learners of English to perceive. The encouraging outcomes of this research motivate further investigations of cross-language similarity to determine the difficulty and learnability of different aspects of L2 pronunciation at different stages of learning. Productive future avenues of research might involve investigations of the role of cross-language similarity in the learning of prosodic, as opposed to segmental, aspects of L2 pronunciation and comparisons of cross-language similarity for learners of different ages, with a view to explaining child–adult differences in L2 pronunciation development (Baker et al. 2008). Future research should also explore pedagogical uses of cross-language perceptual similarity, as part of cross-language awareness building activities and perceptual training (see Thomson 2012).

Aptitude

Language aptitude refers to a cluster of cognitive variables believed to underlie the human capacity for language learning. Although the precise variables considered as part of language aptitude are often specific to particular instruments used to measure it (Carroll and Sapon 1959; Grigorenko, Sternberg, and Ehrman 2000; Pimsleur 1966; Sparks et al. 2011), language aptitude commonly encompasses aspects of short-term memory, phonetic coding (ability to encode and retain auditory sequences), grammatical sensitivity (ability to recognize grammatical functions of words), rote learning (ability to form sound-meaning associations), imitation or mimicry, inductive learning (ability to infer rules or patterns from linguistic information), musical ability, as well as transfer and combination skills (ability to apply inferred patterns to new contexts and to synthesize information). Despite decades of productive research on language aptitude (Skehan 2012), there has been little systematic research on the relationship between various subcomponents of language aptitude and L2 pronunciation learning. Most of the research carried out within the aptitude tradition has examined the contribution of musical ability to the learning of L2 pronunciation, testing the basic assumption that there is an association between musical ability and the quality of L2 pronunciation.

Musical ability typically refers to an individual's ability to "hear" (internalize) music that is no longer present in the physical environment, a skill that Gordon (1995) termed "audiation". For example, upon hearing two musical phrases played consecutively, listeners with greater musical ability, as compared to listeners with weaker musical ability, would presumably be able to judge whether the two phrases are similar in their melodic contour (overall pattern of pitch rises and falls), even if the two phrases differed in the overall number of notes. Musical ability, defined in this manner, is often measured using standardized tests, which

target several aspects of this ability, including pitch, intensity, rhythm, timbre, tonal memory, and timing (Bentley 1966; Gordon 1995; Seashore 1919; Wing 1968).

Although L1 research has shown an important association between musical ability and speech processing, particularly with respect to the music-prosody links (Palmer and Hutchins 2006), the relationship between musical ability and L2 pronunciation remains unclear. Some researchers who have investigated this relationship reported a positive correlation between musical ability and L2 pronunciation (Arellano and Draper 1972; Milovanov et al. 2010; Slevc and Miyake 2006). However, many others have failed to reveal any clear relationship between these two variables (Dexter and Omwake 1934; Flege, Munro, and MacKay 1995; Pimsleur, Stockwell, and Comrey 1962; Tahta, Wood, and Loewenthal 1981). The link between musical ability and L2 speech perception has been even more elusive, essentially because this relationship has been studied much less extensively. For example, Slevc and Miyake (2006) showed that a standardized measure of musical ability accounted for up to 12% of variance in native Japanese speakers' perception of L2 (English) contrasts in words, sentences, and spoken texts (see also Milovanov et al. 2008; Pimsleur, Stockwell, and Comrey 1962). However, in several other studies, no association between musical ability and L2 perception was found (Arellano and Draper 1972; Milovanov et al. 2010). Clearly, more research is needed to enhance our theoretical understanding of the link between musical ability and L2 pronunciation. At the practical level, it would also be important to determine how L2 pronunciation teaching could be made more effective through the use of music-based activities, particularly for the teaching and learning of L2 prosody.

Social processes

The second cluster of variables we discuss in relation to L2 pronunciation development falls under the category of "social processes" identified by Clark (1992). For Clark, the primary goal of language use resides not simply in the act of speaking, but rather in accomplishing a given social goal (e.g. expressing an opinion or getting someone to do something). From this vantage point, then, language learning cannot be considered outside its contexts, which implies that a number of social variables (e.g. ethnicity, motivation) can have a measurable impact on language learning, including L2 pronunciation development. In this section, two of these variables are discussed.

Motivation

Although motivation can be understood as a purely cognitive phenomenon (a subcomponent of language learning aptitude or an individual difference factor), recent research on motivation has firmly placed this variable within the realm of socially situated learning (for a recent review, see Ushioda and Dörnyei 2012). Broadly speaking, motivation refers to a cluster of variables dealing with the willingness, interest, and desire of the language learner to engage in a learning process.

The construct of motivation is tightly linked to its measures, which in the context of L2 pronunciation research have been operationalized as scalar ratings in response to simple statements, such as *English is important for success at work/school* (Flege, Yeni-Komshian, and Liu 1999), or participants' responses to open-ended questions, such as *What is your motivation for studying German at this time?* (Moyer 1999).

Motivation has long been believed to influence L2 pronunciation development (Guiora, Brannon, and Dull 1972; Oyama 1976), yet its precise role has been elusive. For example, in a study of Italian-born immigrants to the United States, Oyama (1976) found no evidence of a relationship between the participants' L2 accent scores and their self-rated motivation while learning or their self-rated motivation to improve their English. Similarly, Flege and his colleagues showed that measures of motivation had a minimal contribution (accounting for less than 2% of total variance) to measures of L2 accent in large samples of native Korean and Italian learners of L2 English in the United States (Flege, Munro, and MacKay 1995; Flege, Yeni-Komshian, and Liu 1999). In contrast, Moyer (1999), who studied highly proficient L2 German speakers enrolled in a German university-level program, found a significant overlap between the speakers' professional motivation (i.e., the importance of German for their future professional lives) and the nativeness of these speakers' speech (see also Bongaerts et al. 1997).

Perhaps one reason for the inconclusive findings thus far is that motivation has rarely been explored in depth in relation to L2 pronunciation development, but has instead been typically treated as a moderator variable measured using a few simple statements. As a rare exception, Polat (2011) recently reported a significant relationship between L2 accent scores and introjection (engaging in a learning activity because of self-imposed sanctions, for instance, to avoid guilt) and integration (engaging in a learning activity for reasons of self-enjoyment and self-fulfillment) for a large sample of young Kurdish learners of Turkish. Both introjection and integration were among several motivational orientations studied within Deci and Ryan's (1985) self-determination theory of motivation, revealing a complex interaction between motivational orientation, L2 accent, and speakers' gender. Future research on L2 pronunciation development would benefit from similar detailed investigations of motivation in L2 pronunciation learning, especially those carried out within the L2 motivational self-system (Dörnyei and Ushioda 2009) and the Willingness to Communicate framework (MacIntyre et al. 1998), as well as those featuring in-depth qualitative measures of motivation.

Ethnic and personal identity

In order to learn an L2, individuals or groups of individuals come into contact with other individuals or groups, increasing the chances that matters of personal and group identity become salient. Ethnic identity can be broadly defined as a subjective experience of being a part of an ethnic group (Ashmore, Deaux, and McLaughlin-Volpe 2004), and in the case of L2 learning, the ethnic groups in question are learners' own (ancestral) ethnic group and the target language (L2) community. There is relatively little research documenting how L2 learners'

identification with their own ethnic group and with the L2 community impacts L2 pronunciation. At least hypothetically, learners may refrain (overtly or covertly) from acquiring an L2, especially if they fear that the vitality of their ethnic group is threatened (Taylor, Meynard, and Rheault 1977). This situation may reflect subtractive bilingualism or assimilation (Giles, Bourhis, and Taylor 1977), whereby individuals (usually members of a minority group) acquire the language of a majority group and often lose their own language and culture. Alternatively, language learners may embrace L2 learning despite a strong sense of ethnic group identity (Ellinger 2000). For example, 95% of the 100 multicultural students surveyed by Derwing (2003) in Alberta indicated their desire to pronounce English like a native speaker and felt that their sense of personal identity was not threatened. This situation illustrates additive bilingualism or integration (Giles, Bourhis, and Taylor 1977), whereby individuals add a new language and culture without losing their own.

The relationship between ethnic identity and L2 pronunciation learning has recently been studied by Gatbonton and her colleagues. These researchers explored whether several aspects of the ethnic identity construct (e.g., strength of identification with one's ethnic group, support for the group's sociopolitical aspirations) are related to measures of L2 pronunciation. For native French speakers of L2 English in Quebec, where French and English are respectively majority and minority languages, both positive and negative identity-pronunciation links were found. Those speakers who expressed stronger political views (e.g., support for Quebec's independence from Canada) were judged as being more accented, less comprehensible, less fluent, and less proficient overall in their L2 English. However, the speakers who had a double-positive orientation (i.e. a positive orientation towards their own ethnic group and the L2 community) were also those who were considered by native listeners to be most proficient in English (Gatbonton and Trofimovich 2008). For Latvian and Russian bilingual speakers in Latvia, where Latvian is the majority and Russian is a minority language, identity-pronunciation links depended on the group studied. For Latvians, a strong sense of ethnic identity was related negatively to their self-rated L2 (Russian) ability. In contrast, for Russians, no such negative associations emerged for their L2 (Latvian), suggesting that these speakers may have preferred (overtly or covertly) not to associate their strong ethnic beliefs with the ability to speak the majority language, perhaps in order to both maintain a strong sense of identity and also to gain access to the social and economic benefits associated with speaking Latvian (Trofimovich, Turuševa, and Gatbonton 2013). These findings show that ethnic groups residing in contact may relate issues of ethnic identity to L2 pronunciation in rather distinct ways, potentially influencing the rate and success of L2 pronunciation learning.

Apart from ethnic identity, several other aspects of the identity construct have been studied in relation to L2 pronunciation development. In a study of nine Americans living in Norway, for instance, Lybeck (2002) showed that the extent of speakers' social and cultural integration, defined as participation in "supportive exchange networks within the target culture" (2002: 184), were related to the accuracy of these speakers' L2 pronunciation (see also Thompson 1991). In another

study, Hansen (1995) examined the relationship between the degree of acculturation and strength of foreign accent for 20 native German immigrants to the United States. She found that acculturation, and especially the degree to which participants engaged in intercultural activities, was negatively associated with L2 accent, such that more acculturated individuals had a more native-like L2 accent (see also Polat and Mahalingappa 2010). Marx (2002) documented a case study of an L2 learner of German, providing a longitudinal perspective on the interplay between L2 accent, on the one hand, and the construction of L2 identity through patterns of language use, on the other. Common to all these studies is the link between L2 pronunciation and identity, most clearly seen through patterns of learners' social, cultural, and linguistic integration.

One broad conclusion that cuts across all strands of identity research is that matters of ethnic identity – construed within the broader sociopolitical setting and a narrower context of a particular learning situation – have consequences for L2 pronunciation development. Indeed, it is plausible that at least some learners would not reach expected levels of L2 proficiency because their language learning needs may clash with their sense of identity. Therefore, a fruitful area of future thinking in this regard would be to consider how language learning motivation, matters of identity (which should include cultural and linguistic patterns of language use), and teaching and learning practices interact to make language learning efficient and enjoyable for L2 learners.

Collective actions

The third cluster of variables we discuss in relation to L2 pronunciation development can be characterized under the broader category of “collective actions”, which for Clark (1992) referred to socially coordinated activities performed by more than a single speaker. Aside from a handful of exceptions (e.g., technology-mediated individual practice, self-study), pronunciation learning is inherently an interactive process, taking place in the social context of a language classroom or in a given naturalistic environment (e.g., workplace, community). Therefore, several contextual factors (e.g., pertaining to the quality and quantity of language experience and use) have the potential of influencing L2 pronunciation development. In the following section, several of these factors are discussed.

Amount of experience

When it comes to L2 pronunciation, it is not always the case that the more experience L2 learners have with the language, the better the outcomes of L2 pronunciation learning will be. While some cross-sectional studies have demonstrated that a longer length of residence (LOR) in an L2 environment is associated with more native-like or more favorably rated pronunciation (e.g., Flege, Yeni-Komshian, and Liu 1999; Trofimovich and Baker 2007), this relationship is not always straightforward. Flege and Fletcher (1992) found that the role of LOR in the L2 pronunciation

of L1 Spanish speakers was important only for speakers who had recently arrived in the L2 environment and not for long-time residents. Similarly, a year-long longitudinal study of newly arrived L1 Mandarin and Slavic immigrants to Canada showed significant early improvement in their pronunciation of some but not all English vowels. This improvement slowed considerably after six months of residence (Munro and Derwing 2008).

There is clear and substantial evidence that the number of years an L2 speaker lives in an L2 setting can be less important to L2 pronunciation than other measures of experience. For example, LOR did not predict the accent ratings in English received by Russian immigrants to the United States, whether they had arrived as children or as adults (Thompson 1991). A similar result was found in a longitudinal study of Japanese adult newcomers to the United States, whose production of individual sounds and accentedness ratings did not change after a year of residence (Aoyama et al. 2008). In the same way, Flege et al. (2006) found that Korean adult immigrants to the United States with LORs of three and five years received similar ratings of accentedness in English. Clearly, L2 speakers' LOR may play a minimal role in their development of L2 pronunciation.

Language use

With more detailed measurements of language use, researchers have shown more nuanced relationships between language experience and L2 pronunciation development. Flege, Frieda, and Nozawa (1997) recorded English speech samples from adult speakers who had arrived in Canada from Italy as children. The speakers who reported relatively high daily use of Italian received less native-like accent ratings than the speakers who reported relatively low use. Derwing, Munro, and Thomson (2008) tracked newly arrived L1 Mandarin and Slavic immigrants to Canada for one year and found that only the Slavic speakers showed significant improvement in the ratings received for fluency and comprehensibility. The Slavic group also reported significantly more exposure to English talk radio and significantly more extended interactions with English speakers than did the Mandarin group (see also Derwing and Munro 2013).

The benefits of language use are not restricted only to using the language productively. In a series of studies, Au and his colleagues have shown that children who simply overheard a language spoken around them in early childhood, but never overtly used it for interaction, were judged to be more native-like and less accented years later, compared to "typical" adult L2 learners (Au et al. 2002, 2008). Beneficial effects of listening-only experience on L2 pronunciation development were also reported for children learning an L2 in an instructed classroom setting. The learners who were only exposed to listening and reading input for about one year of instruction performed on a speaking task similarly to learners taught through "traditional" practice that involved speaking (Trofimovich et al. 2009).

A link between language use and L2 pronunciation has been found consistently for L2 speakers in academic settings. Yeni-Komshian, Flege, and Liu (2000) found that L1 Korean university students in the United States who tended to use English

to a greater extent were rated as having more native-like English accents. The opposite relationship was found between students' accentedness ratings and their self-reported percentage use of Korean. Moyer (2011) studied 42 L2 English students at an American university and found significant relationships between accent and various measures of L1 and L2 use. Students reporting a greater number of hours of weekly L1 use were rated as being more accented. In contrast, students reporting more weekly hours speaking the L2, interacting in the L2, and using the L2 with roommates, host families, or native English speaker friends were judged as being less accented.

Relationships between language use and L2 pronunciation have also been found for languages other than English. Díaz-Campos (2004) found that L1 English learners of Spanish who reported using Spanish 4 hours or more per week outside class had more native-like pronunciation than those reporting 0–3 hours per week. Guion, Flege, and Loftin (2000) also showed that Quichua-Spanish bilinguals who reported relatively high use of their L1 (Quichua) were perceived as being more accented in Spanish than bilinguals reporting relatively low L1 use. A more complex relationship between language use and pronunciation was discovered by Yager (1998), who observed language use and measured gains in pronunciation ratings over seven weeks for beginner-, intermediate-, and advanced-level learners of Spanish. No significant relationship was found between language use and pronunciation gains for intermediate-level learners. For beginner-level learners, the more interactive contact in Spanish they reported at the beginning of the seven-week period, the larger the gain in pronunciation ratings at the end of seven weeks. For both beginner- and advanced-level learners, the more noninteractive contact they reported in the first week, the lower the pronunciation gains at the end of the seven-week period. Thus, in both cross-sectional and longitudinal studies, language use has proved to be consistently connected to L2 pronunciation.

Study abroad

The importance of L2 use outside the classroom for the development of L2 speech is a key argument for the existence of study abroad (SA) programs. SA programs allow students who are usually in post-secondary institutions to study in another country for a limited time. SA students living in an L2 environment have many more opportunities to use the L2 across many domains, as opposed to domestic students, who remain in their home country while studying the language. This potential for increased L2 experience is assumed to confer an advantage to SA students in developing their language proficiency and especially their pronunciation.

Recent research on SA students has shown mixed results regarding the learning of L2 pronunciation. Students of Spanish residing in Spain for one semester significantly improved in oral fluency measures, unlike students from the same university program who remained in the United States (Segalowitz and Freed 2004). The same students' pronunciation accuracy for particular sounds varied, depending on the sound; however, there was generally little difference between SA and domestic students in pronunciation gains (Díaz-Campos 2004).

Although learners' experiences with an L2 are thought to be quite different in SA programs as opposed to programs of study in their home countries, each type of program can take several forms. Martinsen et al. (2010) investigated 25 learners of Spanish in three types of settings over seven weeks: a traditional SA program, a service learning SA program, which involved an additional 5–15 hours a week of service benefiting the community, and foreign language housing (a student residence at learners' home university that was explicitly classified as a residence in which only Spanish was used). None of the three groups demonstrated significant improvement in pronunciation ratings received at the beginning and end of the seven-week period. Generally, findings from existing research suggest that although L2 learners' oral fluency may improve after studying in an L2 environment for a short term, their L2 pronunciation may improve only in certain aspects or may be no different from the pronunciation of learners who study in non-SA environments.

In future research on language experience and use, including SA research, researchers need to continue refining methodologies for capturing fine-grained aspects of language use. In-depth qualitative methods of inquiry (e.g., Kurata 2010; Piller 2002) and extensive audio/video observations of speakers' language use in authentic environments (e.g., Lamarre 2013), especially through mobile technology, seem to be promising research tools for helping researchers link aspects of language experience with L2 pronunciation development.

Theoretical frameworks

It is clear from the preceding discussion that a multitude of factors can shape L2 pronunciation development. Therefore, one challenge for L2 researchers is to conceptualize the influence of these and potentially many other variables within coherent and testable theoretical frameworks that link person-specific, social, and experiential factors to L2 learning outcomes. Several existing theoretical proposals are promising in this respect. In the field of cognitive psychology, Dynamic Systems Theory (de Bot, Lowie, and Verspoor 2007) is one such theoretical proposal. The dynamic systems view presupposes that language learning is an iterative (repetitive) process characterized by variability both within and across individuals. This process occurs on many time scales (e.g., within an interaction, across lessons, during semesters of course work, throughout years of language experience) and features a number of developmental stages (called "attractor states"). Van Geert, Steenbeek, and van Dijk (2011) have recently applied this theory to account for socially mediated L2 learning, thus encompassing both cognitive and social aspects of L2 development. In van Geert, Steenbeek, and van Dijk's model, language development occurs through the interaction between a novice (learner) and an expert (teacher), with learning determined by the interplay between the situation-specific goals of the learner (e.g., the need to acquire certain knowledge, to exert less effort in learning, to preserve aspects of own ethnic identity) and the goals of the teacher (e.g., the need to complete certain learning tasks, to motivate

learners, to satisfy requirements from the employer or the curriculum). Learning is thus conceptualized within this model as a continuous, dynamic adaptation of teacher and learner behaviors, with teachers adapting their actions to the perceived needs of learners.

A related theoretical view that appears to be promising for modeling the multi-dimensional nature of L2 pronunciation development is the sociocognitive approach (Atkinson 2011). This approach is based on the idea that language development is determined by a dynamic interaction between the mind, body, and world. This implies that people's cognitive states, such as person-specific individual variables and mental representations (i.e., the mind), are instantiated in overt behaviors, such as bodily actions, orientations, or emotions (i.e., the body), which are in turn fully embedded in particular social contexts (i.e., the world). As in the language-as-action tradition (Clark 1992), language is seen here as an instrument of social action, as a flexible and adaptable tool of effecting change in a given social environment (e.g., ordering a meal or persuading a listener). Language development is also conceptualized as a gradual, interactive adaptivity or alignment of the learner with a sociocognitive learning environment. For example, a learner might align with the teacher within a given social interaction in a classroom in terms of the complexity of utterances, body gestures, voice volume, and rate of speech (Atkinson et al. 2007; Churchill et al. 2010). This view of learning as social and cognitive alignment, which is compatible with both cognitive research on interactive alignment (Pickering and Garrod 2004) and social psychological research on social accommodation (Giles and Powesland 1975), appears to be very promising for conceptualizing L2 pronunciation development (see Trofimovich 2013 for an initial attempt). The chief benefit is that researchers might use the sociocognitive approach (and Dynamic Systems Theory) to explore pronunciation learning as a person-specific, cognitive, yet highly contextualized, social, and experiential phenomenon.

Other theoretical proposals offering promising avenues for conceptualizing L2 pronunciation development come from the field of social psychology. For example, the Willingness to Communicate framework developed by McIntyre and his colleagues (MacIntyre et al. 1998) incorporates a variety of cognitive, social, and experiential factors to explain a learner's choice to engage in communication in an L2. Similarly, Clément's Social Context model (Clément 1980; Clément and Kruidenier 1985) draws on such variables as L2 confidence, competence, and identity to describe intergroup contact. More recently, Clément, Baker, and MacIntyre (2003) provided empirical data supporting a framework based on a combination of these two models. In the combined model, frequency and quality of L2 contact predict L2 confidence, which is related to both willingness to communicate and identity. These two factors, in turn, both predict frequency of L2 use. It is certainly important to explore the applicability of these social-psychological models to L2 pronunciation development in different L2 learning contexts (e.g., classroom, naturalistic, study abroad). It is also important to investigate how such models might be used to explain various aspects of L2 pronunciation learning, for instance, variability in phonological development or acquisition of specific aspects of pronunciation (see Mougeon, Rehner, and Nadasdi 2004 for some work in this area).

Several multidimensional frameworks focus on L2 pronunciation learning specifically. For example, Segalowitz and his colleagues (Segalowitz, Gatbonton, and Trofimovich 2009) proposed a conceptualization of L2 pronunciation learning that includes several cognitive and social influences. In this framework, ethnic identity is part of a larger motivation system that determines whether and to what extent learners engage in L2 use. Language use is important because it provides learners with opportunities to tune their perceptual and cognitive systems for the processing of L2 input. This cognitive and perceptual tuning is driven by several psycholinguistic variables, which include frequency (i.e., how often a particular pronunciation target occurs in an L2) and cross-language similarity (i.e., perceptual differences between L1 and L2 that determine the ease or difficulty of certain aspects of L2 pronunciation). Thus, in this framework, ethnic identity and motivational variables shape particular patterns of L2 use. L2 use, in turn, impacts language learning outcomes by allowing learners to practise their cognitive processing skills through L2 input and/or output.

Moyer's (2004, 2009) integrated view of critical influences in L2 learning exemplifies another multidimensional framework relevant to understanding L2 pronunciation development. Moyer places learners' experience with L2 input, which she calls "strategic use of input", at the center of her framework. Strategic use of input refers to learners' choices in how and when they take advantage of the available input in accordance with their intentions, orientations, and cognitive styles. Moyer's framework also specifies several clusters of influences that shape how learners use language input. These clusters include cognitive influences (which involve instructional variables, learner strategies, and would also include attention to form), social influences (which encompass different language contact domains and situations of language use), and psychological influences (which involve attitudes, motivations, and identity issues). Moyer is deliberately vague in describing the precise contributions of these different factors to L2 pronunciation learning because these contributions are arguably specific to each learning context. At least one avenue for future research here would be to provide more refined descriptions of how different factors shape L2 pronunciation learning in specific learning contexts. This will allow researchers to use theoretical frameworks (such as the ones described by Segalowitz et al. and Moyer) not solely as descriptive tools but also as sources of empirically testable hypotheses.

Conclusion

We conclude our chapter with a quote from Eleanor Gibson, an American psychologist who, along with her husband James Gibson, developed a theory of human learning and development based on a complex interaction of people's cognitive abilities and environmental affordances, which refer to the possibilities for actions that a given environment offers. This view of learning assumes that development in early infancy proceeds as children experience various environments

(i.e., real-world contexts) and that children use perception to discover various affordances of such environments (e.g., reaching out for a moving object will afford the child to catch it). Through such experience, children both become more accurate at perceptual tasks and learn about the environment they are in. Applied to language, this conceptualization of perceptual learning is remarkably similar to the language-as-action view proposed by Clark (1992), where language use can be seen as perceiving and using affordances for speakers to accomplish real-world goals, making a change in a given social environment (e.g., asking a neighbor to turn down music). In one of her writings on affordances, Gibson noted that “the complementarity of the [human] and its environment is a whole and must be studied as such” and that “the more we try to decompose this complementarity by looking for elements, the more likely we are to sacrifice the meanings we are looking for” (Gibson 1991: 569). This quote aptly highlights the importance for researchers to study L2 pronunciation development as a complex, holistic phenomenon. It also underlines the danger of potentially missing important aspects by investigating L2 pronunciation learning as a function of individual, isolated variables. One important goal for future researchers is therefore to develop a multidimensional picture of L2 pronunciation learning as a complex sociocognitive and situationally embedded phenomenon.

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