ABSTRACT: **Purpose:** This tutorial stresses the importance of being able to transcribe non-English consonants when assessing clients with articulation and/or phonological disorders of various types. The dangers of restricting a transcription to the symbols needed for English are explained, and references to the literature throughout the article demonstrate how often these non-English sounds occur. Bilingual clients are very likely to use non-English consonants in their own language and possibly when speaking English as well.

**Method:** The article describes virtually all of the non-English consonants on the International Phonetic Alphabet chart, with references to the speech-language pathology literature illustrating in what sort of cases such sounds may occur. Typical languages where the particular sounds are found are also noted, many of which are commonly encountered today in the speech clinic. Sources where readers can hear these non-English sounds themselves are provided.

**KEY WORDS:** phonetic transcription, non-English sounds, consonants, disordered speech, multilingualism

Most of the textbooks used to teach phonetics in speech-language pathology courses in the United States are restricted mainly, or indeed solely, to the sounds of American English (see, for example, Calvert, 1992; Edwards, 2003; Garn-Nunn & Lynn, 2004; Shriberg & Kent, 2002; Small, 2004). Unfortunately, clinical experience shows that clients in the speech clinic (whether children or adults) do not restrict themselves to the sounds of their target language (it is also worth noting that in connected speech, even speakers with no speech disorders may produce sounds that are comparatively distant from the canonical, target sound). Furthermore, the rise in the number of clients whose first language is not English means that clinicians may be called on to phonetically transcribe passages that are not English and so may contain sounds that are not part of the English phonological system, or they may encounter varieties of English that are influenced by other languages and so contain sounds from that language.

The dangers of a broad phonemic-based transcription of clinical data have been explored in many previous publications (e.g., Ball & Rahilly, 2002; Ball, Rahilly, & Tench, 1996), and we do not need to go into these in any detail. Suffice it to say that a client’s phonological contrastivity may well be underevaluated or sometimes overevaluated by the use of a broad transcription restricted to the symbols representing the sounds of the target language.
We can show that by considering the example of a client who realizes target /s/ as [ʃ] and target /ʃ/ as [ʃ]. If a transcriber does not know the sound [ʃ] or a symbol for it, and chooses to represent it with the symbol for the nearest English sound, he or she is likely to record target /s/ as [ʃ] and target /ʃ/ as [ʃ]. This would clearly suggest that the client has lost a phonemic contrast, when the earlier transcription shows that the phonemic contrast is intact (though its realizations are inaccurate). See Ball et al. (1996) for more examples.

English has 24 consonant phonemes and between 17 and 20 vowel phonemes (dependent on regional variety). These 40 or so phonemes are realized as a much larger set of actual sounds (allophones), and we may well need to transcribe at the narrow allophonic level if the client is making an incorrect choice of allophone (e.g., using an aspirated fortis plosive after /s/ in clusters, not using the shortened vowel allophone before syllable-final fortis obstruents, or using a clear-1 where a dark-1 would be expected). However, incorrect allophone usage is not the focus of this tutorial; readers interested in a description of the range of important allophones of the phonemes of English should consult a detailed description of English phonology (such as Ball & Müller, 2005).

There are many more consonants and vowels than the 40 of English that are found in natural language—and almost any of these may turn up in disordered speech. It is the purpose of this article to describe a range of non-English consonants (with vowels and suprasegmental aspects to be dealt with in the second part of the tutorial, which is currently in preparation). We will note with which type of disorder we might expect the different sounds (we give illustrative references only and for space reasons do not attempt to provide a comprehensive review of the literature), and which International Phonetic Alphabet (IPA) symbols are used. As we noted earlier, many clients come from multilingual backgrounds; therefore, some non-English sounds may be encountered in code switching or in interference patterns. For this reason, we also mention languages that use the different sounds we describe. We feel that this tutorial will be of use to both students (undergraduate and graduate) and practitioners, and the level of detail reflects this range.

Note that all of the symbols used in this tutorial are from the current IPA chart (International Phonetic Association, 2005). Some writers (e.g., Shriberg & Kent, 2002) use non-IPA symbols for some commonly occurring non-English sounds; we avoid this, preferring to keep to international standards. Finally, it should be remembered that some clients may produce sounds that are not found in natural language. These are not included here, but are described, along with special symbols for their transcription, in Ball and Müller (2005).

**Pulmonic Consonants**

We start our look at non-English consonants by considering a couple of commonly occurring speech disorders, but then turn to a division into manners and places of articulation. Note that this division is simply one of convenience, and in all of the sections below, we include examples of the use of the relevant sounds in the disordered speech of clients whose target language is English, as cited in the literature.

The section of the IPA chart (International Phonetic Association, 2005) showing pulmonic consonants is reproduced in Figure 1.

**Common speech disorders.**

*Sibilance disorders.* Under this heading, we class various disordered attempts at sibilant consonants that have traditionally been labeled as lisps. The lateral lisp involves the use of a voiceless or voiced lateral fricative for target /s/ and /z/ (or sometimes for target /ʃ/ and /ʒ/). As lateral fricatives are found normally in a range of languages, the IPA provides symbols for these sounds: voiceless [f] and voiced [ŋ]. Therefore, in transcribing a client with lateral instead of central fricatives, we might find examples such as yes [jeʃ] and is [is]. Lateral lisps have been reported commonly in the literature (e.g., a recent investigation of the prevalence of lisping in young adults; Van Borsel, Van Rentergem, & Verhaeghe, 2005). A recent study investigated the use of electropalatography (EPG) and ultrasound in the treatment of a range of speech problems, including a client with lateral fricatives for target sibilants (Bernhardt, Bacsfalvi, Gick, Radanov, & Williams, 2005); earlier, Dagenais, Critz-Crosby, and Adams (1994) used EPG to investigate the treatment of lateral lisps.

Lateral fricatives have also been found in other cases; for example, Bressmann, Heng, and Irish (2005) reported on a client who had surgery for a lateral carcinoma on the tongue, with a result that target postalveolar fricatives were produced as lateral fricatives.

Speech-language pathologists (SLPs) working in various mainly English-speaking countries may encounter lateral fricatives correctly used in a variety of indigenous or more recently established languages. Examples include languages such as Zulu of South Africa: isihlabhu “tree” [isitulua], dla “to eat” [dla] (Dent & Nyembezi, 1988); Welsh: Llanfair-pwllgwyngyll (a place name) [ljanvprülgwynɨl] (first author’s language competence); Tlingit: laa “melt” [ltɑ] (Ladefoged & Maddieson, 1996); and Navajo: niiłsh “it has arrived” [niɬtʰɬ] (Ladefoged & Maddieson, 1996).

Problems with target sibilants may result in a variety of other mostly non-English realizations: dentalization = /s/, /z/ → [θ, ð]; or /s/, /z/ → [ʃ, ʒ] (see Grunwell, 1987, for several examples of the use of these grooved dental fricatives); palatalization = /s/, /z/ → [ɕ, ʑ]; or /s/, /z/ → [ɕ, ʑ]; (again, Grunwell, 1987, provides several examples of these realizations).

We return to the palatal fricatives later, but can point out here that [ɕ, ʑ] are grooved fricatives that are made at the dental place of articulation, as opposed to [θ, ð], which are slit fricatives that are produced at the dental position (and, of course, are found in most varieties of English). Several languages have such grooved dental fricatives; for example, the Salishan Native American language Saanich that is spoken on Vancouver Island (Montler, 1986). Russian has palatalized grooved fricatives, [ɕ, ʑ] (e.g., vasb “height” [visb]!); and Polish has the alveolo-palatal fricatives [ɕ, ʑ] (e.g., żrebię “foal” [ʐrebię]) (both Ladefoged & Maddieson, 1996).
Glides for target liquids. English /r/ is phonetically [r] (known as approximant or glide-r), and as discussed in Ball and Müller (2005), for example, can be realized as either a slightly retroflexed postalveolar approximant, or as the so-called “bunched-r” where the tongue dorsum is raised toward the palatal/velar boundary and tongue apex drawn down and inward.

Common disordered realizations include [w] (the labial–velar approximant) and [¢] (the labiodental approximant), and care should be taken to distinguish between these (see Stoel-Gammon & Dunn, 1985). Anecdotal evidence (F. Gibbon, personal communication, November 6, 1994) suggests that clients with labiodental realizations of target /r/ may be more resistant to therapy than those with labial–velar realizations, so it will be important to distinguish the labial–velar from the labiodental articulation.

We can also note that a bilabial approximant [‰] is increasingly common for /r/ in many varieties of English (especially in younger person’s speech in the United Kingdom; see Foulkes & Docherty, 2000, p. 54; also further in Foulkes & Docherty, 2001; Docherty & Foulkes, 2001), and for these varieties would not be considered disordered. However, Ball, Lowry, and McInnis (2006) and Müller, Ball, and Rutter (2008) reported on a case where [‰] was used as a disordered realization of /r/. This sound, although similar to [w] in that it involves lip rounding, differs in that there is no back tongue raising. The glides we have discussed may also be found in a language such as Hindi. Hindi has no /v/ or /w/; instead, it uses a labiodental or bilabial glide: नव “ninth” [nɔːvə] or [nɔːvə] (Ladefoged & Maddieson, 1996).

Another glide that is sometimes encountered as a realization of target /r/ in disordered speech in English is [Ü]. Ball et al. (2006) described a case where syllable initial target /r/ was most often realized as the velar approximant [Ü]. Examples include:

- red [ʁɛd]
- robin [ʁʌbin]
- parent [pʰʁʌpənt]

A possible explanation for this behavior was a previous therapist’s attempts to teach a bunched-r to the client. Howard (1993) reported that a client with cleft palate used [u] for target English /l/, and Grunwell (1987) provided examples of both /l/ and /r/ being realized by [u] in the speech of different clients.

The velar glide [u] is found in Korean and Turkish, among others; for example, Korean Ⓝ摁 “doctor” [uiza] (adapted from International Phonetic Association, 1999).

We can also note the use of the glide [j] for target /l/, as illustrated in several cases in Grunwell (1987).

Another labial glide is the labial–palatal [j̠], and has been rarely reported as occurring for target English sounds. P. Grunwell (personal communication, February 23, 1979)
provided an example of systematic sound preference (also known as favorite articulation) where velars and alveolars were realized as palatals. In this case, [q] occurs for /t/, and the phrase “Christmas tree” has the realization [čuq]. Furthermore, it may occur in the speech of, for example, French–English bilingual clients. Both labial–velar [w] and labial–palatal [q] are found in French: oui “yes” [wi]; huit “eight” [ti]; (authors’ own language competence).

Manner.

Plosives. In this section, we will look at a variety of non-English plosives, although some will not be discussed until we describe particular places of articulation.

Dorsal plosives. Whereas English has a voiceless and voiced pair of velar plosives (k and g), it does not have plosives at the palatal and uvular positions. The dorsal plosives are palatal [c, ʃ], velar [k, q], and uvular [q, ɣ].

Nevertheless, there is recorded use of these sounds in disordered speech (where English is the target language). Gibbon and Crampin (2001) reported on an adult with a repaired cleft palate who used palatal stops and palatal nasals. The authors noted that “/t, d/[, k, /], and /g/ targets were produced as palatal plosives ([c, ʃ]). A secondary characteristic was that these targets had lateral release and variable periods of lateral friction during the aspiration period. Nasals were also palatal (/n, /n/ → [n]), and sibilant targets were judged as lateral fricatives (/s, /s/ → [s]; /z, /s/ → [z]).” (Gibbon & Crampin, 2001, p. 98).

Chin (2003) noted uvular stop usage among child users of cochlear implants. Four of the 12 subjects in his study produced uvular stops, all for velar targets.

 Stops at the palatal and uvular positions will be encountered with clients whose first languages have these sounds as part of their normal phonological system. Palatals occur, for example, in Hungarian, tyúk “hen” [cuk]; gyár “to knead” [jor]. Uvulars occur, for example, in Arabic and Farsi: Arabic ٰق “coffee” [qahwa]. Farsi گه “cave” [gar]. (These three sets of examples are from International Phonetic Association, 1999.)

Glottal stop. The glottal stop [ʔ] (usually for target plosives) has been recorded in a variety of speech disorders. Harding and Grunwell (1996) noted its use in the speech of clients with cleft palate, and Grunwell (1987), among many others, gave instances of its use in children with phonological disorders. Chin (2003) also recorded its use in the speech of children with cochlear implants, and Howard (2007) noted its use as a mark of juncture in the speech of a child aged 9:0 (years:months) with cleft palate.

Many varieties of English use a glottal stop. This may be in the “hard attack” found with vowel-initial words (e.g., “las 21 see ʔa’s...”). In some southeastern England varieties of English, the glottal stop may replace medial /l/ (better, [bɛʔəl]), and in many varieties, glottal reinforcement is found with word-final fortis plosives (hat, [hæʔʰ]).

In other languages, the glottal stop is recognized as a consonant of the phonological system. For example, in Hawaiian, the apostrophe represents a glottal stop, whereas in Arabic, the letter hamza (‘) is used for the glottal stop (Ladefoged & Maddieson, 1996).

Fricatives.

Dorsal fricatives. Dorsal fricatives (i.e., those pronounced at the palatal, velar, and uvular places of articulation) have traditionally been difficult for English speakers to learn to produce, as English has no fricatives in the dorsal area. However, clients with cleft palate may produce back fricatives for target anterior fricatives if they have anterior clefting (see Harding & Grunwell, 1996; Sell, Harding, & Grunwell, 1994). The symbols for the dorsal fricatives (in voiceless and voiced pairs) are palatal [ç, ʃ], velar [x, ɣ], and uvular [χ, ʁ].

Many languages have some of these fricatives, as discussed in Ball et al. (2005):

- German: ich “I” [iq]; nach “after” [naχ]
- Spanish: agua “water” [aβwa] (though the amount of friction here may be minimal)
- French (Parisian): rue “road” [ry]
- Russian: xokkei “hockey” [xokej]
- Polish: suchy “dry” [suksi]; błahy “trivial” [bwaksi]

Clients with a cleft palate are not the only people, however, who may employ dorsal fricatives. Gibbon (1999) described a series of studies of children with disordered speech who may be thought of as using an undifferentiated tongue gesture. Some of these studies included clients using palatal and velar fricatives. For example, Gibson, Hardcastle, and Dent (1995) included one client who backed sibilant fricatives and affricates: /sl, /ʃ/ → [ʃ] or [x]; /l, /ʃ/ → [ʃ] or [y]; /l/ → [cʃ] or [kʃ]; /dʒ/ → [ʃʃ] or [ɡy]; and another where just the fricatives were affected: /sl, /ʃ/ → [ʃ] or [x]; /l, /ʃ/ → [ʃ] or [y]. Finally, we can note Chin (2003), who included a child who wears a cochlear implant who used velar fricatives.

Bilabial fricatives. The bilabial fricatives ([f, β]) have been recorded as occurring for target labiodentals in children with speech disorders (Grunwell, 1987, provides several examples). They may also occur in cases of acquired neurogenic disorders as attempts at bilabial stops that lack complete closure (see the early study by Logeman & Fisher, 1981, where the bilabial fricatives are also recorded used for labiodental fricatives in the speech of clients with Parkinson’s disease).

In natural language, Spanish has [β] as an allophone of /b/ in word medial and final positions (though the friction is not especially strong): Habana [hαˈbaɾa]. There is a possibility, therefore, that first language speakers of Spanish may transfer this allophonic usage to English. Both [f] and [β] occur in Ewe (a language of Ghana and neighboring areas). For example, we can contrast e fa “be polished” ([fəβ] with evé “Ewe” [εʔ*eβe] (Ladefoged & Maddieson, 1996).

Affricates. English has only two contrastive affricates: /tʃ/ and /dʒ/. Affricates may be made at many other places of articulation, however, and may have central or lateral release. Natural language has examples of the following: [pʃ, bʃ, fʃ, bʃ, tʃ, dʒ, f, dz, cʃ, ʃʃ, kʃ, ɡʃ, qʃ, ʃʃ, ʃ, ʃʃ]. Ball and Rahilly (1999, p. 70) illustrated most of these from a range of languages. We can repeat just a few of those here: German: pfeifen “to whistle” ([pʰaɪfən]; Italian: zona “zone” [dzoːna]; Hungarian: gyár “factory” [ʃjaɾ]; and Tlingit: dlaa “to settle” [dʰəa]a.

136  CONTEMPORARY ISSUES IN COMMUNICATION SCIENCE AND DISORDERS • Volume 36 • 133–141 • Fall 2009
Bilabial and dental affricates were recorded by Chin (2003), usually for target fricatives. Grunwell (1987) recorded a range of non-English affricates used for target English sounds. For example, Tanya, aged 8;0, used a laterally released affricate for target initial obstruent+approximant clusters; for example, climbs [tʰaɪm], dress [ḍɛɾ]; and grapes [ḍɛɾ] (Grunwell, 1987, p. 42). Maxine, aged 4;10, used dental affricates for target English affricates and /tʃ/, /dʒ/ clusters; for example, trains [tʰeɪn]; and Pauline, aged 7;6, used a palatal affricate for a target final velar cluster: for example, wings [wɪŋ] (both Grunwell, 1987, p. 165). Gibbon et al. (1995) reported on the use of a variety of non-English affricates (dental, palatals, velars, and laterals) for mostly sibilant targets in different clients with articulation/phono logical disorder.

**Nasals.** Whereas English has three nasal phonemes (/m, n, ŋ/), nasals can be made at a variety of other places of articulation: for example, labiodental [ɲ], palatal [ŋ], and uvular [ŋ]. As we noted earlier, Gibbon and Crampin (2001) reported a client who used palatal nasals, Howard (1993) described a client with cleft palate who used uvular nasals, and Harding and Grunwell (1998) reported on the use of labiodental nasals (among others) in the speech of clients with a cleft palate. Research on cleft palate speech has also shown that voiceless nasals often occur, usually as realizations of target voiceless obstruents (see Grunwell & Harding, 1996). Voiceless nasals are transcribed by adding the voicelessness diacritic to the relevant symbol; for example, [m̪, ŋ̪, ŋ̪, ŋ̪]

In natural language, labiodental nasals are found as allophones of /m/ and /n/ in English; for example, emphasis [ˈɛməsɪs], and invent [ˈɛnvent] (in fact, the sound is found allophonically in many languages when an anterior nasal precedes a labiodental fricative). Palatal nasals are encountered in Spanish, French, and Italian, among many others: España “Spain” [esˈpana] (Spanish); agnées “lamb” [apɔ] (French); bagno “bath” [bappo] (Italian) (authors’ language competence). Other languages having this sound that might be encountered in the clinic include Vietnamese, Albanian, Hungarian, Polish, Indonesian, and Serbian. Uvular nasals are not so common, but are found in Inuit; for example, saarnii “his bones” [saːnɪː] (International Phonetic Association, 1999). Voiceless nasals are rare in the languages of the world, but we can note Burmese, which contrasts, for example, ᶙ “nose” [m̚] with ᵙ “pain” [ná] (Ladefoged & Maddieson, 1996).

Nasalization. The addition of nasal resonance to an otherwise oral articulation is termed nasalization. This occurs normally to a slight extent when sonorants precede nasal consonants, as for example, in English tone [tʰoʊn], as opposed to toad [tʰoʊd]. (Narrow transcription is used here.) Clinically, we encounter the addition of nasalization to target oral sounds in cases of velopharyngeal insufficiency as described, for example, in Grunwell and Harding (1996) and Harding and Grunwell (1996). Nasalized voice quality may be encountered also in the voice clinic, but it should be noted that certain varieties of English may use a greater amount of nasalization than others yet still be considered nonpathological (as is also the case of individual speakers).

Languages other than English may have nasalized sonorants (usually vowels) even when no nasal consonant is in the immediate context. French, Portuguese, and Hindi, for example, have phonemically nasal vowels, as in French un “a, one” [œ̃], bon “good” [bɔ̃], Portuguese cão “dog” [kɐ̃], and Hindi ह “in” [mə]. (International Phonetic Association, 1999).

**Approximants.** We have described the various glide approximants earlier, so now we turn attention to the liquids: lateral approximants and rhotics.

Laterals. English has only one lateral approximant phoneme (albeit with a variety of allophonic variants). However, a palatal lateral ([ʎ]) occurs fairly frequently in the languages of the world, with a velar lateral ([ʎ]) being less common. Grunwell (1987, p. 191) illustrated the use of a palatal lateral for all intervocalic consonants (when followed by close front vowels) in the speech of a girl aged 6;8; monkey [mʌˈki], dressing [dɛˈki], matches [maˈti]. The velar lateral has been noted as occurring in some English dialects as a realization of the dark-l allophone so, for example, Texas English [skəl] for school. It has not been recorded as far as we are aware in disordered speech where the target is English.

Palatal laterals are found in languages that may be encountered with bilingual clients in the clinic. For example, Italian figlio “son” [fɪˈʎo]; European Spanish llama “llama” [ˈxama]; and Portuguese olho “eye” [ˈoɬu] (authors’ language competence).

Rhotics. The rhotic approximants have been dealt with under the discussion of glides for target liquids above. Other consonants have sometimes been grouped with rhotic approximants (trills and taps), but we will assign these their own section.

**Trills and taps.** Although both trills and taps (or flaps) may occur in some varieties of English, they are rarely reported as misarticulations for other target consonants of English (though see Dinnsen, Chin, Elbert, & Powell, 1990, for a report of the use of a bilabial trill, [n], in a child acquiring English). They also occur in several languages that may be used by bilingual speakers attending the speech-language pathology clinic. There are reports in the literature of children having problems acquiring trills in language such as Italian (Bortolini & Leonard, 1991) and Spanish (Carballo & Mendoza, 2000), and flapped /t/ in English (Chin, 2003). Smit (1993) gave the example of [ɾ] used for target English intervocalic /ɾ/ in phonological acquisition.1

Scottish English variably uses trills and taps for /t/; for example, red [red] and crew [kru]; whereas American and Australian English uses taps for /t/ in VV environments, as in better [ˈbeɹə]. Older varieties of British standard pronunciation use the tap for /t/ in VV contexts, as in merry [ˈmeri].

Spanish uses both trills and taps, as can be seen in the following contrast: perro “dog” [ˈpero] and pero “but” [ˈpero]. The velar trill [s] is found in standard French and

---

1The International Phonetic Association recently approved a symbol for a labiodental flap (ʼ). We have not yet found use of this sound in clinical situations in the literature.
German for r: French rouge “red” [ʁuʒ] and German rot “red” [rot] (authors’ language competence).

**Places of Articulation.** Some non-English sounds seem to us better grouped together under place of articulation rather than manner. We look here at retroflex and pharyngeal consonants.

**Retroflex consonants.** It is unusual to find retroflex consonants for target English sounds in disordered speech, with the exception of the retroflex fricatives that have been reported for target postalveolar fricatives (see, for example, Chin, 2003).²

Some dialects of English will have retroflex allophones of /s, z/ following /t/ if the /t/ is notably retroflexed: Northern Irish English curse [kaʃ]; papers [ˈpeʃpɔz]. Retroflex sounds are regularly used for target English alveolars by speakers from India, Pakistan, Bangladesh, and Sri Lanka. Also, retroflex fricatives are used in Chinese and may replace /ʃ, ʒ/ in Chinese-influenced English in some contexts (these examples are all from Ball, Müller, & Rutter, 2005).

Here are some examples of retroflex consonants in other languages (from Ball et al., 2005):

- Plosives: [t, d], Hindi टाल “postpone” [taːl], टाल “branch” [daːl]
- Nasal: [n], Tamil mōṭ irritated “cart” [mōṭi]
- Lateral: [l], Tamil ചെട്ട് “sword” [cheṭṭu]
- Flap: [r], Hindi रक् “boy” [rakka]
- Fricatives: [ʃ, ʒ], Chinese 杀 “to kill” [saː], 让 rang “to assist” [zanŋ].³

**Pharyngeal consonants.** Clients with a cleft palate may use pharyngeal articulations (see Howard, 1993; Harding & Grunwell, 1996). Here, the tongue root is drawn back into the pharynx to produce fricatives (h, ŋ). Epiglottal variants of these fricatives can be found (h̊, ŋ̊), and an epiglottal plosive can occur, symbolized by [ʔ].

Pharyngeal fricatives are found in Arabic, and we can compare the following pharyngeal and glottal consonants (as per Ball et al., 2005):

- Arabic: [saːla] “coughed” ~ [səla] “asked”
- Hebrew [huruwb] “wars” ~ [hurubw] “escape” (n.)

Arabic also uses pharyngealization, where tongue root retraction is added to sounds made at other places of articulation. For example: [t̪] “figs” ~ [t̪in] “mud.” (These examples are all from Ball et al., 2005).

**Pulmonic ingressive consonants.** Ball and Müller (2007) included a review of studies that have reported on the use of pulmonic ingressive speech in the clinic. This form of speech has been reported in cases of persons with stuttering (Ball & Rahilly, 1996) and users of cochlear implants (Chin, 2003), as well as in the speech of children with articulation/phonological disorders (Gierut & Champion, 2000; Grunwell, 1981; Ingram & Terselic, 1983). For example, Ingram and Terselic observed ingressive sounds used for final target fricatives in a client aged 4;1. The sound produced was a pulmonic ingressive alveolar fricative, and the targets were /s, z, ʃ, ʒ, v/, as in vase → [bɛɾʃ] and rough → [ɾaʃ].

Pulmonic ingressive speech is not found in natural language except as a way of disguising the voice (and by some speakers in rapid counting, where each alternate numeral is uttered on a pulmonic ingressive airstream).

**Nonpulmonic Consonants**

Ball and Müller (2007) provided an account of nonpulmonic consonants that were encountered in disordered speech for target pulmonic consonants, so we need not go into detail on these here. We will, however, provide a brief summary. A list of the nonpulmonic consonants from the IPA chart (International Phonetic Association, 2005) is provided in Table 1.

**Ejectives.** Ejectives are made on a glottalic egressive airstream and can be stops, fricatives, or affricates. Chin (2002) and Nicolaides (2004) both reported the use of ejectives for target pulmonic consonants; in the case of Chin, by a wearer of a cochlear implant, and in the case of Nicolaides, by a speaker with hearing impairment. In both cases, the targets were fortis plosives. Examples from Chin (2002) include boot [bʊt] and sock [sʊk]. Ball and Müller (2007) reported on a client with severe disfluency using ejectives for target fricatives and stops (e.g., using [ʃ] for the initial /s/ in the word “semi” for four repetitions).

We should recall, however, that ejectives are more common in normal speech than may be thought. English speakers often realize final fortis stops in English as ejectives, especially when emphasized. Local (2003) suggested that these are most common in turn-final position in conversation.

A wide range of languages use ejectives, including many Native American languages. Examples of ejectives are provided below (from Ball & Rahilly, 1999):

- Ejective stops: Hausa, kara “to increase” [k’arɑː]; Khosa, ukurhula “to tow” [uk’ʊxʊla]
- Ejective fricatives: Hausa, tsara “contemporary” [s’ara]; Tingit, x’aat “file” [x’ɑːt]
- Ejective affricates: Tingit, ch’as “only, just” [tʃ’as]; Kung, tc’a “to pour” [tʃ’a]

**Implosives.** Implosives are a combination of glottalic ingressive airflow, with a small amount of pulmonic egressive (just enough to create vocal fold vibration). As with ejectives, the use of implosives is reported in the speech of clients with hearing impairment or wearers of cochlear implants. Examples are found in Monsen (1976, 1983); Higgin, Carney, McCleary, and Rogers (1996); and Pantelemitou, Herman, and Thomas (2003). One exception to this is Shahin (2006), who described the speech characteristics of three Arabic speakers with cleft palate. Ball and Müller (2007) reported that their own data from the speech of a profoundly deaf adult female shows common usage of implosives. Examples include man [mɑn] and down [dən].

³Researchers at the University of Louisiana at Lafayette are currently investigating a child who seems to have habitual use of retroflex consonants of various types.

²These two transcriptions contain tone marks: [t] high level tone and [ʔ] high falling tone. Prosodic aspects of transcription will be described in detail in the third part of this tutorial, which is currently in preparation.
Implosives are found in the languages of sub-Saharan Africa, South America, and Southeast Asia, as well as the language of Sindhi, spoken by 50 million people in Pakistan and northern India. The following are some examples of implosives in Sindhi (retrieved September 19, 2008 from http://www.linguistics.uiuc.edu/sindhi/script/03-bb/index.html): ئـٙ "scolding" [daiba]; ژـٙ “very” [daqo]; رـٙ “only” [ruqo].

**Clicks.** Clicks are made on a velaric ingressive airstream and so can be accompanied by pulmonic egressive airflow such that nasalized, voiced, and aspirated accompaniments (among others) may be produced at the same time as the clicks. In disordered speech, clicks have been reported for clients with cleft palate and other types of velopharyngeal incompetence (Gibbon, 2006; Howard, 1993) as well as for disfluent clients (Heselwood, 1997). Bedore, Leonard, and Gandour (1994) reported on a child with phonological/articulation disorder (e.g., onex [wən], treasure [twəs]). Howard’s (1993) examples include pig [Orp] and tap [ʔəʔ].

Clicks are only found linguistically in the languages of Africa; for example, Khoi-San languages such as ‘Xóö, and Bantu languages such as Xhosa and Zulu. In Zulu, we can see the use of a lateral click in the word ixixo “frog” [iːʒə], a dental click in icici “earring” [iːdʒi], and an alveolar click in iqaga “polecat” [iːlaːtə] (Dent & Nyembazi, 1988). ‘Xóö has a wide range of clicks with several different possible articulatory accompaniments. The following words illustrate the five different places of articulation for simple clicks in this language (adapted from Ball & Rahilly, 1999): Bilabial [ʘʘ] “dream”; dental [läss] “move off”; alveolar [tāː] “wait for”; lateral [lāː] “poison”; and palatal [ʌːː] “bone.”

## CONCLUSION

We appreciate that it is not possible to learn to recognize these non-English sounds from the pages of a tutorial. However, we do think that an important first step in learning to recognize and transcribe such sounds is to know about them—how many there are and their manners and places of articulation. A next step is to access the sounds themselves. This can be done by asking one’s phonetics instructor to go beyond the limits of the English phonological system and to make some of these sounds during a transcription practice class. If this is not possible, recordings do exist of a wide range of non-English consonants and vowels. For example, Ball and Müller (2005) have recordings of most of the sounds covered in this tutorial article on accompanying CDs. Web sites with recordings of the sounds can also be accessed; for example, the York University version is at http://www.yorku.ca/earrnstro/ipa/ (retrieved September 26, 2008); the UCLA version is at http://www.phonetics.ucla.edu/course/chapter1/chapter1.html (retrieved September 26, 2008); and the UCL site gives details of how to order an audio cassette or CD of the sounds produced there (http://www.phon.ucl.ac.uk/home/wells/cassette.htm; retrieved September 26, 2008).

## ACKNOWLEDGMENT

Thanks to Rachel Yan, Martin Barry, and San San Hnin Tun for their help with some of the orthographies used in this article.

## REFERENCES


Contact author: Martin J. Ball, Department of Communicative Disorders, University of Louisiana at Lafayette, P.O. Box 43170, Lafayette, LA 70504-3170. E-mail: mjball@louisiana.edu.