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The common denominator in the perception of accents in cases with foreign accent syndrome

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\textbf{ABSTRACT}

\textbf{Background:} Foreign accent syndrome (FAS) is a rare speech disorder leading to a perceived presence of a new accent in a speaker’s speech. Until now, around 100 cases of FAS have been reported. It is striking that in most cases the perception of the accent is in one consistent direction, namely from languages like English or Dutch to accents of Romance, Germanic, Eastern European or tonal languages.

\textbf{Aims:} In this article, we will try to come up with an overarching explanation for the accent changes seen in FAS, relating these changes to force of articulation.

\textbf{Main Contribution:} We assume that the foreign accent in FAS is interpreted on the basis of the stereotypical segmental and prosodic characteristics that relate to the phonetics and phonology of specific languages. We hypothesise that the direction in perception of a FAS accent will go from a language characterised by relatively more lenition processes, into languages with relatively more fortition characteristics in their phonetic realisations and phonological system and not the other way around. Accents are expected to change from stress-timed to syllable-timed languages, from weight-sensitive stress systems to weight-insensitive systems, from non-aspirated to aspirated systems, and within these language groups from languages characterised by, for example, relatively more reduction and assimilation processes to languages with relatively less lenition. We have tested our hypothesis with the already described FAS cases. We restricted ourselves to the cases of neurogenic FAS described in English and to which enough details were provided in order to be able to judge the change of accent.

\textbf{Conclusions:} From the 58 cases that fitted with these criteria, almost 90\% showed a change of accent in the expected direction or did not contradict our hypothesis. Only six accent changes did not directly support it. The reported phonetic descriptions of the cases, if available, nevertheless suggest that they do not seem to completely violate our hypothesis.
Introduction

Five years ago, British pop artist George Michael ended up in an Austrian hospital with a coma after a severe lung infection. When waking up from this coma, he thought himself to be king of the world and people around him recognised that he no longer spoke with his north-London accent but with a Western English tongue. This foreign accent lasted for 2 days. Anecdotal information like this can be found all over the Internet, but fortunately, as a result of such cases, the foreign accent syndrome receives more serious scientific attention as well (see also Ryalls & Miller, 2015). There are now about 100 unique cases described in academic literature. In this article, we will try to provide an overview of these cases. What is especially striking is the perception of the accent is in the same direction in most cases, namely from languages like English or Dutch to accents of Romance, Germanic, Eastern-European or tonal languages. In this article, we will try to propose an explanation for this accent change, elaborating on our past paper published in 2014, where we described the accent change in a single speaker with FAS and related this accent change to force of articulation (van der Scheer, Jonkers, & Gilbers, 2014).

The direction of perception

In van der Scheer et al. (2014), we presented a case study of a speaker with FAS. FAS is a rare speech disorder leading to a perceived presence of a new accent in the speech of the speaker. We hypothesised that the increased force of articulation in their speech can account for the foreign accents in patients suffering from impaired speech after brain damage. In our previous paper, we related the increase of articulation in FAS speakers to their underlying impairment. Similar to various other authors, we see FAS as a compensation strategy or adaptation in relation to an underlying (mild) form of apraxia of speech (AoS) (Fridriksson et al., 2005; Kanjee, Watter, Sévigny, & Humphreys, 2010; Mariën & Verhoeven, 2007; Miller, Lowit, & O’Sullivan, 2006; Moen, 2000; Roy, Macoir, Martel-Sauvageau, & Boudreauult, 2012; Whiteside & Varley, 1998). Despite the fact that many authors are linking AoS with FAS, there are also cases described in which the underlying disorder seems to be dysarthria (Mariën et al., 2013) or where it is explicitly mentioned that no motor disorders were evident. However, Miller et al. (2006), who also describe a case of FAS with an expected AoS as underlying disorder, already stated that FAS can arise from a variety of lesion sites. FAS may stem from different motor speech disorders, and it can be argued that FAS actually does not really exist in speakers, but that listeners only perceive it, or as Miller et al. conclude that FAS is a by-product of listeners’ perception. Earlier, we mentioned that FAS in AoS might be seen as an adaptation to the underlying disorder, but as Miller et al. point out, this might also be the case for other motor disorders, like the scanned speech seen in speakers with ataxic dysarthria who try to circumvent their speech problems.

The question remains why not every speaker with a motor speech disorder is heard as a FAS speaker. Again, Miller et al. (2006) provide an explanation. As was also seen in the case of AA, we described in 2014 (van der Scheer et al., 2014), different features may contribute to the perception of a foreign accent, although their salience to the listeners may differ. Naive listeners focus on different aspects of speech to form their judgements.
These are influenced by the listeners’ age, gender, experience with and attitudes to speech disorders or familiarity of the listener with different languages. They might even ignore aspects that do not fit their interpretation. Miller et al. (2006) state that in AOS the striking features will not be interpreted as belonging to a foreign accent, but as belonging to a disorder. Of course, this might be strengthened by the fact that AOS speakers make many speech errors and their speech is non-fluent. Only if the speech errors diminish might the remaining accent be understood as foreign, as, for example, in our case AA, who suffered from aphasia. Only after his aphasia resolved, people around him recognised the foreign accent.

Especially, those speakers with AoS, who adapt to this underlying disorder, will use strategies like segmentation and scanned speech (Feiken & Jonkers, 2012; Jonkers, Terband, & Maassen, 2014). This adaptation is done in the planning phase of speech. It is time-consuming and therefore speech is slower, which leads to less coarticulation, assimilation, reduction and an increased force of articulation; therefore, we hypothesise accent changes occur into languages that express more force of articulation.

Force of articulation, defined from an articulatory point of view, is the degree of muscular effort and breath force involved in speech production. It manifests itself in different acoustic parameters indicating the strength of the speech signal: very robust characteristics of the acoustic speech signal, such as mean pitch (fundamental frequency), pitch range, speech rate and mean intensity (“primary parameters”), but also more subtle parameters like occlusion time and voice-onset time in plosives or the first and second formant in the realisation of laterals (“secondary parameters”). Gilbers, Jonkers, Scheer van der, and Feiken (2013) describe a comprehensive model of the acoustic parameters of force of articulation and their individual strength in the perception and production of speech, the force of articulation model (FoAM), and hypothesise that force of articulation is an overarching factor in how speech is perceived aside from its semantic content, helping people distinguish between different accents.

The acoustic signal connects speech production and speech perception in the sense that differences in how speech is produced with respect to force of articulation can directly affect how speech is perceived. It is remarkable that listeners hear different foreign accents in the speech of one single FAS speaker, suggesting that the determination of force of articulation in FAS cannot be restricted to one single parameter. The diversity in the perception of listeners can only be explained by including all aspects of force of articulation in the analysis. Therefore, the foreign accent is not assumed to be in the speaker, but in the listener. Moreover, Di Dio, Schulz, and Gurd (2006) mention that FAS speakers’ acquired accents do not contain 100% of the features of the new accent.

Of course, listeners’ perception and familiarity with other languages play an important role in perceiving a foreign accent. We assume that the foreign accent in FAS is interpreted on the basis of the stereotypical segmental and prosodic characteristics that relate to the phonetics and phonology of specific languages. For example, a Dutch FAS speaker showed increased force of articulation in the production of voiceless plosives like /t/, leading to an aspirated production. Therefore, some listeners perceived his accent as German. German shows in general more force of articulation in the production of /t/ compared to the Dutch realisation, irrespective of registers and styles of speaking. Of course, you can shout or whisper in both languages, but, for example, the voice-onset time and the occlusion time of plosives are relatively longer in the German system than
in the Dutch (e.g., Jansen, 2004). On the other hand, some listeners perceived the same accent as French. Gilbers et al. (2013) showed that this might be due to differences in vowel reduction and syllable duration in the cognitively stored ideal patterns of Dutch and French. Force of articulation leads to lack of vowel reduction and fewer differences in syllable duration, characteristics of both FAS speech and French.

Regarding these examples, it is expected that the direction in perception of a FAS accent will go from a language characterised by relatively more lenition processes into languages with relatively more fortition characteristics in their phonetic and phonological system and not the other way around. Our hypothesis is falsifiable on the basis of the data of former and new FAS speakers, which means we expect listeners to only hear accents in FAS speakers from languages that are characterised by a larger amount of force of articulation than the mother speech of the FAS speaker. This assumption predicts that people may hear, for example, a German, Spanish or Arabic accent in a Dutch FAS speaker, but not a Dutch accent in, for example, a Spanish or German FAS speaker. The purpose of this article is to put the proposed hypotheses in Gilbers et al. (2013) and van der Scheer et al. (2014) to the test.

Towards a force of articulation scale of languages

Before putting our hypothesis to the test, some remarks have to be made on the division of languages based on the amount of force of articulation. Because the listener may focus on one specific fortition cue, it is not always possible to indicate one dialect or language as higher in this force of articulation hierarchy of languages than another. Catford (1977, p. 203) indeed claims, “The terms tense/lax, strong/weak, fortis/lenis, and so on, should never be loosely and carelessly used without precise phonetic specification”. English may seem to be lower in the hierarchy considering the strength of force of articulation than, for example, Dutch because all vowels in unstressed syllables are reduced to schwa. On the other hand, English initial /t/ in stressed syllables is aspirated, whereas it is not in this position in Dutch. In other words, with respect to voice-onset time, English may seem to be higher posited with respect to the strength of force of articulation than Dutch. Therefore, it is not possible to determine the position in the hierarchy of strongly related languages or dialects. It merely depends on which characteristics of FAS speech a listener focuses on.

Nevertheless, we will propose a coarse-grained division of languages and language families with respect to force of articulation based on the stress systems, the occurrence of lenition processes and segment realisations in these languages. The main division is between stress-timed languages and syllable-timed languages. Because of the lack of reduction in syllables, syllable-timed languages, with Spanish and French as prototypical examples, are regarded as stronger than stress-timed languages, such as English or Dutch. FAS speakers put more force in the realisation of all syllables, and therefore, their speech often lacks characteristics such as vowel reduction in unstressed syllables and shortening of unstressed syllables, which are typical for stress-timed languages. Within these two groups, the division is again based on lenition processes. With respect to stress-timed languages, Van Ommen, Hendriks, Gilbers, Van Heuven, and Gooskens (2013) show that Danish is characterised by more lenition processes than the strongly related language, Swedish. Therefore, we rather expect to find a Danish FAS speaker to
speak with a Swedish accent than the other way around. In a similar way, Dutch is
calared by more lenition processes than German (Gilbers et al., 2013; Grijzenhout,
2000) and American English can be posited below Standard Southern British English
(SSBE) based on, for example, lenition processes such as flapping in words like city and
letter, which is characteristic for the former variant of English but absent in the latter.
Scottish, on the other hand, can be characterised by more force than SSBE. Consider, for
example, the word girl [ɡɛəl] or [ɡəːl] with lenition of /r/ in SSBE. This /r/ is realised in
most Scottish variants of English: [ɡɛral], which almost sounds as a two-syllabic word.
Notice that this typically resembles the segmentation of clusters that is seen in speakers
with AoS that adapt to their articulation problems.

Furthermore, just like SSBE and Dutch, Scottish and most Irish dialects as well are
stress-timed languages. However, whereas SSBE and Dutch are described as having
weight-sensitive stress systems, Scottish and most Irish dialects are described as having
a weight-insensitive stress system, like French and Spanish (Van der Hulst, 1999). In
weight-sensitive systems, syllable structure plays a role in stress assignment. Typical for
weight-sensitive systems is the duration difference between stressed and unstressed
syllables, which is less noticeable in weight-insensitive systems. Therefore, we can posit
Scottish in between SSBE and French in our force of articulation hierarchy of languages.

With respect to the group of syllable-timed languages, the staccato rhythm of
syllables of approximately similar durations is intensified if syllable structure is less
complicated as in most tone languages. Lin and Wang (2007) suggest that Mandarin
Chinese has a syllable-timed rhythm, but being a tone language with simple syllable
structures, it is posited higher in the hierarchy than syllable-timed languages such as
Spanish or French.

In sum, proposing an iron-clad division of languages based on their force of articula-
tion features is impossible. It depends on the specific cue in FAS speech the individual
listener is focussing on. Yet, we expect that the direction of accent identification will go
more often from stress-timed to syllable-timed languages, from weight-sensitive stress
systems to weight-insensitive systems and within these language groups from non-
aspirated to aspirated languages, from languages characterised by relatively more
reduction and assimilation processes to languages with relatively less lenition. Sometimes, the changes in the amount of force of articulation in FAS can be very subtle:
for example, intervocalic clear /l/ in Dutch where dark /l/ is expected. Table 1 shows the
dominance relations between language types. Language types in the right boxes
dominate the corresponding language types in the left boxes.

If languages from different families exhibit similar characteristics, we may expect
perception in both directions. For example, Spanish might be perceived as Czech and
the other way around, since both languages are syllable-timed, with melodic stress and weight-insensitive systems. Still, no matter which hierarchy we propose, it should be emphasised that the perceived accent depends on the specific fortition cue the listener focuses on.

As we have to deal with judgements of naive listeners, often in limited research conditions, we expect counterexamples. Reports on perceived accents are often anecdotal, and only in a small number of cases do listeners have to listen to fragments of speakers with FAS and other speakers with or without accents in a blind situation. These limited conditions, of course, increase the probability of finding counterexamples. Our investigation is also impeded by the fact that a majority of the cases in the literature is hardly supported by means of phonetic research, as will be indicated later. In these cases, it is impossible to detect cues of increased force of articulation. Still, one might expect that if force of articulation were not a major factor in the perception of foreign accents, the change of the perceived accents would be more or less bidirectional in our taxonomy in Table 1. If the number of perceived accents in the predicted direction approximates 50%, the hypothesis should definitely be rejected. Hundred percent seems impossible given the considerations put forward in this section, but if a clear majority of the cases indeed were to move in the predicted direction, we would consider the hypothesis to be supported by the data.

Method

In order to test our hypothesis about the accent changes in FAS cases that were published until now, we did a literature search with as search criterion “foreign accent syndrome” in PubMed. About 64 papers were identified on this topic. Next to this literature search, we added papers on FAS cases that were mentioned in one of these 64 papers, but were not part of the PubMed list. We ended up with 107 papers on FAS. By this, we do not assume to present all cases with FAS described before, but the sample is big enough to test our hypothesis.

The final sample we used for our analysis was obtained after adjusting the following criteria:

- We only considered cases that were described in English. Some cases of FAS are described in French, German, Spanish or Chinese and we will only address these cases in a general discussion.
- We only considered cases of FAS with a neurogenic origin. This means that we excluded psychogenic cases and developmental FAS. We will, however, again address these cases in a more general discussion later.

After applying these two criteria, we were left with 70 unique cases of neurogenic FAS. These 70 cases are presented in Table 2. All papers in which these cases were described were analysed by the first two authors of the current paper separately, on the basis of the aspects mentioned in Table 2. In case there was no agreement on the data, all authors discussed and reanalysed the papers. The aspects that were considered were age and sex of the FAS speaker, the aetiology of the neurological deficit that lead to FAS and its localisation, the presence and type of language and articulatory disorders and
Table 2. Overview of 70 unique cases of neurogenic FAS and their characteristics.

<table>
<thead>
<tr>
<th>Case</th>
<th>References</th>
<th>Age, sex</th>
<th>Aetiology/location</th>
<th>Language</th>
<th>Articulation</th>
<th>Accent (“&lt;” = perceived as)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monrad-Krohn (1947)*</td>
<td>30, F</td>
<td>Shrapnel wound in Broca’s area (left frontal trauma)</td>
<td>Agrammatism, paraphasias</td>
<td>Impaired</td>
<td>Norwegian &lt; German</td>
</tr>
<tr>
<td>2</td>
<td>Whitty (1964)</td>
<td>27, F</td>
<td>Intracerebral haemorrhage from a small angioma in the territory of the left middle cerebral artery</td>
<td>Normal</td>
<td>Impaired</td>
<td>English &lt; German</td>
</tr>
<tr>
<td>4</td>
<td>Schiff, Alexander, Naeser, and Galaburda (1983)</td>
<td>58, M</td>
<td>Infarction in lower half of the left precentralrolandic gyrus</td>
<td>Mild aphasia</td>
<td>Impaired</td>
<td>Portuguese/English &lt; Chinese</td>
</tr>
<tr>
<td>5</td>
<td>Graff-Radford, Cooper, Colsher, and Damasio (1986)</td>
<td>56, M</td>
<td>Damage to the left premotor region and white matter anterior to the head of the left caudate nucleus</td>
<td>Aphasia; rare paraphasias</td>
<td>Impaired</td>
<td>American English &lt; Scandinavian</td>
</tr>
<tr>
<td>6</td>
<td>Blumstein, Alexander, Ryalls, Katz, and Dworetzky (1987)</td>
<td>62, F</td>
<td>Left hemisphere stroke in the subcortical white matter of the pre-rolandic and postrolandic gyri at the level of the body of the lateral ventricle.</td>
<td>Mild agrammatism; mild semantic paraphasias</td>
<td>Impaired</td>
<td>American English &lt; Eastern European, perhaps Slavic, French, Dutch, or Scandinavian</td>
</tr>
<tr>
<td>7</td>
<td>Gurd, Bessel, Bladon, and Bamford (1988)</td>
<td>41, F</td>
<td>Small isolated left basal ganglia infarction</td>
<td>Normal</td>
<td>Mild motor difficulties, slow and laborious speech</td>
<td>English &lt; French</td>
</tr>
<tr>
<td>8</td>
<td>Ardila et al. (1988)</td>
<td>26, M</td>
<td>Left embolic stroke Broca’s area</td>
<td>Slight agrammatism</td>
<td>Impaired</td>
<td>Spanish &lt; English</td>
</tr>
<tr>
<td>9</td>
<td>Moen (1990, 2006)</td>
<td>61, F</td>
<td>Left sided stroke</td>
<td>Normal</td>
<td>Prosodically deviant and deviant articulation of consonants and vowels</td>
<td>Norwegian &lt; English</td>
</tr>
<tr>
<td>10</td>
<td>Berthier et al. (1991)</td>
<td>70, M</td>
<td>Infarction in the middle portion of the left precentral gyrus</td>
<td>Normal</td>
<td>Impaired</td>
<td>Spanish &lt; Slavic</td>
</tr>
<tr>
<td>11</td>
<td>Berthier et al. (1991)</td>
<td>58, M</td>
<td>Right frontoparietal infarction</td>
<td>Normal</td>
<td>Impaired, slow effortful speech</td>
<td>Spanish &lt; Slavic</td>
</tr>
<tr>
<td>12</td>
<td>Berthier et al. (1991)</td>
<td>47, F</td>
<td>Haemorrhagic infarction left dorsolateral frontal region</td>
<td>Impaired grammar</td>
<td>Impaired, slow</td>
<td>Spanish &lt; “foreign accent” (perhaps Hungarian)</td>
</tr>
<tr>
<td>13</td>
<td>Berthier et al. (1991)</td>
<td>34, F</td>
<td>Small infarction of the posterior-superior aspects of the left middle frontal gyrus</td>
<td>Limited verbal output</td>
<td>Impaired</td>
<td>Spanish &lt; Slavic</td>
</tr>
<tr>
<td>Case</td>
<td>References</td>
<td>Age, sex</td>
<td>Aetiology/location</td>
<td>Language</td>
<td>Articulation</td>
<td>Accent (“&lt;” = perceived as)</td>
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<tr>
<td>15</td>
<td>Ingram, McCormack, and Kennedy (1992)</td>
<td>56, F</td>
<td>Hematoma in lentiform nucleus</td>
<td>Rare paraphasias</td>
<td>Impaired; apraxia of speech</td>
<td>Australian English &lt; Asian, Swedish and German</td>
</tr>
<tr>
<td>16</td>
<td>Takayama, Sugishita, Kido, Ogawa, and Akiyoshi (1993)</td>
<td>44, F</td>
<td>Infarction in the middle fifth of the posterior lateral aspect of the left precentral gyrus</td>
<td>Normal</td>
<td>Japanese &lt; Korean</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Boatman, Gordon, Stone, and Anderson (1994)</td>
<td>52, M</td>
<td>Infarction left superior temporal gyrus extending to the parietal lobe</td>
<td>Mild anoma</td>
<td>American English &lt; Norwegian</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Mooonis et al. (1996)</td>
<td>59, M</td>
<td>Minor head injury, caudate nucleus, frontal gyrus</td>
<td>Mild anoma</td>
<td>Mild articulation problems</td>
<td>American English &lt; French</td>
</tr>
<tr>
<td>20</td>
<td>Roth, Fink, Cherney, and Hall (1997)</td>
<td>48, M</td>
<td>Left parietal haemorrhagic stroke</td>
<td>Broca's aphasia; Agrammatism, mild anoma</td>
<td>Impaired</td>
<td>English &lt; Dutch (speaker was born in the Netherlands)</td>
</tr>
<tr>
<td>21</td>
<td>Carbary, Patterson, and Snyder (2000)</td>
<td>51, M</td>
<td>Subcortical; pre-existing infarction in convolutions 2 and 3 of the posterior left frontal lobe</td>
<td>Normal</td>
<td>Mildly impaired</td>
<td>American English &lt; unspecified “foreign accent”</td>
</tr>
<tr>
<td>22</td>
<td>Dankovičová et al. (2001)</td>
<td>43, F</td>
<td>Extensive infarction of the right middle cerebral artery, complicating a subarachnoid haemorrhage</td>
<td>Normal</td>
<td>English &lt; Scottish</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Gurd, Coleman, Costello, and Marshall (2001)</td>
<td>47, F</td>
<td>Minor non-specific ischemic changes both frontal lobes, left inferior frontal corona radiate and left thalamus</td>
<td>Normal</td>
<td>Impaired</td>
<td>English &lt; French</td>
</tr>
<tr>
<td>24</td>
<td>Coelho and Robb (2001)</td>
<td>51, F</td>
<td>No abnormalities at CT</td>
<td>Word finding problems</td>
<td>Impaired</td>
<td>American &lt; French/Canadian</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>Case</th>
<th>References</th>
<th>Age, sex</th>
<th>Aetiology/location</th>
<th>Language</th>
<th>Articulation</th>
<th>Accent (“&lt;” = perceived as)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Avila, González, Parcet, and Belloch (2004)</td>
<td>51, F</td>
<td>Mild neck trauma: small infarction in the left corona radiata and an infarction on the right temporal lobe</td>
<td>Normal</td>
<td>Dysarthria</td>
<td>Patients’ L1 was Spanish, but she also had a good command of French, English and Catalan (L2). FAS affected Spanish dramatically, but no important changes were observed for French; no specific accent reported</td>
</tr>
<tr>
<td>27</td>
<td>Coughlan, Lawson, and O’Neill (2004)</td>
<td>39, F</td>
<td>Infarction in the area of the left internal capsule</td>
<td>Word finding problems</td>
<td>Dysarthria</td>
<td>English (Ireland) &lt; French</td>
</tr>
<tr>
<td>28</td>
<td>Bakker, Apeldoorn, and Metz (2004)</td>
<td>52, F</td>
<td>MS, deep white matter lesions in the corpus callosum, left parietal lobe and left frontal lobe</td>
<td>Word finding problems, grammatical errors</td>
<td></td>
<td>Canadian English &lt; Dutch</td>
</tr>
<tr>
<td>29</td>
<td>Lippert–Grüner et al. (2005)</td>
<td>35, F</td>
<td>Traumatic haemorrhage in the left temporal lobe</td>
<td>Anomia</td>
<td>Mildly impaired</td>
<td>German &lt; English</td>
</tr>
<tr>
<td>30</td>
<td>Munson and Heilman (2005)</td>
<td>49, F</td>
<td>Embolic left-hemispheric cortical infarction; left frontal opercular area</td>
<td>Mild word finding difficulties</td>
<td>Some misarticulations</td>
<td>American English &lt; German</td>
</tr>
<tr>
<td>31</td>
<td>Mariën et al. (2006)</td>
<td>53, F</td>
<td>Left frontoparietal stroke; cerebellum?</td>
<td>Normal</td>
<td>Articulatory deviations</td>
<td>English &lt; French, Russian, German</td>
</tr>
<tr>
<td>32</td>
<td>Miller et al. (2006)</td>
<td>60, M</td>
<td>SAB: Aneurysm right anterior communicating artery</td>
<td>Repetition and word finding problems</td>
<td>Apraxic-ataxic speech disorder</td>
<td>English &lt; Italian and East-European</td>
</tr>
<tr>
<td>33</td>
<td>Varley, Whiteside, Hammill, and Cooper (2006)</td>
<td>40, F</td>
<td>Infarction in the anterior portions of the left middle cerebral artery territory and haemorrhagic changes within the left putamen</td>
<td>Mild aphasis difficulties</td>
<td>Apraxia of speech</td>
<td>British &lt; Swedish</td>
</tr>
<tr>
<td>34</td>
<td>Scott, Clegg, Rudge, and Burgess (2006)</td>
<td>54, F</td>
<td>Small left hemisphere lesion, in white matter underneath the precentral sulcus, dorsal and medial to the anterior insula</td>
<td>Normal</td>
<td>Apraxia of speech</td>
<td>Scottish &lt; German, Polish, South-African</td>
</tr>
<tr>
<td>35</td>
<td>Laures–Gore, Henson, Weismer, and Rambow (2006)</td>
<td>64, M</td>
<td>Right posterior temporal parietal and older CVA left basal ganglia and left cerebellum</td>
<td>Normal</td>
<td>Mild apraxia of speech</td>
<td>American English &lt; Chinese, Dutch, Canadian</td>
</tr>
<tr>
<td>36</td>
<td>Laures–Gore et al. (2006)</td>
<td>67, F</td>
<td>MRI: no lesions</td>
<td>No aphasis, but patient answers with “sí” instead of “yes”</td>
<td>Normal to mild apraxia of speech</td>
<td>American English &lt; Spanish, Jamaican</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Case</th>
<th>References</th>
<th>Age, Sex</th>
<th>Aetiology/Location</th>
<th>Language</th>
<th>Articulation</th>
<th>Accent (<em>&lt;</em> = perceived as)</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Kwon and Kim (2006)</td>
<td>71, F</td>
<td>Infarction in the left temporal and parietal area</td>
<td>Wernicke's aphasia</td>
<td></td>
<td>Cholla-buk (Korean dialect) &lt; Kangwon (Korean dialect)</td>
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<tr>
<td>38</td>
<td>Ryalls and Whiteside (2006)</td>
<td>57, F</td>
<td>Lacunar infarction in left internal capsule</td>
<td>Normal</td>
<td></td>
<td>American English &lt; British, Australian English</td>
</tr>
<tr>
<td>39</td>
<td>Fridriksson et al. (2005)</td>
<td>45, M</td>
<td>Left basal ganglia, left putamen</td>
<td>Normal</td>
<td>Apraxia of speech characteristics</td>
<td>American English &lt; French, Greek, British English</td>
</tr>
<tr>
<td>40</td>
<td>Mariën and Verhoeven (2007)</td>
<td>61, M</td>
<td>Haemorrhagic lesion in the left basal ganglia</td>
<td>Conduction-like aphasia</td>
<td>Mild Broca's aphasia</td>
<td>Dutch &lt; North African</td>
</tr>
<tr>
<td>41</td>
<td>Wendt, Bose, Sailer, Scheich, and Ackermann (2007)</td>
<td>35, F</td>
<td>Left hemisphere stroke: left middle cerebral artery</td>
<td>Mild anomic aphasia</td>
<td>First signs PPA</td>
<td>German &lt; Russian</td>
</tr>
<tr>
<td>42</td>
<td>Katz, Garst, and Levitt (2008)</td>
<td>46, F</td>
<td>Moderate ventriculomegaly and frontal lobe atrophy</td>
<td>Mild apraxia of speech; dysarthric speech</td>
<td></td>
<td>American English &lt; Swedish, Eastern European</td>
</tr>
<tr>
<td>43</td>
<td>Luzzi et al. (2008)</td>
<td>64, F</td>
<td>Mild hypoperfusion of the perisylvian speech area of the left hemisphere and mild left perisylvian atrophy</td>
<td></td>
<td></td>
<td>Italian &lt; Spanish</td>
</tr>
<tr>
<td>44</td>
<td>Hoffmann (2008)</td>
<td>63, F</td>
<td>Garcin syndrome; cranial trauma</td>
<td>Normal</td>
<td>Mild dysarthria</td>
<td>American English &lt; French</td>
</tr>
<tr>
<td>45</td>
<td>Naidoo, Warnier, Oczkowski, Sévigny, and Humphreys (2008)</td>
<td>50, F</td>
<td>A well-defined area of hypointensity involving the left internal capsule, left basal ganglia, and left frontal corona radiata</td>
<td>Word finding problems; semantic paraphasias</td>
<td>Apraxia of speech</td>
<td>Canadian English &lt; Canadian East Coast accent, partly a reported change from her native Southern Ontario accent</td>
</tr>
<tr>
<td>47</td>
<td>Chanson et al. (2009)</td>
<td>39, F</td>
<td>Hypersignal on T2-weighted images in the left periventricular white matter; diagnosis: MS</td>
<td>Normal</td>
<td></td>
<td>French &lt; German</td>
</tr>
<tr>
<td>48</td>
<td>Cohen, Kurowski, Steven, Blumstein, and Pascual-Leone (2009)</td>
<td>58, F</td>
<td>Left frontoparietal infarction</td>
<td>Normal</td>
<td></td>
<td>English &lt; unspecified accent</td>
</tr>
<tr>
<td>49</td>
<td>Teymouri, Raghiehdoust, and Modarressi (2009)</td>
<td>53, F</td>
<td>Central focal infarction left hemisphere</td>
<td>Normal</td>
<td></td>
<td>Persian &lt; unspecified accent</td>
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</tbody>
</table>

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<thead>
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<th>Language</th>
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<th>Accent (&quot;&lt;&quot; = perceived as)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>Verhoeven and Mariën (2010)</td>
<td>53, F</td>
<td>Cortico-subcortical lesion which involved the inferior frontal gyrus, the precentral gyrus, the anterior insular cortex, the postcentral gyrus and the supramarginal gyrus of the left hemisphere</td>
<td>Normal</td>
<td>Apraxia of speech</td>
<td>Dutch &lt; French, German</td>
</tr>
<tr>
<td>51</td>
<td>Perkins, Ryalls, Carson, and Whiteside (2010)</td>
<td>48, F</td>
<td>Trauma: bilateral TBI</td>
<td>Agrammatism</td>
<td>Slow dysfluent speech</td>
<td>English &lt; Eastern European</td>
</tr>
<tr>
<td>52</td>
<td>Dankovičová and Hunt (2011)</td>
<td>56, M</td>
<td>Posterior parietal atrophy superior to the occipital sulcus</td>
<td>Normal</td>
<td></td>
<td>English (Cockney) &lt; Italian, Greek</td>
</tr>
<tr>
<td>53</td>
<td>Bhandari (2011)</td>
<td>55, M</td>
<td>Diffusion in the left parieto-occipital region and in the left middle frontal gyrus</td>
<td>Normal</td>
<td></td>
<td>American English (Texan) &lt; “foreign” and Cockney accent</td>
</tr>
<tr>
<td>54</td>
<td>Akhlagi, Jahangiri, Azarpazhooh, Elyasi, &amp; Ghale (2011)</td>
<td>40, M</td>
<td>Right temporo-occipital lesion</td>
<td>Normal</td>
<td></td>
<td>Farsi &lt; Yazdi or Isfahani accent</td>
</tr>
<tr>
<td>55</td>
<td>Kuschmann, Lowit, Miller, and Mennen (2012)</td>
<td>61, F</td>
<td>Left-hemispheric CVA</td>
<td>Normal</td>
<td>Slurred speech</td>
<td>British English &lt; French, Italian, Eastern European, Jamaican</td>
</tr>
<tr>
<td>56</td>
<td>Kuschmann et al. (2012)</td>
<td>49, F</td>
<td>Left-hemispheric CVA</td>
<td>Mild aphasic symptoms</td>
<td>Mild apraxia of speech</td>
<td>Scottish English &lt; Italian, South African</td>
</tr>
<tr>
<td>57</td>
<td>Kuschmann et al. (2012)</td>
<td>61, M</td>
<td>Brain stem infarction</td>
<td>Normal</td>
<td>Slurred speech</td>
<td>British English &lt; Italian</td>
</tr>
<tr>
<td>58</td>
<td>Kuschmann et al. (2012)</td>
<td>54, M</td>
<td>Left-hemispheric CVA</td>
<td>Normal</td>
<td>Voice problems</td>
<td>British English &lt; Italian</td>
</tr>
<tr>
<td>59</td>
<td>Roy et al. (2012)</td>
<td>63, F</td>
<td>Ischemic stroke left fronto-parietal</td>
<td>Mild Broca’s aphasia</td>
<td>Mild apraxia of speech</td>
<td>Quebec French &lt; Germanic</td>
</tr>
<tr>
<td>60</td>
<td>Perera, Rao, and Veltman (2012)</td>
<td>53, F</td>
<td>Ischemic infarction in the left corona radiata and left basal ganglia</td>
<td>Normal</td>
<td></td>
<td>English &lt; German</td>
</tr>
<tr>
<td>61</td>
<td>Tomasino et al. (2013)</td>
<td>50, F</td>
<td>A brain tumour affecting the left precentral gyrus, at the border between the primary motor and premotor cortex</td>
<td>Normal</td>
<td></td>
<td>Italian &lt; unspecified</td>
</tr>
<tr>
<td>62</td>
<td>Tran and Mills (2013)</td>
<td>60, F</td>
<td>Left hemi-pons</td>
<td>Normal</td>
<td>Slurred speech</td>
<td>American English &lt; Jamaican, Italian, English</td>
</tr>
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Table 2. (Continued).

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<thead>
<tr>
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<th>References</th>
<th>Age, sex</th>
<th>Aetiology/location</th>
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<th>Articulation</th>
<th>Accent (&quot;&lt;&quot; = perceived as)</th>
</tr>
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<tbody>
<tr>
<td>63</td>
<td>Pyun et al. (2013)</td>
<td>37, F</td>
<td>Left basal ganglia haemorrhage</td>
<td>Mixed aphasia</td>
<td>Dysarthria and a moderate degree of buccofacial apraxia and apraxia of speech</td>
<td>Korean &lt; English</td>
</tr>
<tr>
<td>64</td>
<td>Moreno–Torres et al. (2013)</td>
<td>44, F</td>
<td>Bilateral small infarction left deep frontal</td>
<td>Normal</td>
<td>Mild articulation struggling</td>
<td>Spanish/Catalan (bilingual) &lt; Czech and French</td>
</tr>
<tr>
<td>65</td>
<td>Mariën et al. (2013)</td>
<td>71, M</td>
<td>Haemorrhagic lesion in the right cerebellar hemisphere extending into the third and fourth ventricle</td>
<td>Normal</td>
<td>Atactic dysarthria</td>
<td>Dutch &lt; German</td>
</tr>
<tr>
<td>66</td>
<td>Verhoeven et al. (2013)</td>
<td>24, F</td>
<td>Infarction left insular region</td>
<td>Agrammatism</td>
<td>Apraxia of speech</td>
<td>English/Dutch bilingual &lt; English</td>
</tr>
<tr>
<td>67</td>
<td>Gilbers et al. (2013)</td>
<td>59, M</td>
<td>Infarction left middle cerebral artery</td>
<td>Normal</td>
<td>Apraxia of speech cannot be ruled out; symptoms of dysarthria</td>
<td>Dutch &lt; Arabic, Turkish, Surinam, French, German</td>
</tr>
<tr>
<td>68</td>
<td>Gilbers et al. (2013)</td>
<td>55, F</td>
<td>Brain contusion left frontal area with subarchnoidal bleeding at the lateral sulcus left</td>
<td>Improved language problems</td>
<td>Mild to moderate apraxia of speech</td>
<td>Dutch &lt; German, Polish, Spanish, French</td>
</tr>
<tr>
<td>69</td>
<td>Liu, Qi, Liu, Liu, and Li (2015)</td>
<td>41, F</td>
<td>TBI left temporal</td>
<td>Unknown</td>
<td></td>
<td>Chinese? &lt; Mandarin</td>
</tr>
<tr>
<td>70</td>
<td>Liu et al. (2015)</td>
<td>25, M</td>
<td>TBI left temporal</td>
<td>Unknown</td>
<td></td>
<td>Chinese? &lt; Mandarin</td>
</tr>
</tbody>
</table>

b Also described by Perkins et al. (2010).
c Also described by Katz et al. (2012).
d Also described by Kanjee et al. (2010).
e Cases 55–58 were also described by Kuschman and Lowit (2012), Lowit and Kuschman (2012) and Kuschmann and Lowit (2015).
f Another (psychogenic) case described by these authors was first described by Poulin et al. (2007).
g Other described cases were presented in earlier studies of Mariën, Verhoeven and co-authors.
h This case was also described by van der Scheer et al. (2014).
the native language or accent and the perceived accent of the FAS speaker. Only papers were included that provided this information and at least some description of the subject’s accent, in order to discuss the accent when it could be seen as a counterexample to our hypothesis. We want to emphasise that we only discuss the counterexamples in this respect. Of course, it would be possible to describe the segmental and prosodic problems described for the cases in which an accent was heard that would fit our hypothesis. Nevertheless, there are only very few papers that give a full description of all these aspects, and still, even if we would find aspects that would not relate to force of articulation, the listeners still decided that they heard an accent in which more fortition was expressed.

**Results**

Most cases in Table 2 show changes from stress – to syllable-timed languages (e.g., #3), from weight-sensitive stress systems to weight-insensitive systems (e.g., #22), from non-aspirated to aspirated languages (e.g., #65) and from languages characterised by relatively more reduction and assimilation processes to languages with relatively less lenition (e.g., #38). Sometimes the change is very subtle. For example, in case 16, Japanese is perceived as Korean. These languages are phonologically rather similar, but Korean is a heavily aspirated language, whereas plosives in Japanese are hardly aspirated, a difference that is similar to the one between German and Dutch within the family of stress-timed languages (cf. #68). In some cases, we see changes within the same accent type group (e.g., #43). Nevertheless, most cases provide clear evidence for our hypothesis by going from, for example, English to French, American English to Spanish, Portuguese to Chinese, English to Scottish, Dutch to Turkish, etc. The perceived accent in some cases is described very broadly, for example, Slavic or East-European, without mentioning a specific language or dialect (#10, #11, #13, #51). Berthier, Ruiz, Massone, Starkstein, and Leiguarda (1991), for example, mention perceived Slavic accents in Buenos Aires Spanish. Nevertheless, in general, the descriptions of these cases fit our hypothesis of increased force of articulation, that is, slower speech, more pauses and a tendency to isosyllabicity.

In two cases, the native language was not specified (case #69 and #70). In six cases, (#12, #21, #26, #48, #49 and #61) the change of accent was described as a change to a generic accent, a foreign accent or just an unspecified accent change within the same language. If we abstract from these cases, we are left with 58 cases that can be used to test our hypothesis.

From the 58 cases left, 46 cases showed a change of accent in the expected direction, which is a change to an accent of a language in which more force articulation is expressed, as described in Table 1, and six cases remained within the same group of accent types. For some cases, the perception of several accents was mentioned. In these cases, we found that although several accents were mentioned, all the accent changes were in the same direction, that is, accents of languages in which more or comparable force of articulation is expressed. For example, in case #15, Swedish, Asian and German were mentioned as accents perceived in an Australian English speaker, and all three mentioned accents would be expected according to our hypothesis.
In sum, this means that nearly 90% of the cases do not contradict our hypothesis (52 out of 58 cases; 89.7%). The remaining six cases deserve special attention. Ardila, Rosselli, and Ardila (1988) present a Columbian Spanish-speaking patient who speaks with an English accent after his stroke (#8). This seems to be a counterexample to our hypothesis. However, the phonetic description of the speech shows clear aspects of fortition as well: lowering, fronting and backing of vowels (i.e., hyper-articulation), omission of unstressed vowels and stressing of vowels in diphthongs were seen in this patient. Moen (1990, 2006) describes the case of a Norwegian subject who speaks with an English accent after a stroke (#9). This patient’s speech also reflects aspects of fortition and is characterised by a staccato rhythm, which in general gives the impression of a syllable-timed language, and a rise in pitch and intensity on word-initial syllables, aside from aspects of lenition as well. Lippert-Grüner, Weinert, Greisbach, and Wedekind (2005) describe a German patient who ends up with an English accent due to a traumatic brain injury (#29). Although it is tempting to conclude that also for this third case an increased force of articulation is described, as she exhibits strong lowering and lengthened short vowels, we do not see enough description of aspects of fortition to decide on this. Notice that this patient is also not a typical FAS patient. She suffered from a trauma and computed tomography and functional Magnetic Resonance Imaging revealed temporal lobe damage. She definitely cannot be seen as a speaker with an underlying AoS, leading to her FAS. After brain damage, she was mute, except for the expression of some English words. Moreover, the articulatory jaw movements of this patient were strongly limited the jaw being almost immobile. These two aspects could definitely also have influenced the perception of an English accent. The same considerations apply more or less for case #47, where the patient’s accent changed from French into German (Chanson et al., 2009). This subject is also not a typical FAS patient as she suffered from multiple sclerosis, although this is also seen in case #28. Unfortunately, there is no phonetic description of her speech to investigate why a German accent was perceived. Such a clear phonetic description is provided in case #59 in which a Germanic accent is perceived in a Quebecois French speaker (Roy et al., 2012). The description shows an increased staccato rhythm explained by the authors as a tendency to homogenise syllable duration even within a syllable-timed language such as French. Furthermore, the speech was characterised by devoiced consonants: all characterisations of increased force of articulation. Yet, the perceived accent is described as Germanic. Finally, Pyun, Jang, Lim, Ha, and Cho (2013) describe an accent change from Korean to English (#63). The phonetic description mentions unusual rising pitch contours at the end of simple declaratives, prolonged intervals, slow rate, reduced fluency and initial consonant blocking. Furthermore, in this study, the participants had a restricted choice with respect to the indication of the perceived accent; they had to choose between Korean dialects, Japanese, Chinese and English for the perceived FAS accent.

In sum, we conclude that although in these six cases the perceived foreign accent clearly is an accent of a language in which less fortition is expressed, the reported phonetic descriptions, if available, suggest that they do not completely violate the hypothesis.
Other cases

As described in our method, we only provided cases that were described in English. In our literature search, we also found cases described in other languages. Among these are the first reports of FAS by Marie (1907) and Pick (1919). Marie described a Parisian French speaker who ended up with an Alsatian accent after stroke, and Pick mentioned a Czech soldier who had a Polish accent after stroke. Although both authors do not provide phonetic details about the accent itself, both hearing an Alsatian accent in a French speaker and hearing a Polish accent in a Czech speaker does not fit our hypothesis.

More recently, reports in Spanish and Chinese were found. Hwang, Lin, and Lin (2001) presented a case of a 40-year-old female Chinese Mandarin speaker who after a stroke ended up with an accent of an American English speaker trying to speak Mandarin. Gonzalez-Alvarez, Parcet-Ibars, Avila, and Geffner-Sclarsky (2003) described a case in Spanish of a 51-year-old Spanish-speaking woman who after an injury in the basal ganglia ended up with a French or other accent. Also a case in Spanish was published by Villaverde-González, Fernández-Villalba, Moreno-Escribano, Alias-Linares, and García-Santos (2002), describing a 38-year-old woman who acquired a French accent due to multiple sclerosis. These case descriptions, in general, show accent changes that support or, at least, do not go against our hypothesis, except for the cases described by Marie (1907), Pick (1919) and Hwang et al. (2001). For these cases, unfortunately, no more information is available as to why an Alsatian (Marie), Polish (Pick) or an American English (Hwang et al.) accent was perceived.

Other case descriptions that lack detail to be analysed in the same way as the cases described in Table 2 also in general support our hypothesis. Nielsen and McKeown (1961) describe two cases of American English speakers getting a Swedish accent after a cerebrovascular accident or an automobile accident, respectively. Critchley (1970) describes four cases of English speakers ending up with a Welsh accent after neurological damage, but in these cases, subjects were already speaking Welsh or had close contact to this language. Aronson (1990) mentions 13 cases from the Mayo Clinic, but provides an overview of these and 12 other cases without providing individual participant data, but he concludes that it is striking that a large number of accent changes involve a change into a Germanic accent. Edwards, Patel, and Pople (2005) provide six new cases of FAS. Two cases showed a change from English to a Welsh or Irish accent, respectively, but both subjects were rather familiar with these languages. One had a Scottish accent, but ended up with a Dutch/Swedish/Russian/German accent after stroke. There were three cases of British English speakers who ended up with a Dutch, French/German or American accent, respectively, the first two due to traumatic brain injury and the latter due to a stroke. Only the perceived American accent can be seen as a counterexample of our hypothesis, but unfortunately Edwards et al. do not provide any phonetic descriptions of the accent itself.

Cases with non-neurological origin

As said earlier, we excluded in our analyses cases of FAS without a neurogenic origin. As far as we know, 17 unique cases of FAS due to psychogenic or other non-neurological deficits (electrocution and jaw injury) are described until now and three cases of
developmental FAS. In Table 3, we provide these cases and we describe the perceived accent changes in them. The cases with developmental FAS are #9, #10 and #20 in Table 3.

In one case (#12), the accent change was not described or just described as foreign. In the other 19 cases, the accent change was, like in most of the neurogenic cases, into a language in which more fortition is expressed (mostly German or French). This is the case for the psychogenic cases, but also for the three developmental cases.

One case we would like to add to this overview is a case described by Ryalls and Miller (2015). In their book on FAS, many anecdotes are presented from people who suffer from FAS as well as anecdotes from FAS patients’ relatives. In one case, a mother described the accent change of her daughter going from a German to a Dutch accent during several episodes. However, although neuroimaging took place, there was no evidence of a neurological background of this FAS. As there is also no evidence for a psychogenic background and as there is no description of the speech problems of this subject, the case was not added to the overview, but it would be an example against the hypothesis.

Discussion

In this article, we provided an overview of the cases of neurogenic FAS that, as far as we know, have been published in English to date. We came up with an overarching explanation for the accent change in the cases that were described. It is notable that accent changes mostly go in the same direction. Accent changes, especially to American English, are, with few exceptions, not reported, where if accent changes were random
more of these cases would have been described. In contrast, we mostly see changes from accents of languages expressing more lenition in their speech to accents with more fortition. We assume that the increase of force of articulation seen in FAS speakers is due to their underlying deficit. In line with many other authors describing cases of FAS (Fridriksson et al., 2005; Kanjee et al., 2010; Mariën & Verhoeven, 2007; Miller et al., 2006; Moen, 2000; Roy et al., 2012; Whiteside & Varley, 1998), we assume that FAS is often due to an underlying AoS. Speakers with AoS adapting to this underlying disorder will speak slowly and use strategies like segmentation and scanned speech. By speaking slowly and using such strategies, speakers will put much more force of articulation into their speech, leading to, for example, a lack of assimilation and stress on every single syllable; however, speaking with more force of articulation may lead to different accents. FAS is not only seen in subjects with AoS though. As Miller et al. (2006) already pointed out, we should not state that FAS is a symptom of AoS, as it is also seen in speakers with dysarthria or even in speakers with no evident speech disorder. These speakers are often described as speaking slowly or as using scanned speech. In all these cases, the presumed accent therefore is not assumed to be in the speech of the FAS speaker, but it is the interpreted accent of the listener. Listeners focus on stereotypical segmental or prosodic aspects of speech, on the basis of which decide on a specific accent.

The fact that listeners focus on different aspects of speech also means that it is not possible to come up with a hierarchy of possible accent changes. In the introduction, we explained that, for example, English and Dutch have some aspects that would put English higher in such a hierarchy, whereas other aspects would lead to a higher position for Dutch. Nevertheless, we identified some aspects of force of articulation and provided expectations with respect to the change of accents. According to us, accents were expected to change from stress-timed to syllable-timed languages, from weight-sensitive stress systems to weight-insensitive systems, and within these language groups from languages characterised by, for example, relatively more reduction and assimilation processes to languages with relatively less lenition, or from languages with relatively short voice onset times in plosives to languages with relatively longer ones.

We tested our hypothesis with the FAS cases that have been described until now. We restricted ourselves to the cases of neurogenic FAS described in English and to which enough details were provided in order to be able to judge the accent change. From the 58 cases that fitted with these criteria, 89.7% showed a change of accent in the expected direction. From these cases, six were changes within the same type of accents. Only six accent changes did not directly support our hypothesis. The reported phonetic descriptions of the cases, if available, nevertheless suggest that they do not seem to completely violate our hypothesis.

We also made an overview of the other neurogenic cases that were published until now, including the ones published in other languages. Most accent changes in these cases are described in the expected direction as well, although we have to admit that there are also some cases, among which the first described cases of FAS by Marie (1907) and Pick (1919), that do not show the expected direction. Unfortunately, detailed descriptions lack for these counterexamples. Therefore, we are not able to discuss why unexpected accents were reported in these cases.

A change of accent in the expected direction also seems to hold for the developmental and psychogenic cases of FAS. With respect to the latter observation, it is not
possible to assume that an adaptation to an underlying impairment leads to an increase of force of articulation. However, it is remarkable that also in these cases the same distribution of accent changes is seen. We speculate that in the psychogenic cases, the slow speech of the speakers (due to their psychogenic deficit or due to the medication they use) may lead to comparable symptoms as seen in speakers with neurogenic FAS. Of course, this speculation deserves more detailed future research, especially to the underlying impairment in these cases.

We tested our hypothesis on the cases of FAS described so far. However, our hypothesis is still falsifiable with future cases of (neurogenic) FAS. Table 1 may be used for this purpose. To be able to interpret and compare cases, it is advised that the foreign accent is clearly described, especially with respect to the segmental and prosodic aspects of the accent, that a group of naive, objective listeners is asked to judge the accent without forced choices and favourably by providing them not only a sample of the foreign accent, but also other speech samples with, for example, second-language learners, as Verhoeven et al. (2013) have done and a clear description of the language and articulatory deficits from which a speaker suffers; the ideal situation would be access to the FAS speaker’s speech sample, to give all scholars interested in FAS the opportunity to hear the perceived accent themselves.

Disclosure statement
No potential conflict of interest was reported by the authors.

References


