Learning Outcomes

Understand the basics of the source filter model of speech production and how it relates to the production of different consonant sounds

Speech Production – the source

- Air is forced out the lungs by the raising of the diaphragm.

- The air flow passes through the vocal cords.

- Voiced sounds: the vocal folds shut, air pressure build up behind them, folds forced open, air flows through, folds snap shut and the cycle begins again - for voiced sounds the air flow is periodically interrupted (c.f. click-trains)

Speech Production – the source

- Air is forced out the lungs by the raising of the diaphragm.

- Voiceless sounds: the vocal cords are open all the time, there is no periodic structure to the sounds produced – these are often noise-like sounds.

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- (1) feel the larynx with your fingers, say the vowels "aaah", "eeee", "oooo" "eerr" trying to keep a constant pitch - the vocal folds vibrate at the same rate but the tongue moves around.

- (2) repeat this with the same vowels but with a higher pitch - the articulators move in the same way, but the vocal folds vibrate faster

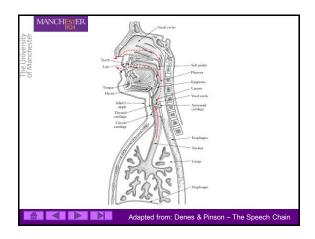
- (3) Now repeat this with whispered (voiceless) vowels - the vocal folds no longer vibrate.

Speech Production – the filter

- Air flows up through the pharynx into the mouth (buccal cavity) and, for nasal sounds where the soft palate is lowered, into the nasal cavity.

- The position of the articulators (tongue, lips, teeth, soft palate) can be moved around to change the shape of the resonant cavities which change the spectral shape (i.e. filter) the of the sound entering them.

- The speech sound is radiated from the lips.



## Speech production (recap)

- Air forced out from lungs
- Vocal folds vibrate (voiced sounds) or stay open (unvoiced)
- Air-flow enters the mouth (& nasal cavity for nasal sounds such as m & n)
- Resonances in these cavities result in formants (e.g. in vowel sounds)
- Consonants are produced by differing degrees of constriction of the vocal tract occurring at different places
- Narrow constriction fricatives (e.g. s, sh, z etc)
- Complete closure stops or plosives (e.g. p, t, k, b, d, g)



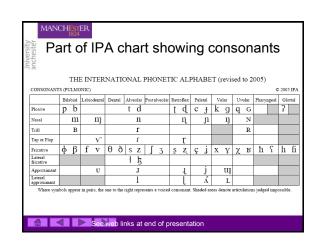
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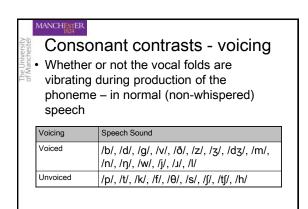
## Phonemes

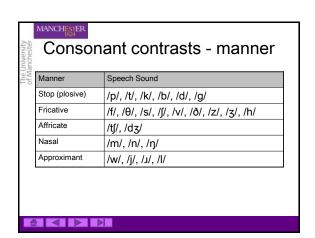
- When talking about speech sounds we need to be able to describe them individually
- We do this on the basis of the shortest discrete "chunk" of speech – what we term **phonemes**
- "A phoneme is a family of sounds that function in a language to signal a difference in meaning" (Speech Science Primer)
- "pat" has three phonemes the sounds: associated with "p", "a" and "t"
- "bat" has three phonemes the sounds: associated with "b", "a" and "t"



## Voice, Place, Manner – labelling consonants. • Human speech sounds (phonemes) can be described in terms of: – (a) vibration or not of vocal folds (voicing) – (b) position of articulators (place of closure or near closure in the vocal tract). – (c) the type of constriction caused by the articulators (manner - plosive, fricative, affricate, nasal, approximants, ...).







ret.	Consonant contrasts - place		
Univers Manches	Place	Speech Sound	I
The L of Ma	Bilabial	/p/, /b/, /m/, /w/*	FRONT
	Labiodental	/f/, /v/	<u>+</u>
	Dental	/θ/, /ð/	
	Alveolar	/t/, /d/, /n/, /s/, /z/, /ɹ/, /l/	
	Palato-alveolar	/ʃ/, /ʒ/, /tʃ/, /dʒ/	
	Palatal	/j/	$\downarrow$
	Velar	/k/, /g/, /ŋ/, /w/*	BACK
	Glottal	/h/	B/
*/w/ is in two "places" because there is both a narrowing of the lips, and a raising of the tongue towards the soft palate			