

En model for hvordan den enkelte lytter fastlægger sit Acceptable Noise Level (ANL)

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Acceptable Noise Level (ANL)

- A method for quantification of the level of background noise a subject can accept when listening to speech at MCL
 - Used for prediction of individual hearing aid use patterns
 - “I use my hearing aid whenever it is needed”
 - “I use my hearing aid occasionally”/ “I don’t use my hearing aid at all”

Nabelek et al (2006)

The chance for success and failure is equal



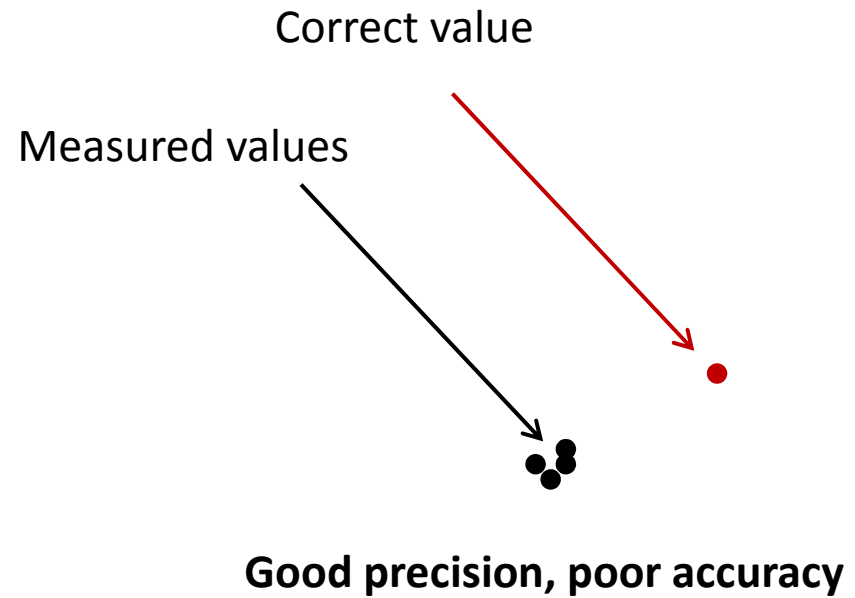
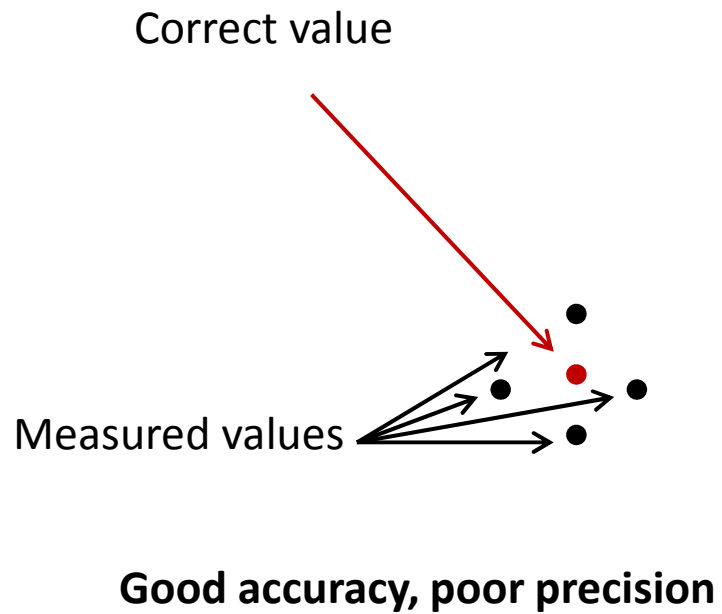
ANL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Will probably be a full-time user						Uncertain outcome						Will probably only use hearing aids occasionally or not at all							

- Used for evaluation of hearing aid features
 - Directional microphone systems, noise reduction algorithms

The ANL method

- Speech presentation
- Speech set to MCL by test subject
- Add noise to speech
 - Same transducer
 - Speech kept at the selected level
- Noise set to highest acceptable level (BNL) by subject
- $ANL = MCL - BNL$

Accuracy and precision



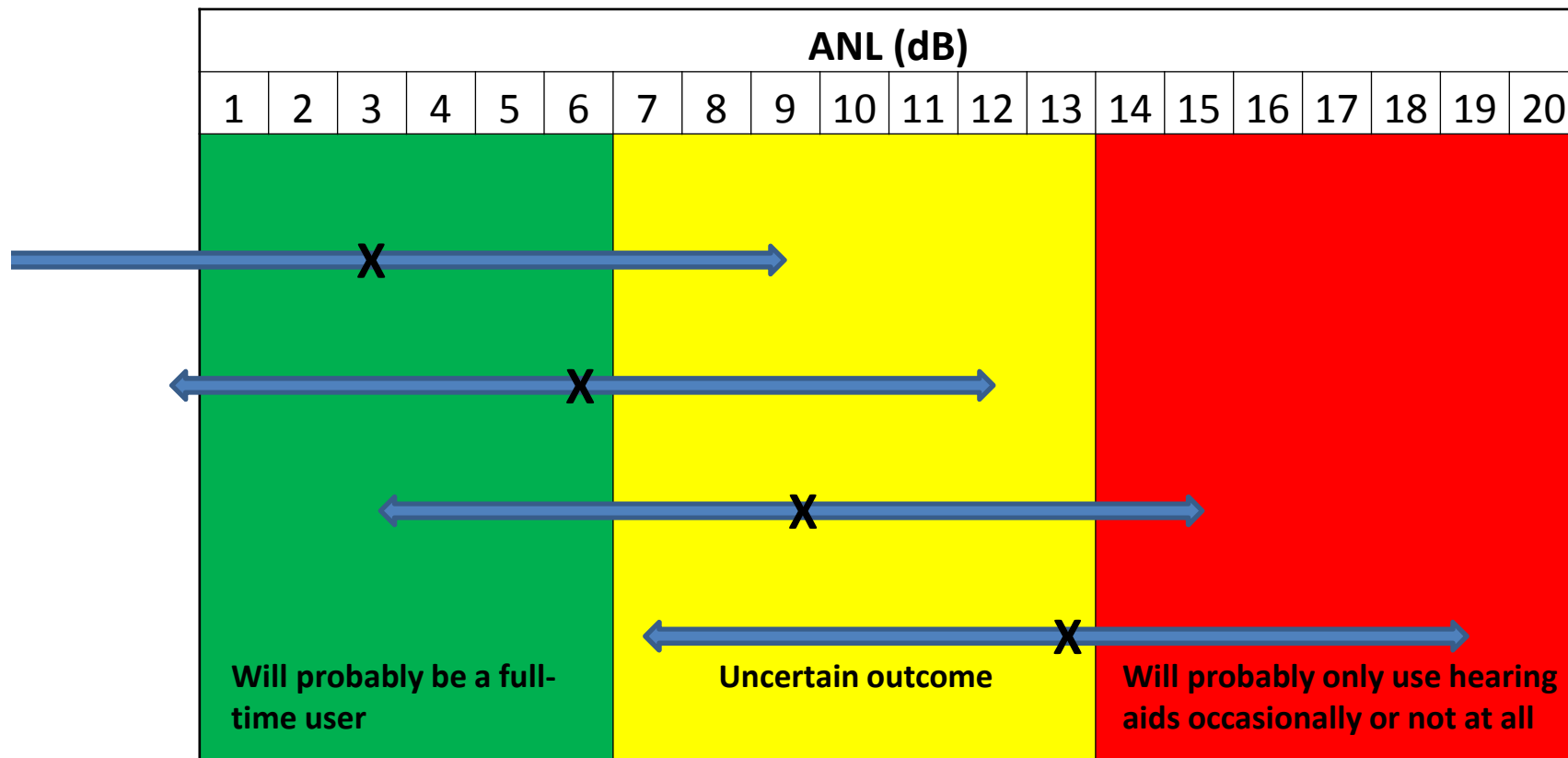
	Study	Number of subj	Sessions on the same day			Sessions on separate days	
			Normal Hearing	Mixed	Impaired hearing	Normal Hearing	Impaired hearing
Intra tester	Freyaldenhoven et al (2006)	30	CR (dB)			-	
			Max test retest diff (dB)			14.3	
	Nabelek et al (2004)	50	CR (dB)				-
			Max test retest diff (dB)				4.0
	Olsen et al (2012a)	39	CR (dB)	6.0 - 8.9		8.8 - 10.2	
			Max test retest diff (dB)	12.0		15.3	
	Olsen et al (2012b)	63	CR (dB)		6.5 - 8.6		7.1 - 8.8
		Max test retest diff (dB)		15.4		15.0	
	Holm & Kastberg (2012)	32	CR (dB)	7.6			
			Max test retest diff (dB)	14.0			
	Walravens et al (2012)	290	CR (dB)		8.5		
			Max test retest diff (dB)		20		
Inter tester	Gordon-Hickey et al (2012)	25	CR (dB)	4.7 - 7.6			
			Max test retest diff (dB)	8.7			

CR = 1.96 X SD of differences between repeated measures

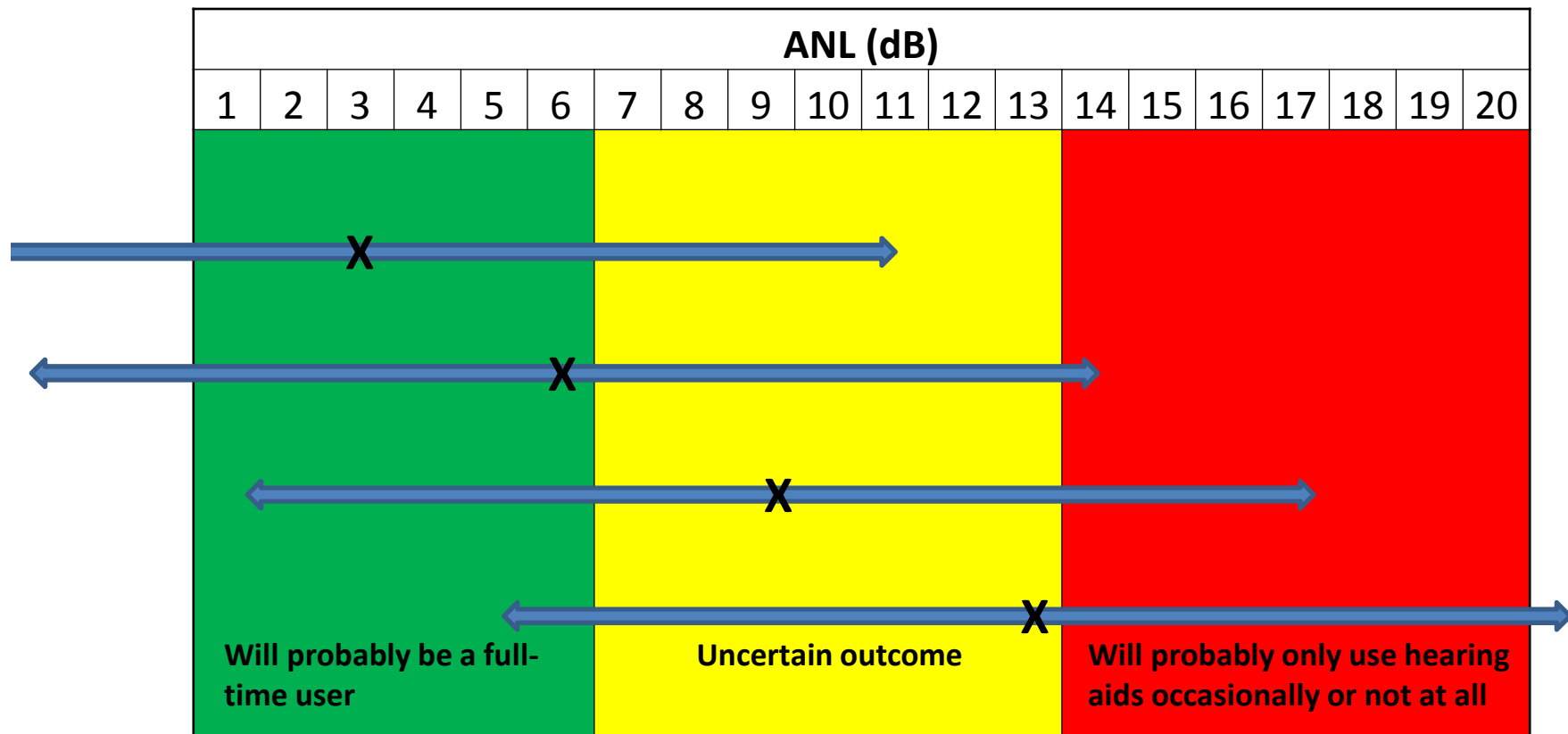
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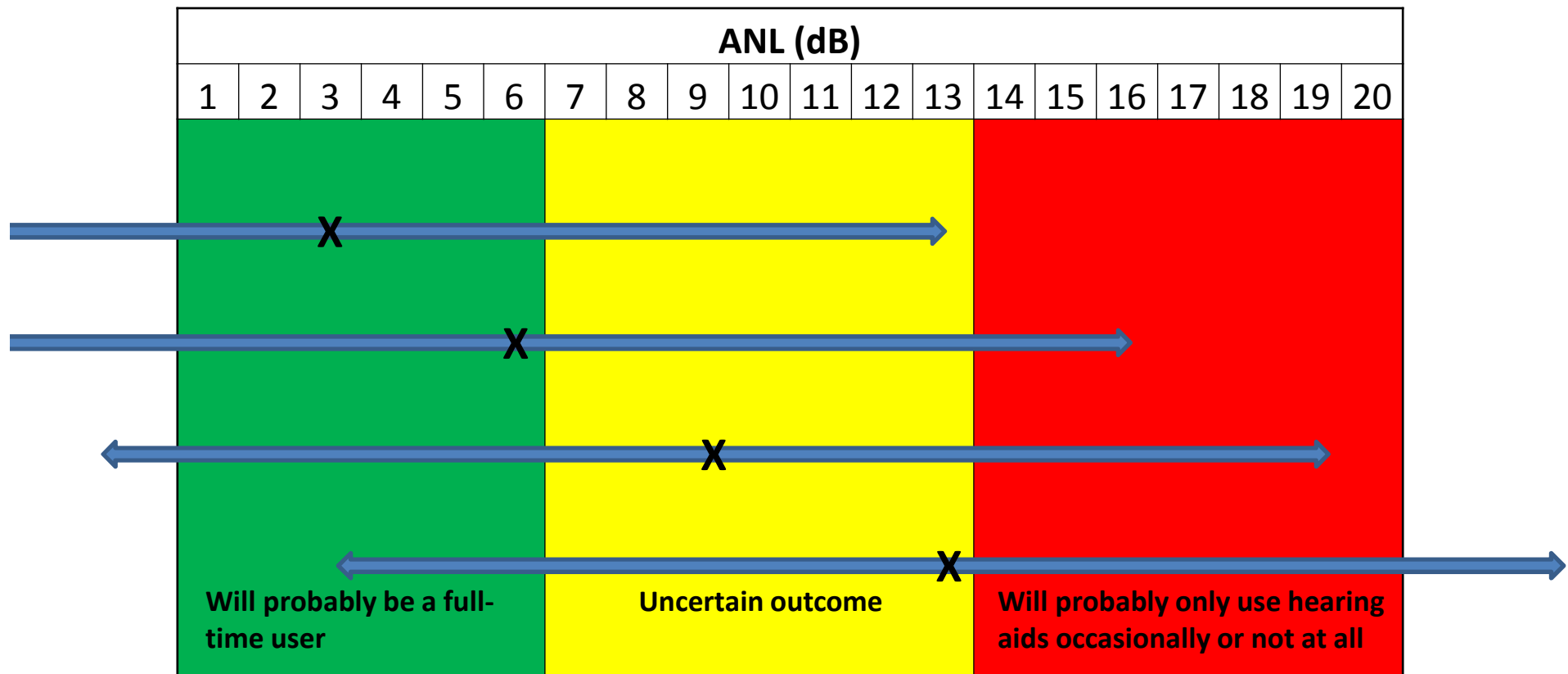
What does a CR of 6 dB mean?



What does a CR of 8 dB mean?



What does a CR of 10 dB mean?



Precision and prediction accuracy

- The precision of the ANL is too poor to show differences of the magnitude that it was designed for.
- It has never been shown that ANL can predict hearing aid use.

Prediction of future HA use

- ANL predicts HA use with 85% accuracy
- A statistical model tends to fit the data upon which it is developed better than on independent data

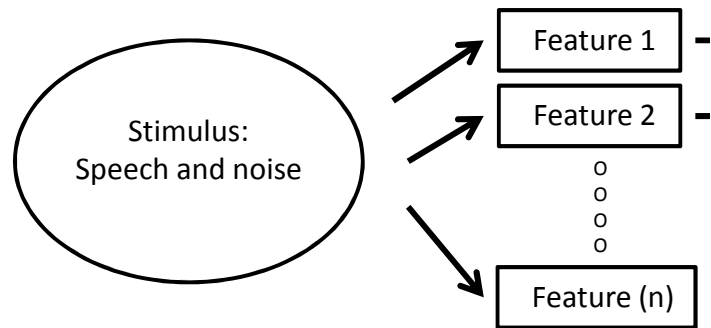
Nabelek et al (2006)

- 25% of listeners would be misclassified with the ANL procedure

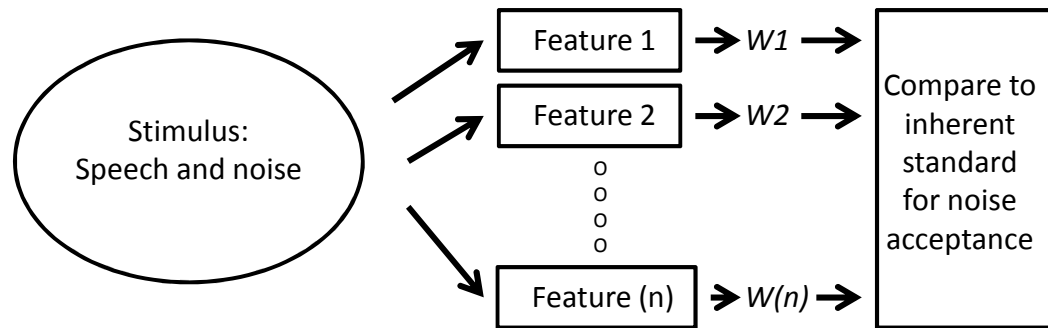
Nabelek et al (2007)

Stimulus:
Speech and noise

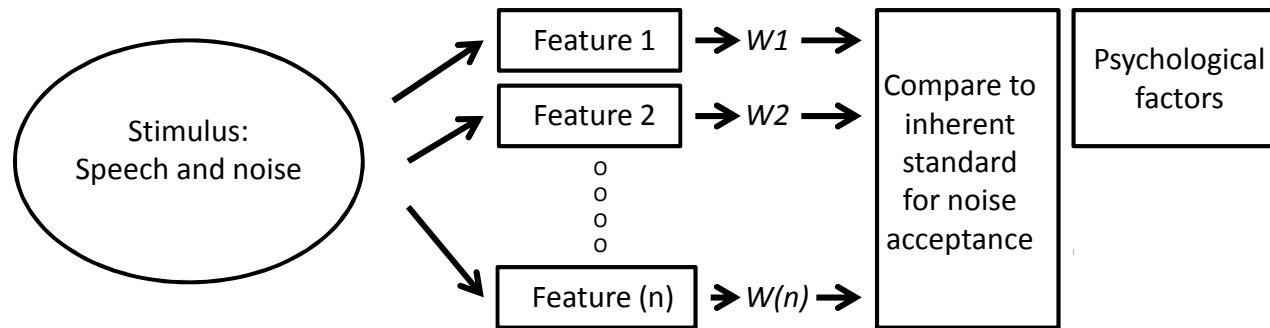
Model by Wu et al (2013)



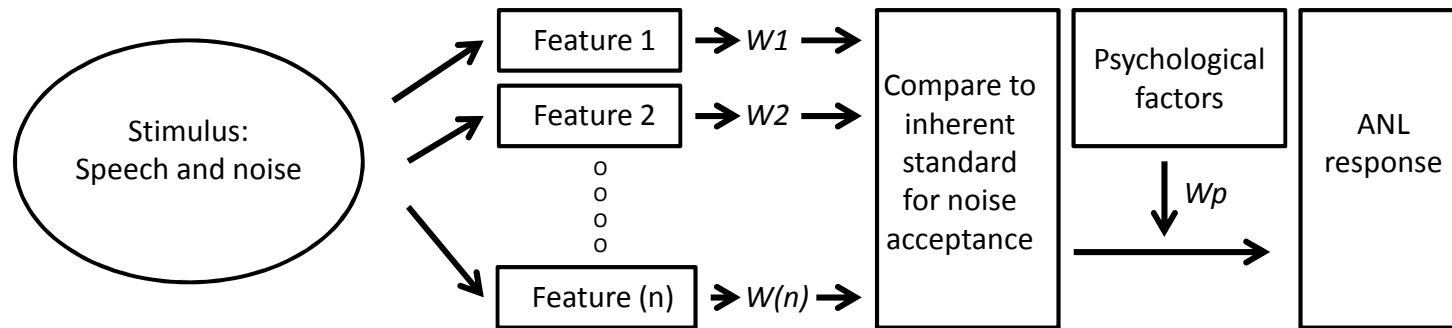
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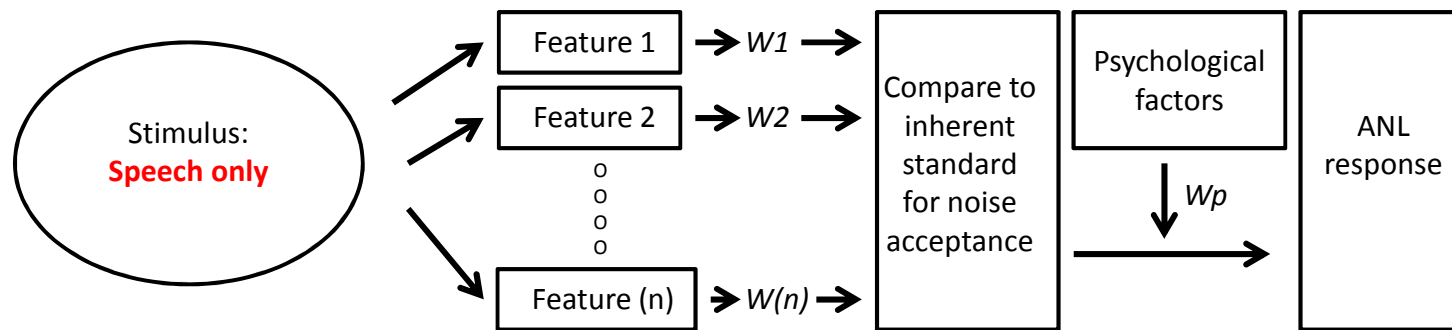
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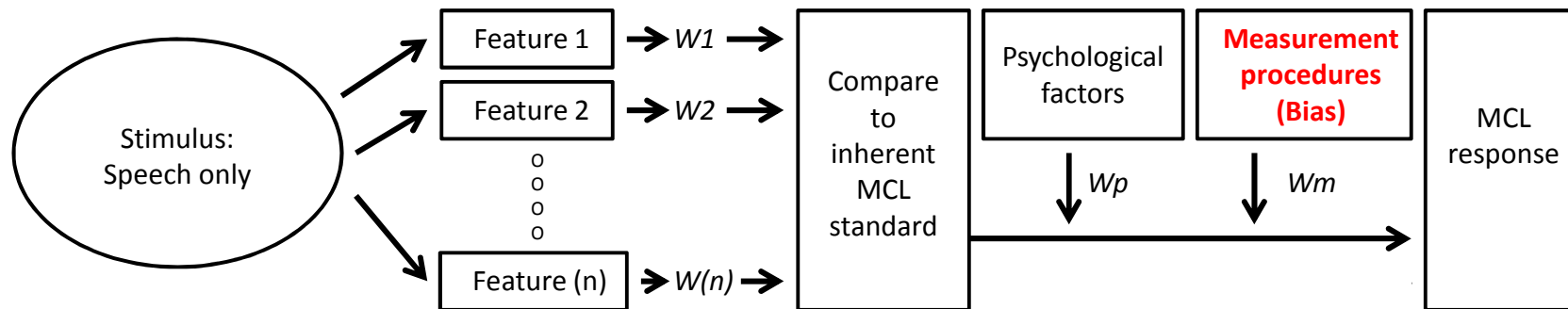
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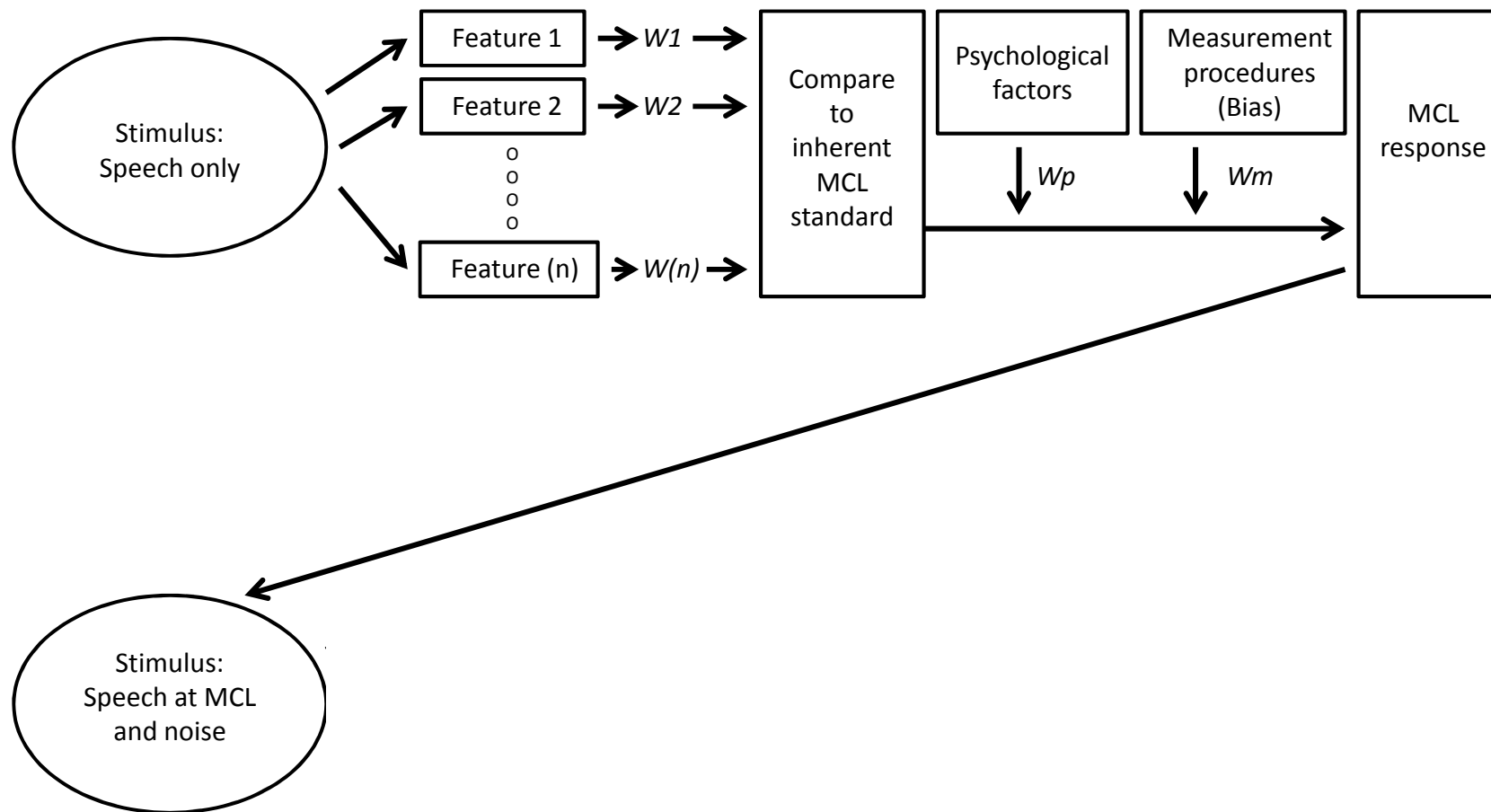
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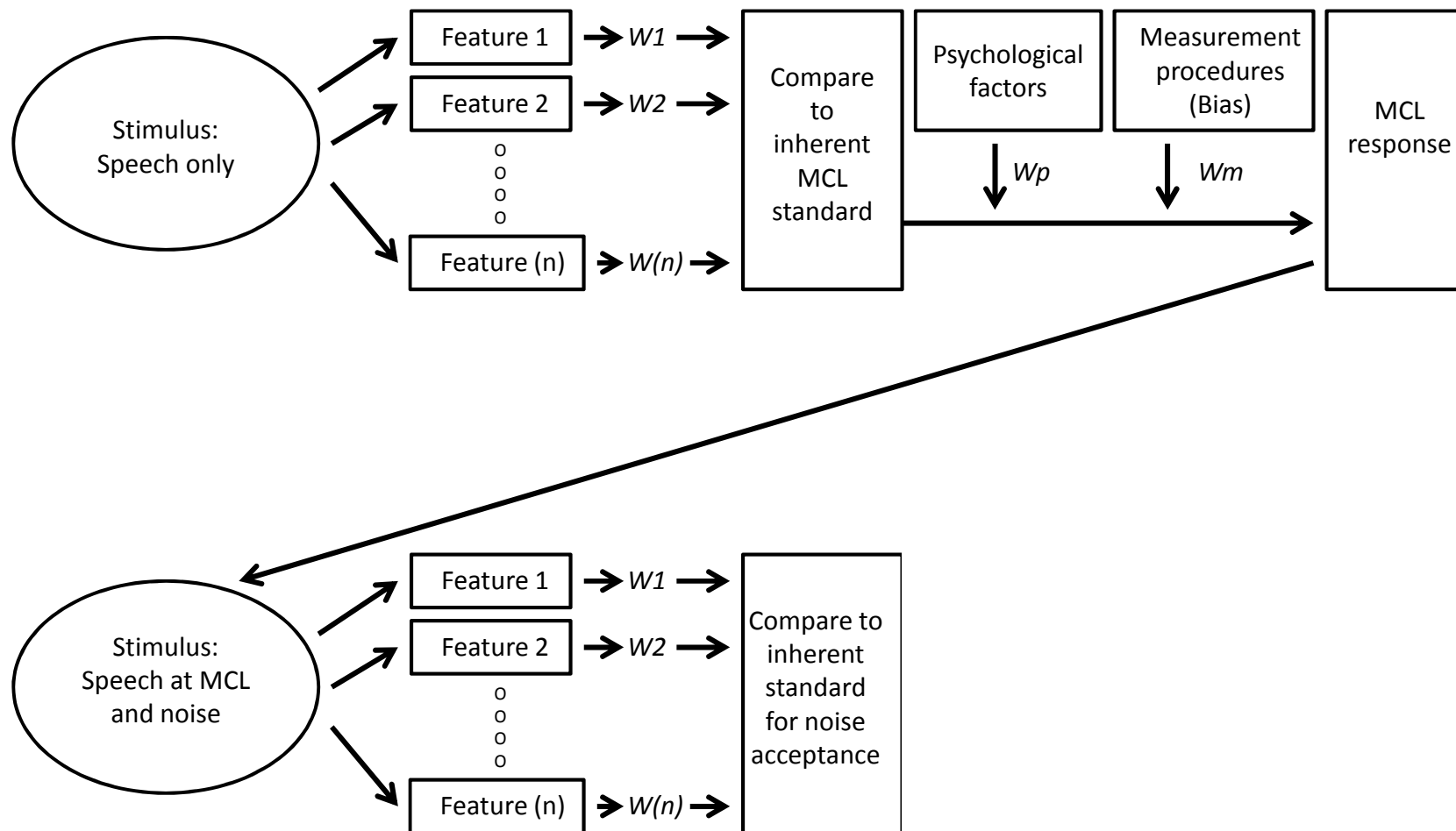
Model by Olsen & Brännström, 2013



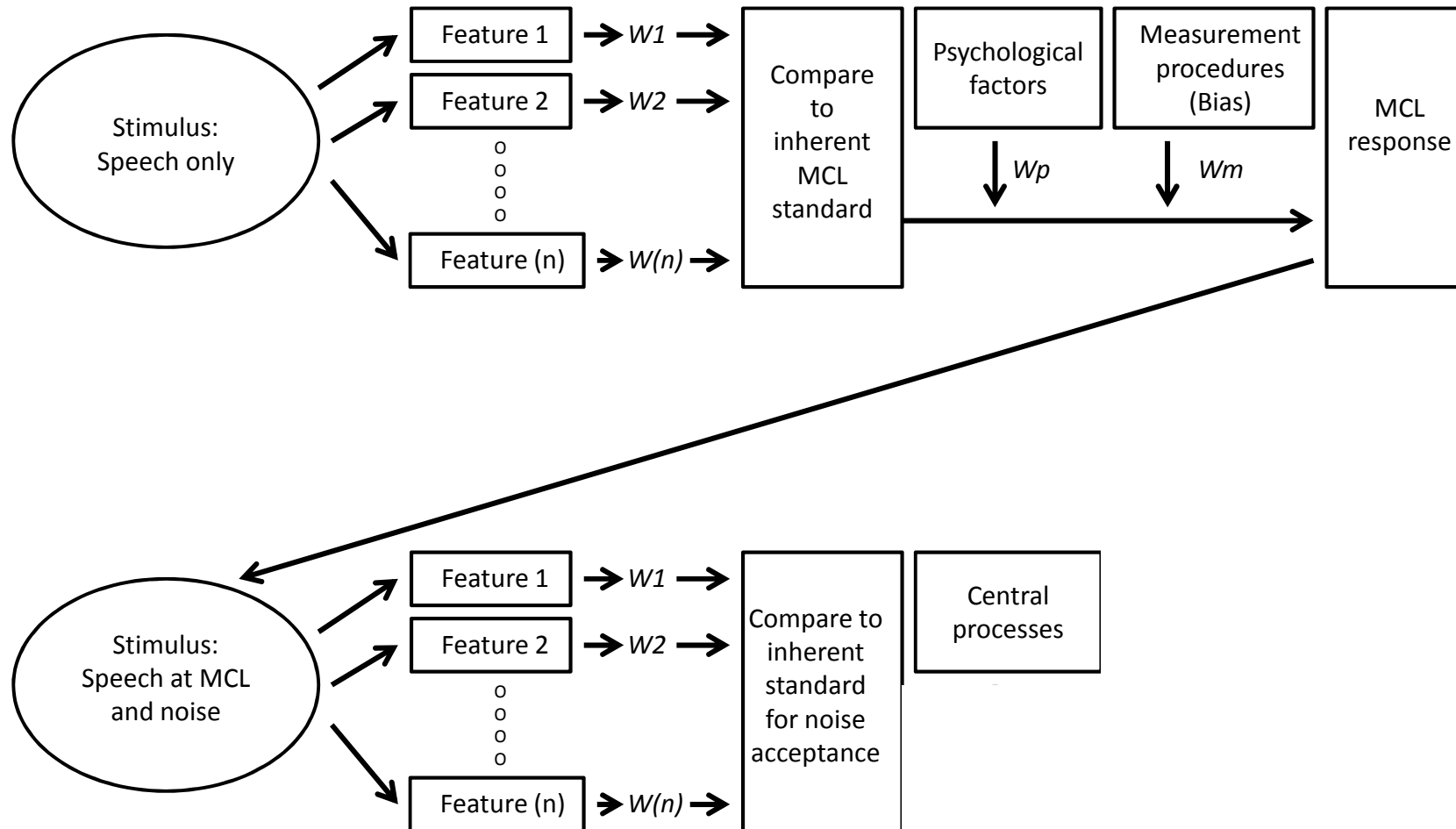
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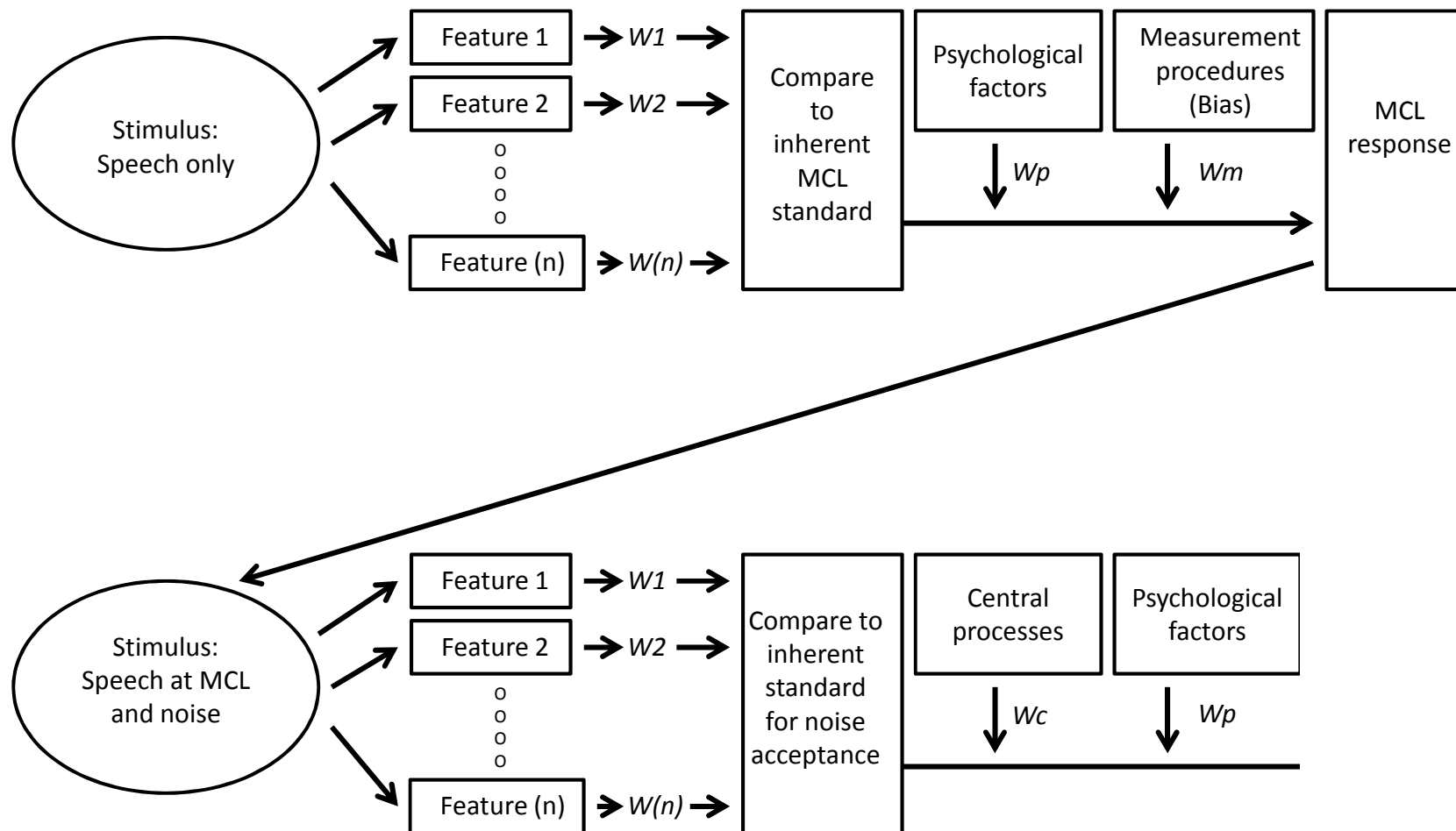
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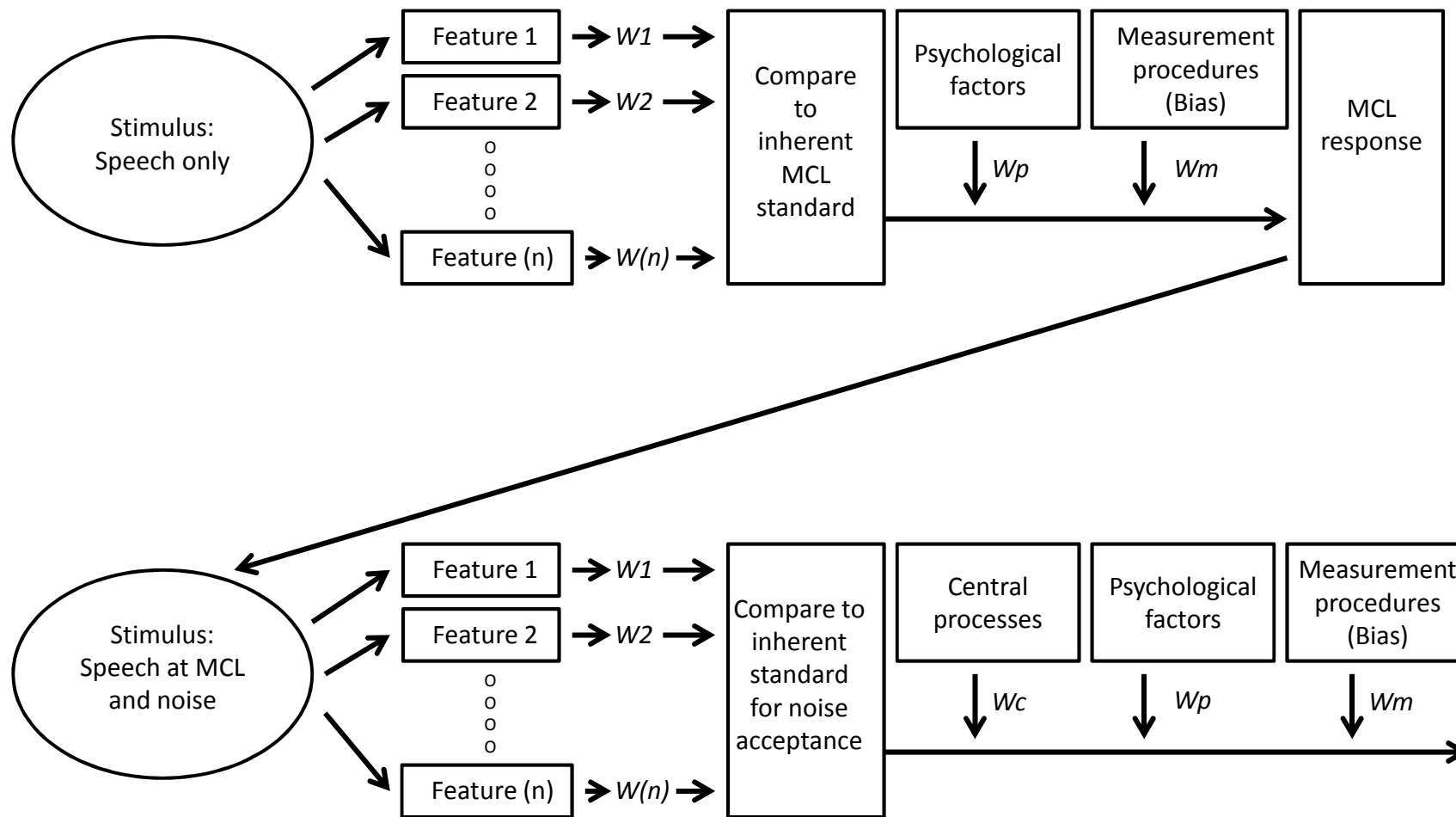
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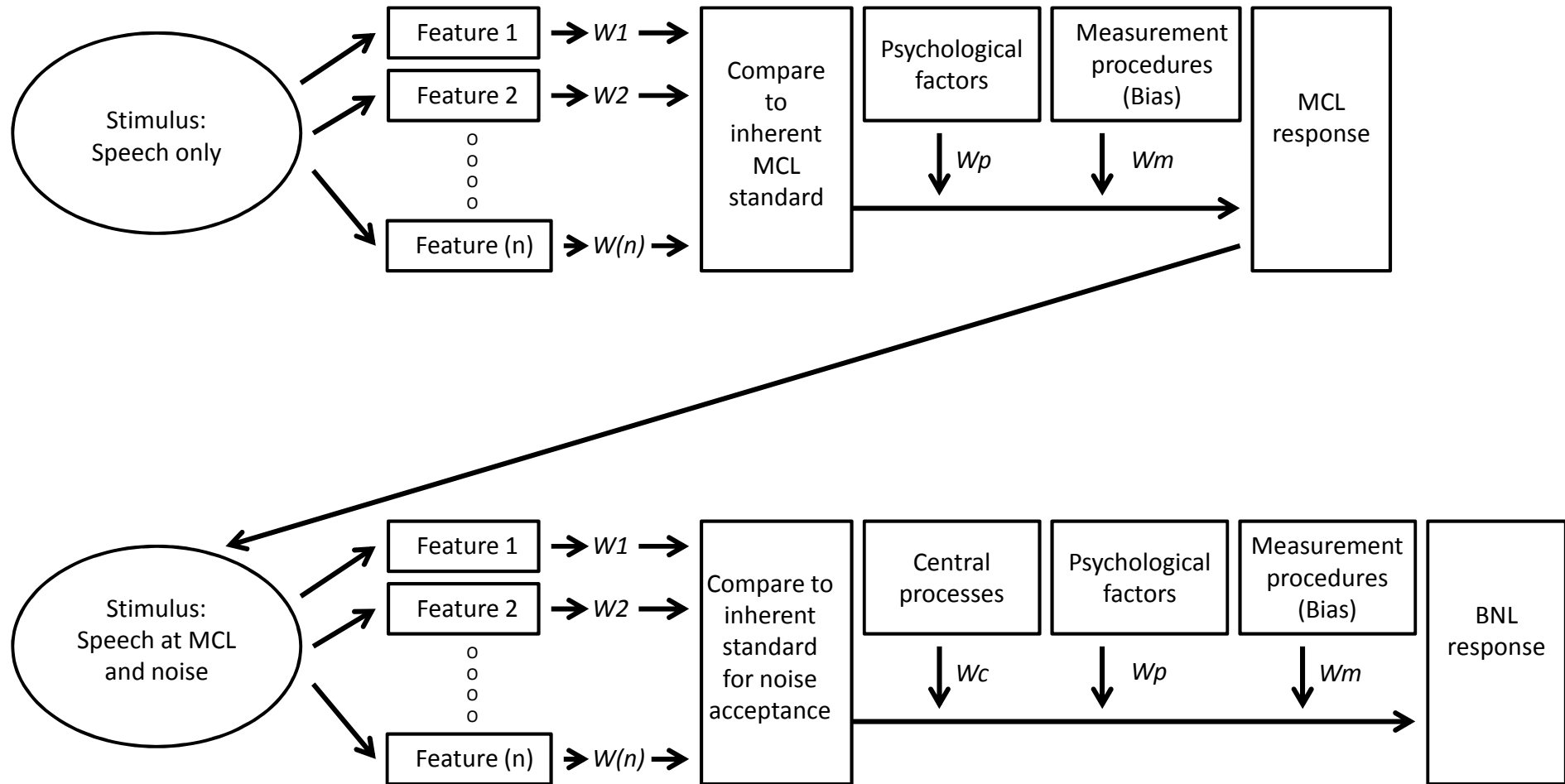
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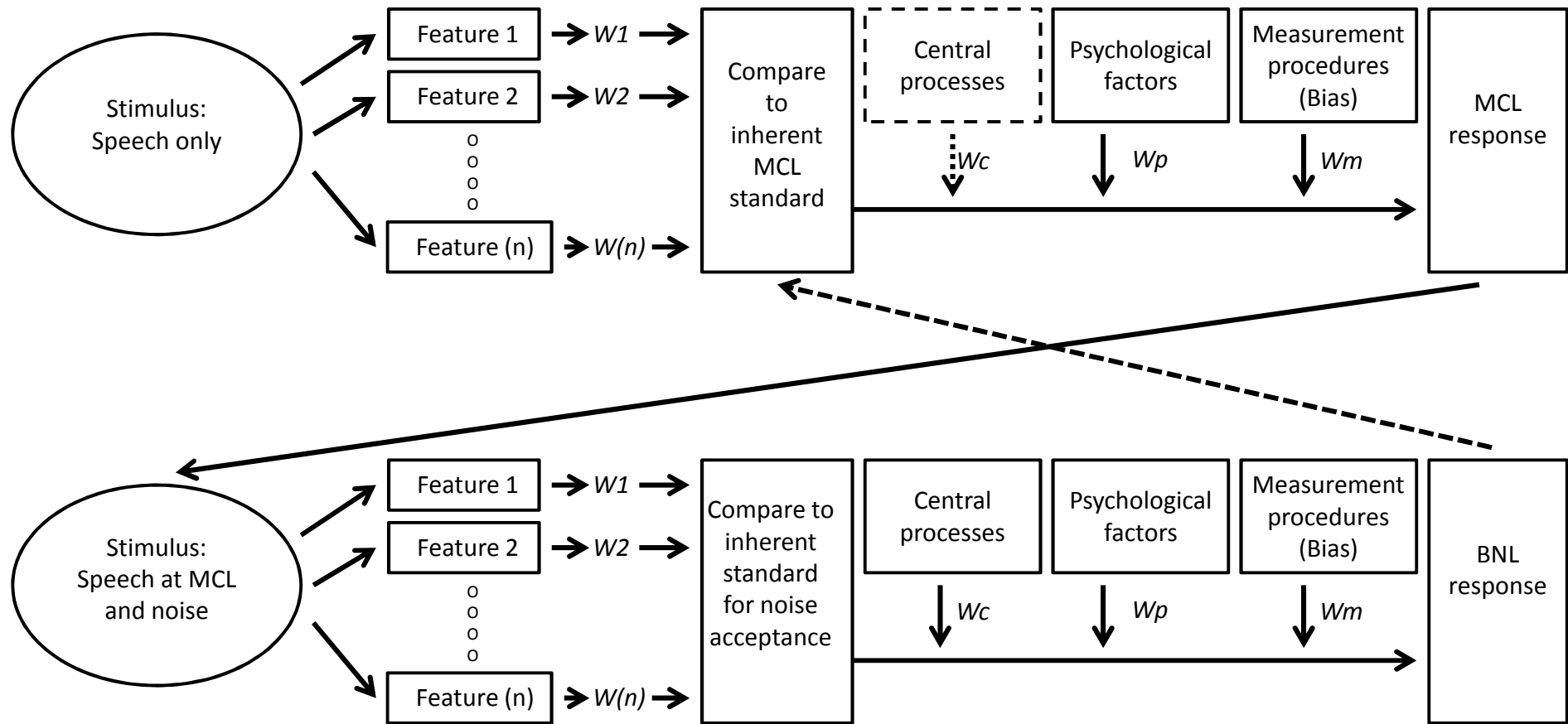
Model by Olsen & Brännström, 2013



Model by Olsen & Brännström, 2013



Model by Olsen & Brännström, 2013



Model by Brännström et al, 2013

Summary

- Our ANL model includes effects of
 - measurement procedures
 - psychological factors
 - WMC and central auditory processes
- The model demonstrates why ANL may not be related to HA use.
- Future research should propose improvements of the ANL method.

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