

University Forum (May 24, 2011)

Strategic Research Theme – Sciences of Learning

# Application of implicit motor learning principles to speech motor learning

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# The “speech motor learning” team



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SHS



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Ph.D. candidate



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# Background

## – speech and voice production

- Clients with motor speech and voice disorders have impaired regulation of speech and voice production (programming and execution of speech motor movements).
- Clinical examples
  - Parkinson's disease – reduced pitch variability
  - Cerebral palsy – excessive pitch variability.
  - Hyperfunctional dysphonia – excessive laryngeal muscle tension.
- Treatments target at training clients to (re) learn motor skills for effective speech and voice production.

# Background

## – Implicit learning

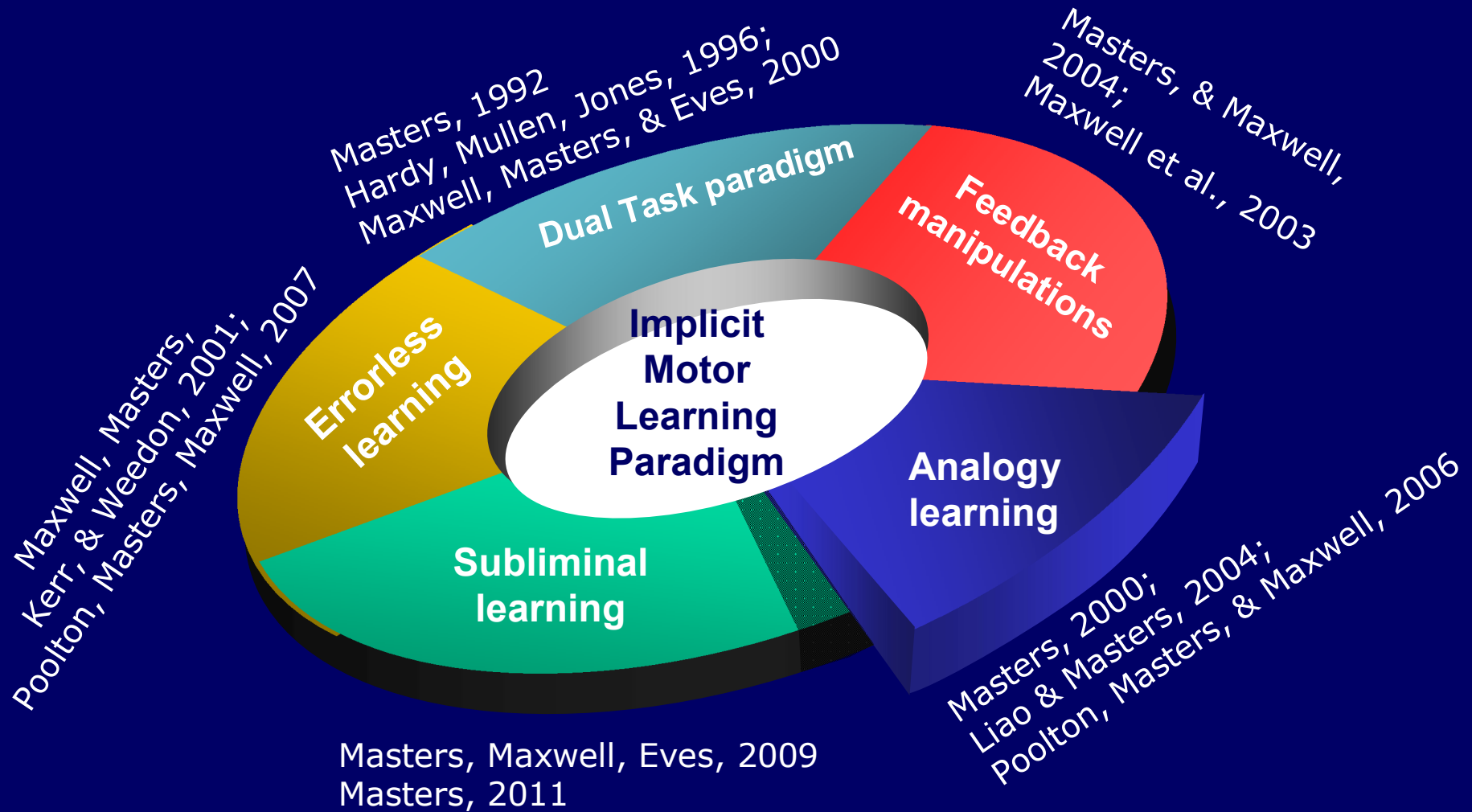
### A typical definition of implicit learning...

“a person typically learns about the structure of a fairly complex stimulus environment **without necessarily intending to do so**, in such a way that the resulting knowledge is difficult to express.”

Berry & Dienes (1993, p.2)

# Background

## – Implicit motor learning paradigms

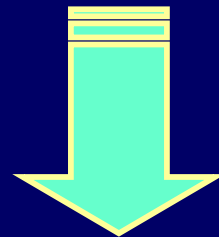


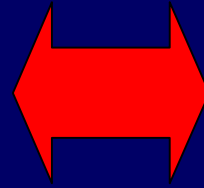
**An analogy is .....**

**“a similarity between like features of two things,  
on which a comparison may be based”**

**Dictionary.com**

**e.g., the analogy between the heart and a pump**





### Advantages of analogy learning

- ✓ Easy to learn quickly.
- ✓ Performance is robust under stress.
- ✓ Learners are able to multi-task after training.

# “speech production” & “motor learning”

## SHS

- Expertise in speech treatment.
- Speech motor learning.



## IHP

- Expertise in psychology of motor learning.
- Sport learning.



If the principles of general (non-speech) motor learning can be applied to speech motor learning??



# Implications of research findings

- Practical (clinical application)
  - Inform clinicians an intervention program that can optimize clients' learning of speech and voice production.
- Theoretical
  - Evaluate the universality of motor learning theories.

# The use of analogy in speech motor performance

Tse, A. C.-Y., Masters, R., Whitehill, T., & Ma, E. P.-M. (in press). *International Journal of Speech-Language Pathology*.

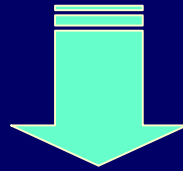


# Aim of study

- To examine pitch variation in participants who received either analogy instructions or explicit instructions (modulating their intonation during speech production).

# Methodology

**Step I** – Focus group for culturally appropriate analogies of monotone, normal and excessive intonation.



**Step II** – 40 participants completed a speech task following either analogy or explicit instructions.

## Monotone (Minimal) Pitch Variation

### Explicit Instruction

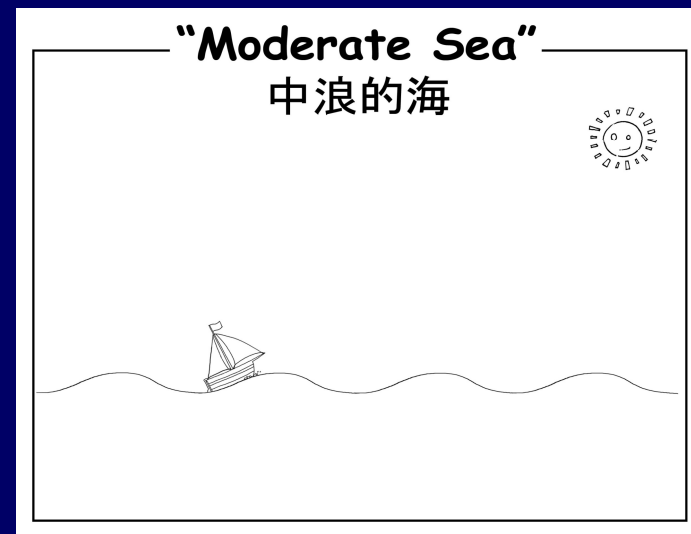
Read aloud with no pitch variation. That is, speak without changes in the highness or lowness of your voice.



## Moderate Pitch Variation

### Explicit Instruction

Read aloud with moderate pitch variation. That is, speak with neither excessive nor minimal changes in the highness or lowness of your voice.

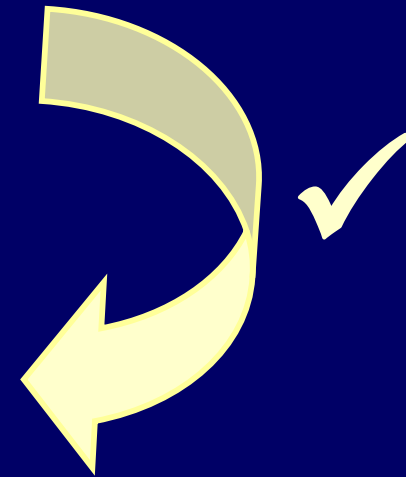


# Results & implications

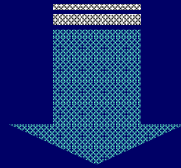
- Analogy instructions were significantly more effective than explicit instructions for inducing monotone.

Well-established advantages of analogy learning in sport learning.

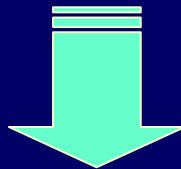
Demonstrated its benefits in speech learning.



**Step I** – Focus group for culturally appropriate analogies of monotone, normal and excessive intonation



**Step II** – 40 participants completed a speech task following either analogy or explicit instructions.

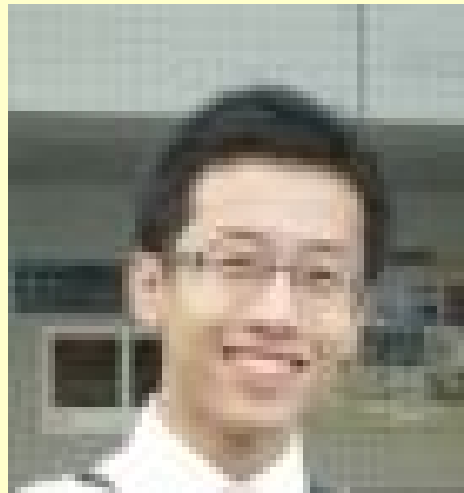


**Study 2** – Examine the effectiveness of analogy instruction under stressful conditions.

## Study Two

### The effectiveness of analogy instructions under stressful conditions

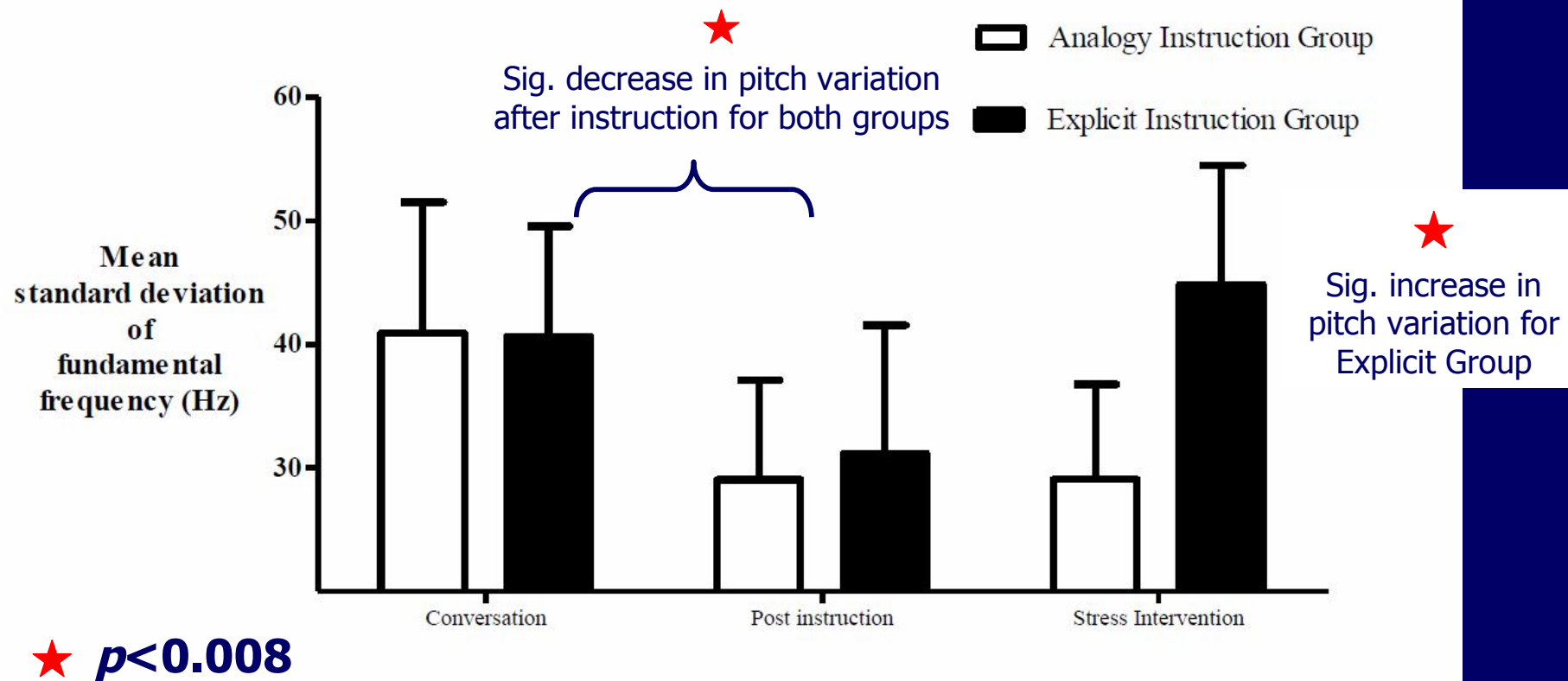
Tse, A. C.Y., Masters, R.S.W., Whitehill, T., & Ma, E.P.-M (2010).  
The potential application of analogy learning in speech rehabilitation.  
Poster presentation at the 3rd HKASMSS Student Conference on  
Sport Medicine, Rehabilitation and Exercise Science, Hong Kong.



**Best Paper Award !!**



# Results of Study Two



# Future planning

- Continue our “programmatic research”.
  - children population, clinical populations, other implicit learning paradigms.
- Apply for external competitive grants (GRF, HHRSF)
  - Further our research to clinical applications.
- Explore international exchanges (e.g., with UQ)
  - Learn new techniques, generate new collaborations.
- Undergraduate dissertation studies

# Added values of the SRT

2009

2011 and onwards

- Brain-storming research ideas at the first Town Hall Meeting in 2009.
- Collaborative research projects, co-supervise PhD and PDF.
- Established a programme of research to be further expanded.

# Added values of the SRT

- Team personnel (supported by the SRT SoL)
  - Andy Tse (PhD candidate)
  - Dr. Andus Wong (Post-doctoral fellow)
- Projects to date
  - 2 completed, 3 in progress
- Research output
  - 10 refereed papers (5 published, 1 in press, 4 in preparation)
  - 6 conference presentations
  - 2 grants funded (internal)

# Added values of the SRT

- Cross-disciplinary fertilizing
  - Transfer the scientific principles across disciplinary boundaries (SHS and IHP).
  - Enable us to pilot our ideas, generate research data.
  - Develop a specific track record and work within a programme of research.

# Papers

- Tse, A. C.-Y., Masters, R., Whitehill, T., & Ma, E. P.-M. (in press). The use of analogy in speech motor learning. *International Journal of Speech-Language Pathology*.
- Wong, A. W.-K., Ma, E. P.-M., Whitehill, T., & Masters, R. (in preparation). Effects of practice schedules on speech motor learning. *Journal of Speech, Language, and Hearing Research*.
- Wong, A. W.-K., Ma, E. P.-M., Whitehill, T., & Masters, R. (in preparation). Effects of errorless learning on velopharyngeal control: Implications for the treatment of resonance disorders. *Journal of the Acoustic Society of America*.

# Conference papers

- 1) Tse, A. C.-Y., Masters, R., Whitehill, T., & Ma, E. P.-M. (2010). Investigating the use of analogy in speech motor learning. Presented at Faculty of Education Postgraduate Research Conference, The University of Hong Kong, Hong Kong, 11 Dec.
- 2) Tse, A. C.-Y., Masters, R., Whitehill, T., & Ma, E. P.-M. (2011). Investigating the use of analogy in speech motor learning. Poster presented at *The Asia Pacific Conference on Speech, Language and Hearing*. Canterbury, New Zealand. 11-14 Jan.
- 3) Tse, A., Masters, R.S.W., Whitehill, T., & Ma, E. (2011). Testing an applied solution to a speech motor problem. *ASARG Australasian Skill Acquisition Research Group Annual Conference*, Institute of Human Performance, The University of Hong Kong, Hong Kong, 23 – 24 May.

# Conference papers

- 4) Tse, A. C.-Y., Masters, R.S.W., Whitehill, T., & Ma, E.P.-M (2010). The potential application of analogy learning in speech rehabilitation. Poster presentation at the 3rd HKASMSS Student Conference on Sport Medicine, Rehabilitation and Exercise Science, The Chinese University of Hong Kong, Hong Kong. **(Best paper award)**.
  
- 5) Wong, A. W.-K., Whitehill, T., Ma, E. P.-M., & Masters, R. (accepted). Effects of practice schedules on speech motor learning. Poster submitted to the 6th International Conference on Speech Motor Control. Groningen, Nijmegen, June 8-11, 2011.



# Funded research grants

- Effects of practice schedules on speech motor learning. Faculty of Education Research Fund. 2010-11. (HK\$30,000).
- Effects of errorless learning on velopharyngeal control: Implications for the treatment of resonance disorder. HKU Seed Funding Programme for Basic Research 2011-2012. (HK\$60,780).