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# Distance Estimation Training: A Proposed Model of Transfer

Background

- Individuals estimate distance inaccurately

- Inability to estimate distances is pervasive
  - Outdoors (Gibson & Bergman, 1954; Gibson, Bergman, & Purdy, 1955)
  - Underwater (Ferris, 1972; 1973)
  - Virtual Environments (Mohler, Creem-Regehr, & Thompson, 2006; Richardson & Waller, 2005; 2007)
  - Night Visions Goggles (Reising & Martin, 1994; 1995)

Training Protocol

- Training protocols have been implemented as a means for improving distance estimations

- Training typically involves two steps:
  - Trainees estimate a target distance
  - Trainees are given feedback on the exact distance to the target

Gibson & Bergman, 1954; Gibson, Bergman, & Purdy, 1955; Hall, Jones, & DeLucia, 2008; Jones, DeLucia, Hall, & Johnson, 2006; Mohler et al., 2006; Richardson & Waller, 2005; 2007; Reising & Martin, 1994; 1995

A Complex Literature
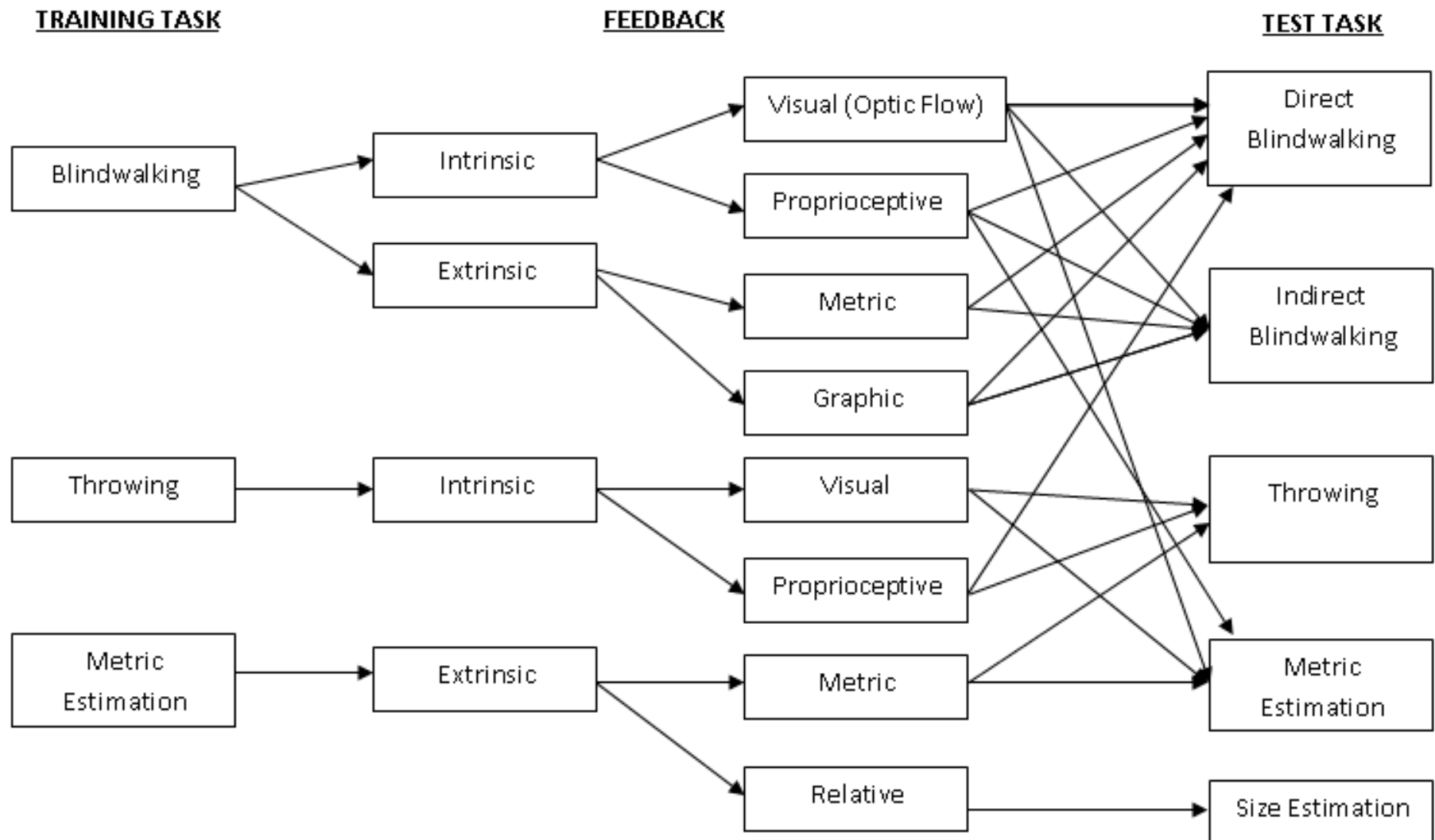
Problems

- Consequently, these diverse combinations of training task, feedback, testing task, distance, and environment do not lend any broad conclusions about transfer.

- Therefore, reliable statements about transfer are limited.

- Up to this point, no attempt has been made to organize the training and transfer research.

Until Now!!

Model - Purpose

- Created a model to foster a better understanding of particular feedback effects and training on post-training performance.

- Highlight specific areas in distance estimation training that would benefit from additional research.

Model - Creation

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  - Type of feedback
  - Transfer task
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- Excluded studies that just focused on transfer between environments (i.e., VE to real world)
- Separated Training and Transfer Experiments
- Examined underlying similarities and differences

Transfer Model

What does training teach?

Perception/Action →   What does transfer require?

         Perception/Action →   Do training and transfer tasks share function?

                                                        Yes → Positive
                                                        No → None

         Cognition→ ?

Cognition →   What does transfer require?

         Perception/Action → Negative

         Cognition →   Do training and transfer tasks share same cognitive component?

                                                        Yes → Positive
                                                        No → None

Model Fit

- Results of past research fit well within the elements of the model, with the exception of a couple:
  - Mohler et al., 2006
  - Richardson & Waller, 2005

- Studies investigated the effects of feedback on blindwalking performance in a virtual environment.
  - Conclusion: Improvements in blindwalking performance most likely due to application of cognitive rule.

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Model – Blindwalking

- At this point, it is unclear whether blindwalking is a perception/action task, or one that has a cognitive component.

- Future research should clarify whether blindwalking has a cognitive component.

Model - Conclusions

- Perception/Action Tasks:
  - For transfer to have a positive result the training and transfer task should share the same underlying functionality.

- Cognitive Tasks:
  - For transfer to have a positive result the training and transfer task should share the same cognitive component.

Model – Future Research

- Further research is necessary to identify the effects of perception/action training on tasks that require cognition.

- Additionally, future research should focus on the underlying structural requirements of blindwalking tasks.

QUESTIONS

Model – Future Research

- More research is needed to assess the negative effects of cognitive training on perception/action transfer tasks.
  - Jones et al., 2006
  - Hall et al., 2008

Transfer Results: Conclusions

- Feedback training encourages individuals to apply a cognitive rule or strategy on subsequent tasks
  - Hall et al., 2008; Jones et al., 2006; Mohler et al., 2006; Richardson & Waller, 2005; Wohlwill, 1964

- Feedback results in perceptual adaptation effects
  - Mohler et al., 2006 (Exp. 3); Richardson & Waller, 2007; Waller & Richardson, 2008

- Training changes ones perception of space and distance
  - Niall, Reising, & Martin, 1999

Model - Separate Elements

- Training vs. Transfer Experiments:
  - Training:
    - Experiments in which the training task and feedback fed directly into transfer task.
      - Metric verbal estimates @ Pre-Test
      - Metric verbal estimates with Metric feedback @ Training
      - Metric verbal estimates @ Post-Test

  - Transfer:
    - Training task and/or feedback were not exactly the same as that required in transfer trials.

Model Fit

- According to the model, if blindwalking is a perception/action task, then the findings of Mohler, et al. (2006) and Richardson and Waller (2005) contradict those of Jones et al. (2006).
  - Cognition → Perception/Action → Positive
    - Richardson & Waller, 2005
    - Mohler et al., 2006

  - Cognition → Perception/Action → Negative
    - Jones et al., 2006

Model Fit

- Perhaps blindwalking is not entirely a perception/action task. A possible explanation, is that blindwalking in fact has a cognitive component to it.
  - Richardson & Waller, 2005
  - Mohler et al., 2006

- Hypothetically, if blindwalking is considering more of a cognitive task, then:
  - Cognition → Cognition → Positive