Validation of the Pitch-Height Stroop Test: A Multidimensional Measure of Cross-Modal Correspondence

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Scan for Selected References

Background

- Pitch-height cross-modal correspondence is a cognitive phenomenon in which pitches of faster vibrational frequency are congruent with "high" spatial direction and pitches of slower frequency is congruent with "low" spatial direction *(e.g. Spence, 2011; Walker, 2016)*.
- Prior researchers have focused on either its perceptual or linguistic dimension alone and found conflicting evidence as to its developmental origins and trajectory *(e.g. Dolscheid et al., 2014; 2015; Fernández-Prieto et al., 2017; Holler et al., 2022; Speed et al., 2021; Starr & Srinivasan, 2018; Walker et al., 2010)*.
- Researchers have previously used Stroop-like tasks to measure one dimension at a time *(e.g. Ben-Artzi & Marks, 1995; Evans & Treisman, 2010; McClain, 1983; Moss et al., 2020; Spapé & Hommel, 2008)*.
- A multidimensional measure of Pitch-Height Cross-Modal Correspondence could enable comparison within the same participant group.
- This could potentially reveal developmental differences across dimensions, clarifying prior research.

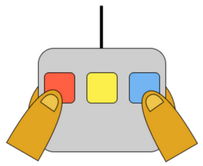
Purpose

Determine the validity and reliability of the Pitch-Height Stroop Test, a novel measure of cross-modal correspondence between pitch and multiple dimensions of the construct of height.

Method

- Participants: 50 adult, English-speaking singers
- Measures:
  - Pitch-Height Stroop Test (Novel)
  - Demographic and Musical Background Questionnaire
  - Profile of Music Perception Skills, Pitch and Melody Subtests (Zentner & Strauss, 2017)
  - Flanker Task (covariate; Eriksen & Eriksen, 1974)
  - Vocal Sight Reading Inventory (Henry, 1999)

PHST Tasks



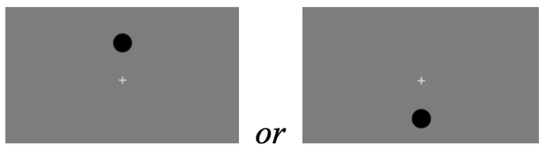
a. Baseline pitch classification task

with 196 Hz *or* 392 Hz

b. Pitch-word auditory Stroop

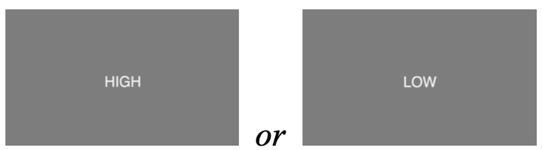
with 196 Hz *or* 392 Hz; "high" or "low"

c. Pitch-location auditory-visual Stroop



or *with* 196 Hz *or* 392 Hz

d. Pitch-text auditory-visual Stroop



or *with* 196 Hz *or* 392 Hz

Validity

- Content Validity Panel
- Construct Validity
  - Divergent: Task scores did not correlate with PROMS pitch or melody subtests
  - Convergent: Interference ratios similar to prior pitch-related Stroop-like tasks
  - Pitch-Location task score did not significantly correlate with VSRI

Reliability

- Internal Consistency: $\alpha > .96$ for all tasks
- Test-Retest Reliability:
  - Response Time: $r > .8$, $p < .001$ for all tasks
  - Interference Ratio: $r = .33–.47$, $p < .05$

Conclusion

- Good validity and reliability for group-level analysis
- Low test-retest reliability is common for interference tasks (Hedge et al., 2018), limits individual-level analysis
- Potentially useful tool for investigating relationships between linguistic and perceptual pitch-height cross-modal correspondence between groups (e.g. musicians vs. non musicians, instrumentalists vs. vocalists, children at different developmental stages)

Additional Findings