Preregistration: Replication of Jin, Hayward, & Cheung (2024)

Two faces of holistic face processing: Facilitation and interference underlying part-whole and composite effects

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Notes on Data Collection

Data collection for this study has already begun, but no data have been examined, viewed, or analyzed prior to this preregistration. Recruitment and data acquisition were initiated unintentionally before the preregistration was done. All study hypotheses, design details, exclusion criteria, and analysis plans were specified before accessing any collected data.

Introduction

Justification Human face perception requires integrating fine-grained local features (eyes, nose, mouth) into coherent global representations that support identity recognition. The complete composite task introduced by Jin, Hayward, & Cheung (2024) offers a well-defined behavioral paradigm for studying this integration process by separating two components of holistic processing:

- Facilitation: when congruent information in the irrelevant half benefits performance
- Interference: when incongruent information harms performance

Replicating these effects helps clarify mechanisms of holistic face perception and connects directly to my research interests in how visual systems integrate spatially distributed information.

Stimuli and Procedure

This study replicates the complete composite task online using jsPsych and Prolific.

Each trial consists of: - 1. Fixation (500 ms) - 2. Study composite face (500 ms) - 3. Mask (500 ms) - 4. Test composite face (until response)

Participants judge whether the cued half (top or bottom) of the test face matches the same half in the study face, ignoring the other half. The design manipulates: - 1. Congruency (congruent vs. incongruent) - 2. Alignment (aligned vs. misaligned) - 3. Correct response (same vs. different) - 4. Cue location (top vs. bottom)

Unlike the original study, isolated top/bottom halves are not included in this replication, as my confirmatory analyses focus on the aligned/misaligned × congruency pattern.

Stimuli were generated from grayscale CFD faces; aligned/misaligned composites were created following the structure described in Jin et al. (2024), and cue brackets were added to indicate the relevant half.

Links

Replication repository: https://github.com/psych251/jin2024 Original paper: https://jov.arvojournals.org/article.aspx?articleid=2802147

Methods (Pre-Data Collection)

Power Analysis Jin et al. (2024) reported large effects in the complete composite task - Facilitation: Δd +0.45 - Interference: Δd −0.66 These were estimated with N=455, driven by cross-task reliability analyses rather than the complete composite task alone. For a within-subject congruency effect in the composite task, Cohen's dz 0.40–0.50 is a conservative estimate. Power analysis indicates that N=60–80 participants yields ~85–95% power. Planned sample size: N = 72, balancing power and feasibility for online data collection.

Planned Sample

- Population: Prolific participants (English-speaking adults, normal or corrected vision)
- Target N: 72 valid datasets
- Stopping Rule: Stop once 72 valid submissions are collected; allow 72–80 usable datasets after exclusions.
- Exclusion Criteria
  - RT $<$ 200 ms or $>$ 5000 ms
  - Incomplete or invalid submissions
  - Browser/timing failures
  - Attention failures (e.g., incorrect responses on designated check trials)

Materials

Stimuli were created following confirmation from the first author (Haiyang Jin, email exchange Oct 27, 2025) that the originals were based on the Chicago Face Database (CFD). Exact originals could not be shared due to copyright restrictions. Stimulus construction steps:

- 1. Download CFD base images
- 2. Create aligned and misaligned composites
- 3. Add cue brackets
- 4. Ensure grayscale formatting and standardized size

Procedure

The procedure replicates Jin et al. (2024): "Each trial began with a fixation cross (500 ms), followed by a composite study face (500 ms), a mask (500 ms), and then a composite test face that remained onscreen until response." The factorial design:

- 1. Cue: top / bottom
- 2. Congruency: congruent / incongruent
- 3. Alignment: aligned / misaligned
- 4. Same/different response trial types

Participants complete only composite trials in this replication.

Analysis Plan

Outcome Measures Primary: sensitivity (d) computed from correct/incorrect responses Secondary: reaction time (RT) on correct trials

Primary Confirmatory Tests

- Congruency effect (congruent > incongruent) in aligned composites
- Congruency × Alignment interaction, specifically stronger interference in the aligned-incongruent condition
- Facilitation and interference indices (if isolated baseline is omitted, these will be referenced qualitatively but not computed numerically)

Statistical Models

- GLMM (logistic) for accuracy/d indexing
- LMM or GLMM for RT (log-normal or Gamma family), restricted to correct trials
- Predictors: Congruency, Alignment, Cue, and their interactions
- Random intercept for Subject
- Data Exclusion Rules (repeated for clarity)
- RT trimming as above
- Removal of trials with missing condition labels
- Participant exclusion if >20% trials invalid or RT trimming results in >50% trial loss

Pre-Specified Additional Analyses

- Exploratory visualization of congruency and alignment effects
- Subject-level effect size estimates
- Comparisons to original effect size distributions

Differences From Original Study

Task Scope Original study administered three holistic processing tasks; this replication administers only the complete composite task. - Expected impact: None on within-task effects.

Sample Size My N = 72 vs. original N = 455 (driven by cross-task reliability). - Expected impact: No negative impact on detecting large within-subject effects.

Trial Count Original: 400 composite + 80 isolated trials Replication: Reduced repetitions per cell; isolated trials removed - Expected impact: Effects are large and robust; reduced repetition should still provide adequate sensitivity.

Analysis Plan Matches the original modeling approach closely, with GLMMs for accuracy and LMM/GLMM for RT. - Expected impact: None.