Evaluating a Refined Gesture annotation system: Distribution Patterns of Co-verbal Gesture Forms and Functions Across Aphasia Severity and Discourse Types 2425EDU1004

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Introduction

- Previous studies identified a significant challenge in gesture analysis for people with aphasia: The **high prevalence** of **non-identifiable gestures** and **nonspecific functions** (Kong et al., 2015; Kong et al., 2017).
- This study applies a **refined gesture annotation system** to address these limitations, with dual objectives:
  - **Reducing ambiguous classifications** while enhancing identification of specific gesture forms
  - Expanding analysis beyond traditional gesture forms to **include gesture functions**
- While examining both forms and functions, the gesture patterns vary across **aphasia severity levels** and **discourse types** (procedural vs. narrative) are investigated, extending previous research that primarily focused on **gesture forms** (de Beer et al., 2019; Sekine & Rose, 2013).

Objectives of this study

(1) To evaluate and compare the effectiveness of the **refined gesture annotation system** against the **previous system** in classifying gestures produced by individuals with aphasia.
(2) To investigate how **aphasia severity** influences the co-verbal gesture forms and functions.
(3) To examine how **different discourse tasks** (**personal narrative** versus **procedural discourse**) affect gesture production patterns in people with aphasia.
The following research questions were formulated:

1. Does the refined gesture annotation system provide **enhanced classification of iconicity** and **reduce non-identifiable gestures** compared to the original gesture annotation system?
2. How does the distribution of gesture forms and functions vary across **different levels of aphasia severity**?
3. What patterns of difference exist in the distribution of gesture forms and functions when comparing between **personal narrative** tasks and **procedural discourse** tasks?

Methods

Participants

- Six Cantonese **speakers with aphasia** (classified as **Anomic**, **Transcortical motor**, or **Broca's** aphasia) were selected from the **Cantonese Aphasia Bank**.
- Two discourse samples ("Egg and Ham Sandwich" [procedural discourse] and "Important event" [personal narrative]) were analyzed for each participant.
- Video recordings were synchronized with language samples using the **EUDICO Linguistic ANnotator** (**ELAN**; Max Planck Institute for Psycholinguistics, 2002; Lausberg & Sloetjes, 2009).

Data analysis

- All gestures were coded using a **refined "DoSaGE" annotation framework** (Kong et al., 2015)
- Each co-verbal gesture was coded for one **gesture form** category, and one **function** category.
- **Comparative analysis** of gesture frequency data examined distributions across the **original vs. refined "DoSaGE" framework**, **different aphasia severity levels**, and **discourse task types** (procedural vs. narrative)

Discussion

Findings

- *Comparison between Original and Refined Gesture Annotation System*
  - **Enhanced Classification** is demonstrated with substantial increases in **Iconic**, **Referential** and **Deictic** gestures in the refined gesture annotation system.
  - A **marked reduction** in **ambiguous** categorisations with **Non-identifiable** gestures and gestures with **no specific functions**.
  - More **precise** functional categorisation with significant increases in **Essential**, **Enhancing**, and **Lexical retrieval** functions.
- *Aphasia Type Differences*
  - **Negative correlation** between **Iconic** gesture production and **severity** of aphasia.
  - Distinctive **gesture function** pattern across aphasia types.
- *Comparison between Personal Narrative and Procedural Discourse*
  - **Procedural discourse** elicits significantly **more Deictic-Concrete** gestures.
  - **Personal narratives** feature more **Referential** gestures than procedural discourse.
  - **Essential** and **Enhanced** gestures appear markedly more **frequent** during **procedural discourse** than **personal narratives**, suggesting different communicative strategies are employed based on discourse type

Limitations

- **Limited sample representation**: Small sample size with restricted aphasia types (primarily anomic aphasia for fluent aphasia) limits generalizability of findings.
- **Methodological subjectivity**: Gesture annotation involved high subjectivity with different raters across annotation systems and no established inter/intra-rater reliability measures.
- **Unexplored variables**: Important factors influencing co-verbal gestures (e.g. sentence length, discourse topics) were not examined, necessitating more comprehensive analysis in future research directions.

Conclusion

- In general, the refined gesture annotation system demonstrated **improvements** over its predecessor through **enhanced classification precision** and **reduced ambiguity** in gestural classification.
- Distinct patterns emerged across aphasia types and discourse tasks, showing a **negative correlation** between **Iconic** gesture production and aphasia **severity**, with **increased Deictic-Concrete** gestures in **procedural** discourse compared to **personal narratives**.
- Future research should expand to include **larger samples with diverse aphasia types** and additional discourse contexts, particularly **interactive gestural analysis** in conversations, to develop a more comprehensive understanding of co-verbal gestures in aphasia.

Results

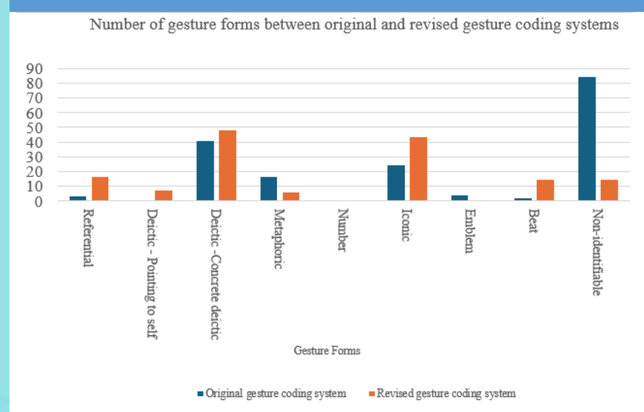

Fig 1. Number of Gesture Forms between the Original and Refined Gesture Annotation System

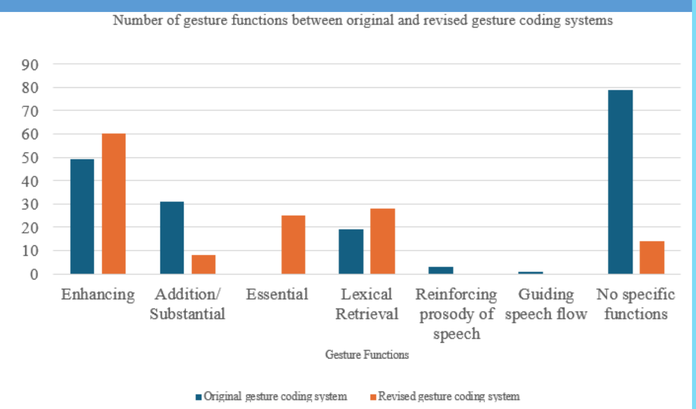

Fig 2. Number of Gesture Functions between the Original and Refined Gesture Annotation System

Comparison between the Original and Refined Gesture Annotation Systems

- *Gesture forms*
  - The refined system identified **more Iconic** gestures (43) compared to the original system (24), showing approximately a 79% **increase**.
  - The refined system effectively identified **Referential** gestures (16) which were minimally recognized in the original system (3).
  - **Deictic** gesture (48) in the original annotation system was differentiated into two categories in the revised system: **Deictic-Pointing to self** (7) and **Deictic-Concrete Deictic** (48).
  - **Non-identifiable** gestures (14) in the refined gesture annotation system were **significantly reduced** by 83% compared to the original gesture annotation system (84).
- *Gesture functions*
  - Gestures with **no specific functions** were **reduced** by 82% in the revised gesture annotation system (14) compared to the original gesture annotation system (79).
  - The functions of "**Reinforcing prosody of speech**" and "**Guiding speech flow**" were eliminated as separate functions and instead classified under the gesture form of **Beat** in the revised gesture annotation system.
  - **Significant increases** from the original to the revised annotation system were observed in the **Essential** function (0 to 25), **Enhancing** function (49 to 60) and **Lexical retrieval** function (19 to 28).

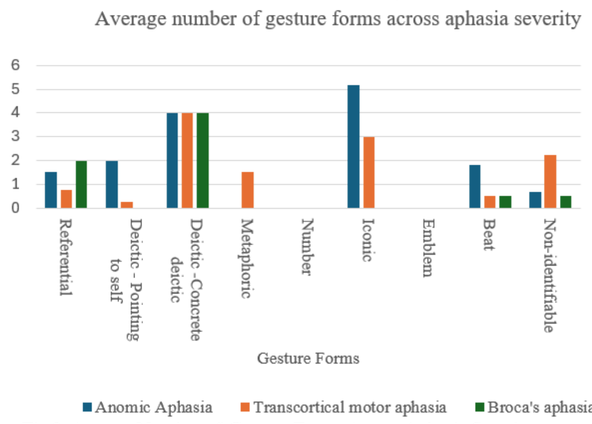

Fig 3. Average Number of Gesture Forms Across Aphasia Severity

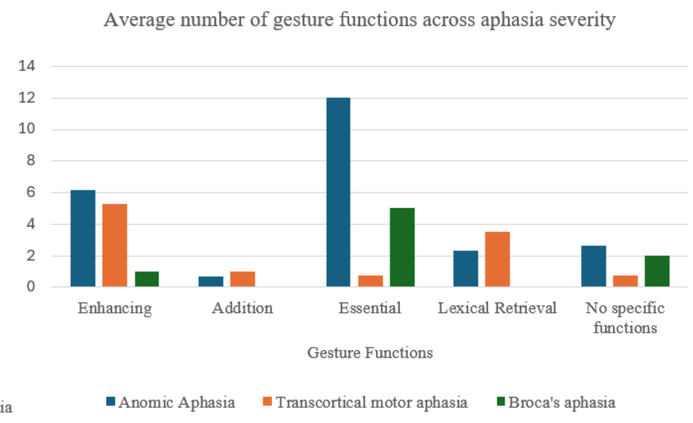

Fig 4. Average Number of Gesture Functions Across Aphasia Severity

Comparison across Types of Aphasia

- *Gesture Forms*
  - **Iconic** gestures follow a **severity-related pattern**: **highest** in **Anomic** (5), **moderate** in **Transcortical motor** (3), **minimal** in **Broca's** aphasia (0).
  - **Non-identifiable gestures** are **most prevalent** in **Transcortical motor** aphasia.
  - **Deictic-Concrete deictic** gestures remain relatively **consistent** (4) across all aphasia types.
- *Gesture Functions*
  - **Enhancing** and **Essential** gesture use contributed to the majority of gesture functions across aphasia types.
  - Participants with **Anomic** Aphasia show **frequent use** of **Essential** gestures (12), **moderate** use of **Enhancing** gestures (6) and limited use of other gesture functions
  - Participants with **Transcortical motor** Aphasia show **moderate** use of **Enhancing** gestures, **higher lexical retrieval** gestures (3.5) compared to other aphasia types.
  - Participants with **Broca's** Aphasia show **moderate** use of **Essential** gestures (5), with a **generally lower gesture usage function** compared to other aphasia types.

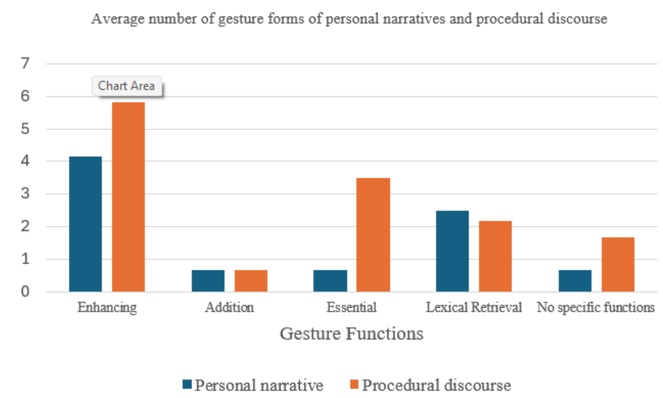

Fig 5. Average Number of Gesture Forms between Personal Narrative and Procedural Discourse

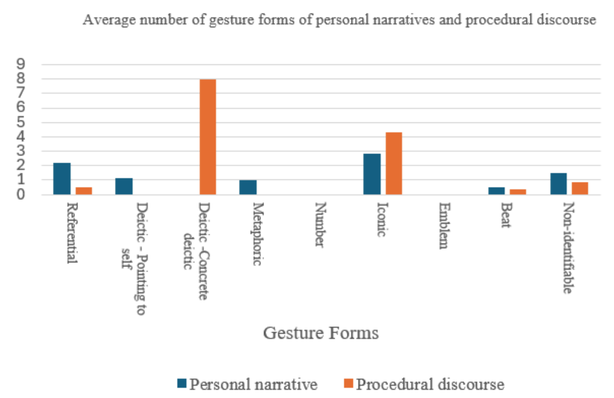

Fig 6. Average Number of Gesture Functions between Personal Narrative and Procedural Discourse

Comparison between Personal Narrative and Procedural Discourse

- *Gesture Forms*
  - **Deictic-Concerete deictic** gestures show a significant difference with **prominent** use in **procedural discourse** (8) but **absent** use in **personal narratives** (0).
  - **Referential** gestures appear more **frequently** in **personal narratives** (2) than **procedural discourse** (0.5).
- *Gesture Functions*
  - **Essential** gestures show a difference with **greater use** in **procedural** discourse (6) than **personal narrative** (0.5).
  - **Enhancing** gestures are more **frequent** in **procedural discourse** (6) than **personal narratives** (4).

Acknowledgement

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Key References

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