



Applying Main Concept Analysis (MCA) to analyze spoken discourse by Cantonese speakers with aphasia and unimpaired individuals



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Introduction

- **Main Concept Analysis** (MCA; Nicholas & Brookshire, 1995) is a content-based analytic approach that focuses on the quantification of **presence**, **accuracy**, and **completeness** of essential information in oral discourse by persons with aphasia (PWAs).
- Kong (2009, 2011, 2016) and Richardson and Dalton (2016)
 - more comprehensive and multilevel coding of PWAs' spoken output
 - able to **distinguish PWAs from controls using single and sequenced pictures**, in *English* (Kong, Whiteside, & Bargmann, 2016; Nicholas & Brookshire, 1993, 1995), *Cantonese* (Kong, 2009), and *Mandarin* (Kong & Yeh, 2015)

MCA measures

A main concept should contain only **one main verb** and provide an **outline of the gist** depicted in a picture, or an **outline of the essential steps** in a procedure

1.	# of Accurate and Complete (AC) concepts
	E.g. The man (tried to) save the girl 男人 (諗住/嘗試/想/準備) 救 女仔
2.	# of Accurate but Incomplete (AI) concepts
	E.g. The man saved someone 男人 救 個人
3.	# of Inaccurate but Complete (IC) concepts
	E.g. The girl was saving the man 女仔 救緊個 男人
4.	# of Inaccurate and Incomplete (II) concepts
	E.g. The girl tried to save ... 男人 諗住 救 ...
5.	# of Absent (AB) concepts
	E.g. none of the essential information in a main concept is given
6.	Overall main concept score (MC score): "3xAC + 2xAI + 2xIC + 1xII"
7.	# of AC per minute (AC/min)

Aims

1. To establish the MC lists for tasks of storytelling, procedural description, single & sequential picture description
2. To examine effects of age, gender, educational level, & genre type on discourse performance in unimpaired speakers
3. To determine how well MCA differentiated between fluent & non-fluent PWAs
4. To investigate how factors of fluency status, semantic processing integrity, & naming ability would predict PWAs' MCA performance

Method

- Language samples were extracted from the Cantonese AphasiaBank
 - 150 neurologically-unimpaired native Cantonese speakers
 - 105 PWAs
- Aim 1: Relevant concepts (RCs) mentioned by all unimpaired participants were tallied.
 - **Target MCs** - RCs produced by at least 25% of the speakers, together with acceptable vocabulary
- Aim 2: **four-way mixed ANOVAs** were used to analyze effects of tasks, gender, age (18-39 years, 40-59 years, +60 years) and education (High and Low), as well as their interaction effects on MC score and AC/min
- Aim 3: **one-way ANOVAs** to compare fluent and non-fluent PWA's performance across tasks, as measured by standardized MC Z-score and AC/min
- Aim 4: A **stepwise multiple regression** was conducted

Results

Aim 1

Task	Total MC	Examples
Sequential picture description 1 (Broken Window)	10	The boy kicked the ball to window 小朋友 踢咗 個波 去個窗度 The man looked at the window/outside 男人 望 窗/出便 男人 睇窗度 望
Sequential picture description 2 (Refuse Umbrella)	14	The mother gave the boy an umbrella 媽媽 畀 把遮 畀 小朋友 The boy was drenched 小朋友 淋 濕晒 小朋友個身 濕晒
Single picture description 1 (Flood)	7	The flood was coming 有 洪水 The man (tried to) save the girl 男人 (諗住/嘗試/想/準備) 救 女仔
Single picture description 2 (Cat Rescue)	17	The dog was chasing the man/cat 隻狗 追 男人/隻貓 The firemen saved the man 消防員 救 男人
Procedural description (Egg and ham sandwich)	12	To whisk the egg 打勻 雞蛋 To put/place the ham on the egg/bread 將火腿 放 喺 雞蛋 將火腿 放 喺 麵包
Story telling 1 (The tortoise and the hare)	13	The hare was faster than the tortoise 兔仔 領先 烏龜 The tortoise got the trophy 烏龜 得到 冠軍
Story telling 2 (The boy who cried wolf)	17	The wolf was chasing/killing the sheep 有狼 嚟 食 啲羊 The boy tricked the villagers 小朋友 整蠱 村民

Aim 2

- Significant main effects age and education were found for **standardized MC score**
- Younger > Older groups: **MC scores, AC/min**
- High > Low Education groups: **MC scores**

Aim 3

- Fluent PWA > Non-fluent PWA
- ✓ General performance on all tasks
- ✓ Significantly better **standardized MC Z-score** and **AC/min**

Aim 4

- **Naming (of action/object)** was a significant predictor for MC score
- **Fluency status** was a significant predictor for AC/min
- In short, PWA who had a higher word retrieval integrity would perform better in MCA, and fluent PWAs was more efficient in producing AC concepts than non-fluent PWAs

Reliability

- Intra- and inter-rater reliabilities (based on calculation of 10% of randomly selected PWA and control samples): 83.2% or better point-by-point agreement and at least 0.92 Pearson correlations of all MC scoring

Discussion

- High level of **inferencing** is needed for **single picture description** tasks. Ideas produced were more **heterogeneous**, and target MCs were less likely to be mentioned.
- **Dialogic speech** was common, especially in storytelling tasks, for both speakers groups.
- **Visual complexity** of stimuli and **familiarity** of topic also seemed to contribute to PWA's difficulty in producing the discourse.
- A **more refined scoring system** that can better reflect performance along the **accuracy-completeness continuum** is suggested.
- 'Coherence' or 'temporal sequence' of MCs mentioned was not addressed currently.

Key references

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