



Title	Naming and discourse production : a bilingual anomic case study
Author(s)	Dai, Yi-ling; 戴伊玲
Citation	
Issued Date	2011
URL	http://hdl.handle.net/10722/192881
Rights	The author retains all proprietary rights, (such as patent rights) and the right to use in future works.

Naming and Discourse Production: a Bilingual Anomic Case Study

Dai Yi Ling

A dissertation submitted in partial fulfillment of the requirements for the Bachelor of Science (Speech and Hearing Sciences), The University of Hong Kong, June 30, 2011.

Abstract

Though numerous studies have reported language recovery patterns in bilingual speakers with aphasia in Indo-European languages, studies of bilingual Chinese speaker with aphasia are not found. This paper presents a Cantonese-Mandarin bilingual speaker with aphasia and compares his performance in each dialect by examining both lexical retrieval and discourse production. Contrary to the expectations that he would perform differently in both dialects, results suggested that asymmetries in performance may be less likely found among structurally similar languages. Results also revealed word class effects in the absence of language effects in object and action naming. Further investigation on pattern of recovery in different modalities of structurally similar languages would contribute to studies of recovery pattern in bilingual Chinese speakers with aphasia.

Introduction

A majority of the world population speaks more than one language (De Bot, 1992). Despite this, research in communication sciences has focused almost exclusively on English language comprehension and production. When studies in communication science do look beyond English, the languages studied are typically Indo-European. Although research in communication disorders has followed this trajectory, studies of aphasia in speakers of languages that are not Indo-European has been at the cutting edge of cross-linguistic research (for a review see Weekes & Chen, 1998). These pioneering studies promoted a more systematic study of bilingual aphasia, particularly bilingual aphasia in speakers of two or more languages that are not Indo-European (Weekes, 2005). Despite these advances, few studies have investigated the phenomenon of bilingual aphasia in Chinese speakers who use more than one language (though see April & Han, 1980; April & Tse, 1977; Yiu & Worrall, 1996) or more than one dialect (though see Chen et al., 2004; Weekes et al., 2007). The aim of this study is to report in detail for the first time a Chinese speaker who has aphasia in two dialects: Cantonese and Mandarin.

Debate persists on how to define bilingualism. A “real” bilingual has long been viewed as a person who is equally and fully fluent in two languages. However, Grosjean (1994) has argued that since the use of the two languages is usually quite different, a person who can communicate in more than one language is rarely completely fluent in both languages. Grosjean (1994) defined bilingualism as the regular use of two languages, and bilinguals as those people who need and use two languages in their everyday lives. According to this

definition, balanced, equal, or perfect knowledge of both languages is not required to be bilingual. This view will be adopted in this study.

One of the most interesting aspects of bilingual aphasia is the finding of different recovery patterns between a bilingual's two languages. Two of the most prominent patterns are parallel recovery and differential recovery. According to Paradis (2004) and Fabbro (2001), the former refers to recovery of languages that parallel the premorbid relative abilities while differential recovery refers to the situation that one language is recovered much better than another compared to premorbid competence. However, the question of what constrains the patterns of aphasia observed in bilingual speakers is subject to debate. Suggested factors include but are not limited to language type (Nilipour & Paradis, 1995), language status (first language versus second language) (Weekes, 2010), language dominance (the most familiar language used premorbidly) (Paradis, 2008) and variables such as cognate status (Weekes, 2010). Roberts and Deslauriers (1999) found that pictures representing cognates were more often correctly named in both languages by bilingual French-English speakers with aphasia than those representing non-cognates. In addition, studies of confrontation naming reveal better overall performance in the first learned language (L1) when compared to the second learned language (L2) (Kambanaros & van Steenbrugge, 2006; Hernandez et al., 2008; Poncelet et al., 2007). A cognitive model proposed by Kroll and Stewart (1994) can explain the effects of language status on lexical retrieval by assuming that L1 is more conceptually mediated in bilingual speakers than L2, i.e., stronger links are available between concept information and L1 during processing.

In this study, a bilingual Cantonese-Mandarin speaker with aphasia is presented. This kind of study is intriguing because of the linguistic similarities between the two dialects and the paucity of studies that compared performance between Cantonese-Mandarin bilingual speakers with aphasia. Cantonese is the standardized form of the Yue dialect group spoken in the Southern provinces in China (e.g., Guangdong, Hong Kong and Macau) as well as in many overseas Chinese communications while Mandarin (which is used interchangeably with the term “Putonghua”) is the standardized form of modern spoken Chinese in Mainland China, Taiwan, and Singapore (Fung, 2009). Though the syntactic and phonological properties of Cantonese and Mandarin are different, there are overlaps in the lexicon and morphology of the two languages. Paradis (1993) suggested that structurally similar languages will tend to be coincidentally more impaired and recovered more equally as cognitive neuropsychological language substrata may be shared to a greater degree in these cases. Given this hypothesis, it is of interest to know whether a participant with aphasia who speaks similar dialects in Chinese performs differently across overlapping tasks (a naming task and a discourse production task) presented in the two dialects. The choice of discourse production to examine language abilities in aphasia is motivated in part by a lack of studies in this field as it is notable that nearly all studies of speakers with bilingual aphasia have examined lexical or syntactic processing and only one or two have examined discourse and pragmatic language processing (see Penn et al., 2010), but also because Kambanaros (2010) showed that confrontation naming tasks (object and action naming) are not necessarily reliable predictor of word retrieval performance (nouns and verbs) in connected speech.

Previous cross-linguistic studies of communication disorders and examination of recovery in bilingual aphasia have used the Object and Action Naming Battery (Druks and Masterson, 2000). Some studies show that patients with bilingual aphasia are better with naming performance in L1 than L2 and that object naming is better than action naming in both languages (see for example Poncelet et al., 2007; Weekes & Raman, 2008). Similar results were also obtained from studies using different object and action pictures (Kambanaros & van Steenbrugge, 2006; Hernandez et al., 2008). In view of this, it is predicted that the participant with aphasia in this study would perform better in object than action naming and have an overall better performance in Cantonese (L1) when compared to that in Mandarin (L2). In addition, it is expected that the participant with aphasia will score lower than a recruited control who matches his/her age, gender, handedness, bilingual status, and educational level on both object and action naming in both dialects.

Poncelet et al. (2007) also found that, the effect of the variable imageability on performance was most evident during object naming across participants with aphasia. However, as with many other studies of speakers with bilingual aphasia it is not clear if this relationship is the result of poor control over stimuli and their psycholinguistic properties. Other variables that are known to influence action and object naming such as age-of-acquisition (AoA), familiarity and word frequency were found to have non-significant effects on naming performance in both languages (Poncelet et al., 2007). The values for these variables were taken from ratings made by native English speakers since values for the second language (French and Turkish) are not readily available. By contrast, psycholinguistic

studies in Cantonese and Mandarin have assembled ratings for many of these variables with a relatively large number of items (objects and actions) (see Law et al., 2009; Weekes et al., 2007). One aim of the present study is to examine the effects of these variables using ratings taken from native Cantonese and native Mandarin speakers.

Research in aphasia in English and Cantonese has also produced a very valuable bank of tests and normative data for discourse production. Discourse produced by speakers with aphasia contains rich and valuable information for the understanding of the manifestation of aphasia (Kong, 2009). Various approaches have been proposed to quantify and qualify discourse production among speakers with aphasia. Two of the most influential quantitative and qualitative systems for analyzing aphasic production in English are Quantitative Production Analysis (QPA; Berndt et al., 2000) and Conversation Analysis Profile for People with Aphasia (CAPPA; Whitworth et al., 1997). The QPA has been the basis for a few studies of Cantonese aphasic sentence production (for a review see Yiu & Worrall, 1996; Law, 2001). In particular, Law's Cantonese version of the QPA contains a total of 33 indices with modifications made on the classification of different word types, and the structural analyses of compound words and utterances that capture the essential characteristics of grammatical, morphological, and structural deficits of Chinese aphasic output. As for the CAPPA, the spontaneous discourse production of speakers with aphasia with different conversational speakers is categorized qualitatively with a total of 26 measures under four important aspects of interaction that include linguistic abilities, repair skills, initiation and turn taking, and topic management (Whitworth et al., 1997). Results obtained from the CAPPA can subsequently

allow clinicians to understand the social-pragmatic skills as well as to highlight any communicative strategies and their relative success demonstrated by speakers with aphasia. It is of theoretical interest to know whether the participant with aphasia performs differently in discourse production across the two dialects as reflected by indices obtained from the modified QPA and CAPPA, and if a difference is to be found, whether he experiences greater language impairment in Cantonese (L1) or Mandarin (L2).

Methods

Preparatory Study

Object and action naming battery

The Object and Action Naming Battery was originally designed by Druks and Masterson (2000) for use in English. The stimuli are black and white line drawings of 100 objects and 100 actions matched for word rated AoA, frequency, imageability and word length in English. However, a direct translation of these items from the Battery into Cantonese and Mandarin revealed two main problems and as a consequence, two object items were dropped in both dialects: (a) “waitress/waiter” 侍應/si6 jing3/¹ and 服務員/fu2 wu4 yuan2/ in Cantonese and Mandarin respectively, in which the two pairs of items took the same noun as their “best response” in both dialects, even though they were encoded with separate nouns in the original English version of the test; and (b) “hammock” 吊床(pronounced as /diu3 cong4/ in Cantonese and /diao4 chuang2/ in Mandarin) in both dialects, as it was too culture-specific

¹Mandarin examples are written in *pinyin*, and Cantonese examples are transcribed using the Romanization system, *jyutping*, developed by the Linguistic Society of Hong Kong.

for use with both native Cantonese and Mandarin speakers. All the remaining stimuli were translated into their Cantonese and Mandarin equivalents.

Given the lexical similarity between Cantonese and Mandarin, cognate words were found in 73 out of 98 object items and 71 out of 100 action items. Among the non-cognate words, there are mainly four types of differences that exist between a Cantonese lexicon and its corresponding Mandarin lexicon. The differences can be found in (i) the use of Chinese characters (e.g., “sandwich” 三文治/saam1 man4 zi6/ in Cantonese versus 三明治/san1 wen2 zhi4/ in Mandarin; or “walking” 行路/haang4 lou6/ in Cantonese versus 走路/zou3 lu4/ in Mandarin), (ii) the addition of a suffix at the end of the word (e.g., “stool” 凳/dang3/ in Cantonese versus 凳子/deng4 zi3/ in Mandarin), (iii) the character order (e.g., “swinging” 盪/打鞦韆/dong6 cin1 cau1/ or /daa2 cin1 cau1/ in Cantonese versus 盪鞦韆/dang4 qiu1 qian1/ in Mandarin), and (iv) the use of two distinctive lexical terms (e.g., “cherry” 車厘子/ce1 lei4 zi2/ in Cantonese versus 櫻桃/ying1 tao2/ in Mandarin; “weighing” 磅重/bong6 cung5/ in Cantonese versus 量體重/liang2 ti3 zhong4/ in Mandarin).

Ratings of 98 objects and 100 actions

Although prior studies have collected and published subjective ratings of critical psycholinguistic variables for single Cantonese and Mandarin words, ratings of some items from the Object and Action Naming Battery (Druks & Masterson, 2000) were unavailable. Given that familiarity is often considered a measure of subjective word frequency (Feyereisen et al., 1988; Hirsh & Ellis, 1994; Nickels & Howard, 1995), high correlation has been found between familiarity and subjective word frequency (Law et al., 2009) and only a small

percentage of the naming stimuli have norms in available frequency counts, only one of these variables was chosen in this study. Therefore, fresh ratings were taken from 50 native Cantonese and 50 native Mandarin participants for each of the variables under study (word rated AoA, familiarity and imageability).

Among the native Cantonese participants, there were 36 undergraduate students and 14 postgraduate students. They were all native Cantonese speakers enrolled at universities in Hong Kong and aged between 19 and 30 years. For the native Mandarin participants, there were 22 undergraduate students and 28 postgraduate students. They were all native Mandarin speakers enrolled at universities in Hong Kong and across Mainland China and aged between 20 and 36 years. The participants were presented with two separate computer spreadsheets of the printed verbal labels of all the items in the picture set, one for the nouns and one for the verbs. Items were presented in a different random order for each participant, with each rating variable presented in a separate column. The instructions of the AoA and familiarity ratings were adopted from Gilhooly and Logie (1980) and the imageability rating instruction was adopted from Paivio et al. (1968) (see Appendix A), which were the same as those described in Masterson and Druks (1998). Three separate 7-point scales were used and they were visible at all times at the top of the spreadsheets. Participants were given examples of possible ratings for words not included in the set.

Experimental Study

Case details

YF is a 52-year-old right-handed bilingual Cantonese-Mandarin speaker with chronic

mild anomic aphasia. YF participated in this study following referral to clinic. At age 49, YF experienced a left hemisphere cerebral infarction, resulting in a large fronto-temporo-parietal lesion. No hemiplegia was reported. Prior to his stroke YF had completed an associate's degree in social sciences, and worked as a National Geographic photographer and later as a restaurant owner in Mainland China. YF has not returned to work since his stroke. YF's first language was Cantonese, which he acquired from birth and used extensively as a young adult and less frequently during the decade prior to his aphasia onset. Mandarin was his second language, learned informally beginning at 18 and then used extensively during his work in Taiwan as a photographer and Mainland China. At the time of the aphasia onset, Mandarin was the language YF used for communication among his family members and friends. In addition, it was reported orally that YF had working knowledge of English and Japanese.

Prior to the commencement of the study, YF had received individual and group treatment once a week in Cantonese for three months at the time of two years post-onset. The Cantonese Aphasia Battery (CAB; Yiu, 1992) revealed the diagnosis of anomic aphasia with an aphasia quotient of 83.7. He had intact repetition and nearly intact auditory comprehension. His oral language production in simple picture description was characterized by a slow rate and short phrases, which were filled with false starts and self-corrections. He experienced word-finding difficulties in confrontation naming, divergent naming and picture description, with semantic and phonemic paraphasias found in the first task.

Control

A control who is matched with YF for age, gender, handedness, educational level and

bilingual status was recruited. He is a 50-year-old right-handed businessman, who received one and a half years of post-secondary education. Cantonese was his first language, which he acquired from birth. He learnt his second language, Mandarin, informally. He had stayed in Taiwan before and his current job requires him to station in Mainland China. It was reported orally that the control had functional knowledge of English.

Language assessment

At the time the study began, two and a half years post-onset, YF experienced mild anomic aphasia with no associated motor speech disorders. Portions of the Bilingual Aphasia Test (BAT) in Cantonese and Mandarin (Paradis, 1987) were administered (see Appendix B) to assess his receptive and expressive language abilities in both dialects. YF's performance revealed relatively mild language impairment in Cantonese and mild-to-moderate impairment in Mandarin. Despite his generally good accuracy across tasks, relatively greater difficulties on synonym and autonym judgments were observed in both dialects. YF's synonym judgment was further explored together with judgment and use of Chinese idioms, semantic fluency and oral narrative using informal assessment. The oral narrative was transcribed verbatim and analyzed quantitatively based on the QPA method (Berndt et al., 2000) (see Appendix C). The results of the informal assessment (see also Appendix D) revealed no synonym impairment in Cantonese and mild synonym impairment in Mandarin. YF had equal performance in judgment of Chinese idioms and semantic fluency in both dialects, but experienced significant difficulties in use of idioms. YF's oral narrative was relatively more fluent in Mandarin while increased proportional use of closed class words, pronouns and verbs were

found in Cantonese.

Naming assessment

The naming battery of Druks and Masterson (2000) was employed. YF completed the naming assessment individually in two 60-min sessions that were arranged one week apart while the control completed the whole assessment within one 60-min session. The sequence of assessments was arranged to counterbalance grammatical word class and dialect effects: (i) action naming in Cantonese, (ii) object naming in Mandarin, (iii) object naming in Cantonese, and (iv) action naming in Mandarin. Pictures were presented individually using standardized procedures (see Appendix E) including a battery booklet and all responses were audiotaped.

Additional Study

Discourse production

Three one-hour sessions were conducted over a two-month period. YF was instructed that he could talk about anything of interest with an examiner and start off with any of the two dialects. In the first and second sessions, YF used L2 to converse a wide range of topics with the examiner, including sports, daily agenda, countries visited, things related to photography, news and his comments and feelings towards photography. In the third session, YF was asked to use L1 to repeatedly talk about the above topics. Upon YF's own preference, he repeatedly had conversations with the examiner under the following three main topics: news and his comments, daily agenda and countries visited. All responses were audiotaped.

YF's discourse production was transcribed verbatim by the examiner. Quantitatively, the transcription was analyzed and grouped under 9 out of 22 QPA indices and 20 newly added

word classes that reflect the lexical use of the participant with aphasia at conversational level. The addition was made to better suit the morphosyntactic structures of Cantonese and Mandarin, e.g., classifier was added since it is different from measure words in Indo-European languages in that they have an additional feature of expressing the conceptual classification of the referent of a noun along with some features that are salient to the speaker (Fung, 2009). Qualitatively, 20 out of 26 CAPPAs indices together with 7 new indices were used to give a complete profile of YF's discourse production skills (see Appendix F). The new addition includes repetition of words, off-topics and code-switching patterns.

Reliability measures

Two reliability measures were calculated, which included inter-rater and intra-rater reliabilities. 20% of all Mandarin interaction and 20% of all Cantonese interaction were transcribed verbatim, analyzed and re-analyzed a month later by the examiner to assess intra-rater reliability. A native Cantonese and a native Mandarin judge were also recruited to obtain inter-rater reliability. Both of them were given separate lists of indices of the modified QPA (Berndt et al., 2000) and CAPPAs (Whitworth et al., 1997) and examples of possible categorizations for a small sub-set of conversation not included in those 20% to-be-analyzed transcript. The conversations to be analyzed were chosen at random from the pool of conversations.

Results

Ratings of 98 Objects and 100 Actions

A simultaneous logistic regression was carried out to examine the effects of AoA,

familiarity and imageability ratings on YF's naming performance. The three variables did not make a significant contribution to predicting performance in object and action naming in both dialects (all p 's > 0.01).

Naming Assessment

Number of correct responses in naming the object and action pictures for YF and the control are presented in Table 1. Apart from target responses, the following were considered correct responses: (i) acceptable alternatives or synonyms (e.g., both Mandarin words 起司 /qi3 si1/ and 奶酪/nai3 lao4/ correspond to “cheese” in English); (ii) self corrected responses; and (iii) recognizable but misarticulated responses (e.g., phonetic or tonal errors). The criterion of (iii) was motivated by the aim of testing the participants' ability to name lexical items which could be indicated by the results of object and action naming. The errors produced by YF and the control were grouped qualitatively into the following categories for both object and action naming: (a) translation errors, i.e., the use of non-target language in responding or the use of lexical items found in the non-target language (e.g., use of the Cantonese lexical item 較剪/gaau3 zin2/ “scissors” during Mandarin object naming); (b) circumlocutory errors, i.e., the participant “talked around” a word (e.g., use of utterance 進餐...女人/jin4 can1...nü3 ren2/ “having lunch...woman” when the actual Mandarin target item was 服務員/fu2 wu4 yuan2/ “waitress”); (c) neologisms, i.e., novel word invented by an individual; (d) semantic errors, i.e., using a wrong lexical item from the same semantic category (e.g., use of lexical item 蛋糕/dan4 gao1/ “cake” when the actual Mandarin target item was 起司/qi3 si1/ or 奶酪/nai3 lao4/ “cheese”); and (e) no response. The errors were

also grouped qualitatively into an action-specific category, non-action naming, i.e., naming the object(s) in the target picture instead of the action during action naming. Table 2 listed YF and the control's error patterns in all the naming tasks.

Table 1

YF and the Control's Number of Correct Responses in Naming Assessment

Language	Word type	YF	Control
L1	Object	85	98
	Action	77	100
L2	Object	84	95
	Action	69	98

Note. L1 = Cantonese, L2 = Mandarin.

Table 2

Categorization of YF and Control's Error Patterns in Naming Assessment

	AN in L1		AN in L2		ON in L1		ON in L2	
	YF	C	YF	C	YF	C	YF	C
Translation error								
----use of Mandarin	3	0	1	1	5	0	2	1
----use of English	1	0	1	0	0	0	1	0
Circumlocutory error	3	0	2	0	0	0	1	0
Neologism	5	0	3	0	0	0	1	1
Semantic error	9	0	11	1	7	0	9	0
Non-action naming	2	0	12	0				
No response	0	0	1	0	1	0	0	1
<u>Total no of errors</u>	23	0	31	2	13	0	14	3

Note. L1 = Cantonese, L2 = Mandarin, C = Control, AN = Action naming, ON = Object naming.

Mann-Whitney *U* Tests were conducted to test whether YF scored lower, on average, than the control on both action and object naming tasks in both dialects. The results were in the expected direction. Significant differences were found in Cantonese object naming ($z(196) = -3.72, p < 0.01$), Mandarin object naming ($z(196) = -2.79, p < 0.01$), Cantonese action naming ($z(200) = -4.78, p < 0.01$), and Mandarin action naming ($z(200) = -5.51, p < 0.01$). It

can thus be concluded that YF has word retrieval impairment in Cantonese and Mandarin. To evaluate the hypotheses that for YF, his mean naming scores in both object and action naming would be higher in L1 than L2 and his mean object naming score would be higher than mean action naming score within each dialect, Mann-Whitney *U* Tests were again used separately. A significant difference was only found when comparing YF's object and action naming in L2 ($z(198) = -2.80, p < 0.01$). No significant differences were found when comparing YF's object and action naming in L1 ($z(198) = -1.77, p = 0.08$), object naming in L1 and L2 ($z(196) = -0.21, p = 0.84$), and action naming in L1 and L2 ($z(200) = -1.27, p = 0.20$). The naming score was thus further analyzed using a two-way ANOVA with language type (L1 versus L2) and word class (objects versus actions) as independent variables. Only the main effect of word class was significant, $F(1, 392) = 10.88, p < 0.01$. Both the main effect of language and the interaction were not significant, $F(1, 392) = 1.27, p = 0.26$ and $F(1, 392) = 0.76, p = 0.39$, respectively.

Discourse Production

For quantitative analysis, the frequency usage of different word classes in YF's three discourse topics and the results of the selected QPA measures are listed in Appendix G. For qualitative analysis, YF's communication profile reflected by CAPP indices is summarized in Appendix H. In general, YF was able to maintain topics throughout his conversation with the examiner. He mainly used nouns and verbs, with a vast amount of fillers in between his utterances (quoted by 'filler' and 'production of long pauses in the middle of turns' in Appendix G and H respectively). Code-switching patterns were evidenced and similar

performance in both dialects was observed in YF's discourse production under all three topics. Mann-Whitney *U* Tests were administered to test the hypothesis that YF's usage of different word classes in L1 would differ from those in L2. No significant differences were found between any of the three topics ("daily agenda": $z(58) = -0.79, p = 0.43$; "news & his comments": $z(58) = -0.58, p = 0.56$; "countries visited": $z(58) = -0.44, p = 0.66$) and in the overall pattern $z(174) = -0.56, p = 0.57$. Mann-Whitney *U* Tests were also employed to test the hypothesis that YF's communication profile in Cantonese would differ from that in Mandarin. No significant differences were found between any of the topics ("daily agenda": $z(52) = -0.95, p = 0.34$; "news & his comments": $z(52) = -1.38, p = 0.17$; "countries visited": $z(52) = -0.21, p = 0.83$) and in the overall pattern $z(156) = -1.22, p = 0.22$.

Reliability Measures

Pearson's *r* coefficients for inter-rater and intra-rater reliabilities in both quantitative and qualitative analysis of the discourse production are listed in Table 3. All coefficients are significant at the 0.01 level. The coefficients of the intra-rater reliability in general were higher than those of the inter-rater reliability, which is in line with the Chinese discourse analysis carried out by Kong and Law (2004). Any disagreements between the raters and the examiner were resolved by consensus. In the inter-rater reliability, the coefficients for the modified CAPPAs were comparatively lower than the modified QPAs for both raters. Since the analyses were based solely on the orthographically transcribed language samples, it is believed that the listen of YF's original oral production would render a higher degree of reliability, especially for the modified CAPPAs where more subjective indices are found.

Table 3

Reliability Measures of Discourse Production

		Pearson's <i>r</i>	
		Inter-rater reliability	Intra-rater reliability
L1	Modified QPA	0.99**	0.99**
	Modified CAPP	0.87**	0.99**
L2	Modified QPA	0.90**	0.99**
	Modified CAPP	0.86**	0.99**

Note. ** = $p \leq 0.01$. L1 = Cantonese, L2 = Mandarin. QPA = Quantitative Production Analysis, CAPP = Conversation Analysis Profile for People with Aphasia.

Discussion

This primary aim of this study was to examine the confrontation naming of object and action pictures and the discourse production of a Cantonese-Mandarin bilingual speaker with anomia, YF. In the naming of objects and actions, it was expected that YF would score lower than the control participant in both dialects. It was also expected that YF would perform better in Cantonese (L1) naming than that in Mandarin (L2) and better in object naming than that in action in both dialects. In discourse production, it was expected that YF's performance in L1 would differ from that in L2. The above expectations were met except for better naming performance in L1 and differential discourse performance in L1 and L2.

The results show significant differences between YF and the control in both dialects, providing evidence of YF's word finding difficulties at lexical levels. Interestingly, there were only a few occurrences of his word finding difficulties in discourse production. It is likely that outside a context of fixed linguistic properties, as in naming tasks, YF could avoid using items that he could not name spontaneously. Moreover, if it is not mandatory to use a particular vocabulary, he might not use strategies such as circumlocutions (occurred less than

1% under the topic “countries visited” with 100% successful rate) to help convey the message. Under these circumstances, it would be hard for an examiner to judge whether YF exhibited failure in word retrieval. These assumptions could also explain the uncommon occurrence of uncorrected semantic paraphasias in discourse production as opposed to his frequent occurrence of semantic errors in naming tasks. According to Kambanaros (2010), object and action naming scores can underestimate and/or overestimate word retrieval performance for nouns and verbs in connected speech as they are subjected to different retrieval contexts. The findings from YF lend support to this assertion.

Statistical analyses were also carried out to evaluate whether there were discrepancies in YF’s object and action naming in both dialects. The results showed that a significant difference was only found in YF’s Mandarin object and action naming. A follow-up ANOVA test gave further evidence that this was a word class difference, not a language difference. According to Kambanaros and van Steenbrugge (2006), different lexical modules and/or semantic representations for nouns and verbs may exist in a lexicon for both mono-lingual and bilingual speakers. However this dissociation was observed for YF in Mandarin only. According to Lebrun (1995), the language used by the people around an individual with aphasia may play a part in the recovery of two equally well-mastered and frequently used dialects. YF was reported to have moved back to Hong Kong one year after his stroke and have been living in a homogeneous Cantonese environment since then. Cantonese is now his major and therefore currently dominant language used in daily communication.

To investigate whether YF performed better in his first acquired language (Cantonese)

than his second acquired language (Mandarin), statistical analyses were again implemented. The results showed no significant differences between his L1 and L2 naming scores. This suggests YF is equally proficient in both dialects, possibly because of equal linkages between each language and concept information allowing YF to exhibit a pattern of parallel recovery in the two structurally similar dialects he pre-morbidly spoke fluently (Pearce, 2005). His parallel recovery of the dialects is reflected in the discourse production task. Taking the modified QPA indices that account for fluency into consideration, YF's performance in the use of the dialects under different topics fluctuated and was observed to be variable. This can be seen in the average number of narrative words per minute, average number of utterances per minute and number of narrative words per utterances. For example, under the topics "news and his comments" and "daily agenda", he was relatively more fluent in Cantonese than Mandarin while the opposite pattern was found in the third topic "countries visited". These must be considered as subtle differences of his performance since statistical analyses revealed no significant effects between the two dialects in discourse production. In view of this, a discourse analysis that quantifies sentential and discourse grammars within a narrative proposed by Ulatowska et al. (1983) and Ulatowska et al. (1981) could possibly be adopted in future to further investigate whether YF's discourse production differ in L1 and L2. It is possible that indices such as complexity and types of clauses could allow a capture of subtle differences in YF's recovery use of the two dialects when the focus is not restricted to the quantification of lexical contents and sentence structures of narratives as in QPA (Berndt et al., 2000).

Qualitative analyses of discourse production also revealed a similar communication profile across the two dialects. Most prominent was the overuse of pronouns, production of agrammatic speech, jargon, delay in responding when selected as next speakers and production of long pauses in the middle of turns. Since Cantonese and Mandarin are similar in lexical and morphological structure, it could be postulated that these findings are in accord with the structural distance hypothesis. Paradis (1993) proposed that structurally similar languages will tend to be impaired coincidentally and also recovered more equally in bilingual aphasia than structurally different languages (e.g., Cantonese and English) which are more likely to recover differentially as the cognitive neuropsychological language substrata may be shared to a greater degree in the former case. To verify if this is really the case in YF, a possible further investigation will be to replicate the naming and discourse testing in YF's English.

Another unexpected observation in the qualitative analysis of YF's discourse production is code-switching. In some bilingual communities, code switching is socio-linguistically accepted and quite commonly found during everyday conversation (Fabbro, 2001). According to Gibbons (1987), code switching is a Hong Kong-wide language phenomenon, especially among educated Hong Kong Chinese. In the case of YF, it could be observed that he included English words/utterances when using either Cantonese or Mandarin in discourse production. Occurrences of code switching were the most frequent when YF talked about past countries he had visited before in Mandarin. It could be speculated that he was more familiar with country names in English than Mandarin. He might have failed in word retrieval if he was not

allowed to use languages other than Mandarin when talking about different countries. This speculation is in accord with the claim by Paradis (2008) that bilingual speakers with aphasia may switch between the two languages more than they used to, as a conscious way of coping with word-finding difficulty, but also involuntarily and irrepressibly. The case of YF showed that the degree of habitual language mixing was affected by the ease of access to the lexicon in various semantic domains. This should be taken into account when assessing the significance of language mixing in multilingual patients with aphasia.

Simultaneous logistic regression was carried out to study the effects of word rated AoA, familiarity and imageability on YF's naming performance. Unlike previous observations, none of them were found to be important determinants in object and action naming across both dialects. It could be postulated that those variables might only act as robust predictors in non-high-functioning speakers with aphasia.

There are two limitations of the study. Firstly, discourse production could be subjected to further investigations of other parameters, such as grammatical errors and syntax analysis, which when investigated systematically, will allow one to differentiate a bilingual speaker's performance in both languages. Secondly, the 100 object and 100 action naming pictures were originally constructed in English, a language with an Indo-European different deep structure from both Cantonese and Mandarin. This creates problems in the direct translation of items into Chinese dialects. Very often, it is found that the "-ing" form of an English verb does not correspond to a single word in Cantonese and Mandarin. The "-ing" forms used in Indo-European languages follow deictic verbs of movement such as go, come, take, bring and

carry. No such distinction exists in Chinese dialects. For example, “swinging” is translated to 打鞦韆/daa2 cin1 cau1/ (打/daa2/ is a verb whereas 鞦韆/cin1 cau1/ refers to an object) in Cantonese and 盪鞦韆/dang4 qiu1 qian1/ (盪/dang4/ is a verb whereas 鞦韆/qiu1 qian1/ refers to an object) in Mandarin. In both cases, a verb-noun structure is used in naming the action. Since compound words of one form class that are composed of components of a different word class are not uncommon in Chinese (Fung, 2009), it could be argued that these grammatical class deficits need to be considered at either the lexical or the sublexical level.

This study focused mainly on the spoken form of Cantonese and Mandarin, and it would be theoretically and clinically interesting to investigate whether the structural distance hypothesis (Paradis 1993) could also apply to the written scripts of the above dialects and in other languages that share similar written scripts but different phonological properties (e.g., Welsh and English) or similar phonological properties but different written scripts (e.g., Russian and German). It is possible that the testimony of Paradis’ hypothesis is subjected to the modality of the tested languages.

In conclusion, results from the present study suggest that asymmetries in confrontation naming performance in bilingual aphasia may be less likely found among structurally similar languages (e.g., Cantonese and Mandarin). This may be because dialects that have a similar linguistic structure benefit more from shared cognitive neuropsychological substrata as they tend to be recovered more equally than the structurally different languages (Paradis, 1993). Reliance on cognates benefits recovery in bilingual aphasia (Roberts & Deslauriers, 1999). Therefore, languages that contain many cognates are likely to mutually benefit the bilingual

speakers. Despite the very similar pattern of recovery in Cantonese and Mandarin shown by YF, there were dissociations in performance that seem to emerge as in previously reported bilingual speakers with aphasia. It can therefore be concluded that discrepancies in object and action naming resist parallel recovery in structurally similar languages and dialects and the patterns of recovery in Cantonese-Mandarin speakers could be subjected to word class effects in the absence of language effects.

Acknowledgements

I would like to express my sincere thanks to all the participants in this study, especially YF and Mr. Lyndon Chia for their participation. I would also like to thank Ms. Wendy Tse, Ms. Sun Yan Ping and Ms. Ma Xiao Ran and other friends for their tremendous help in this study.

My deepest thanks go to my supervisors, Professor Brendan Weekes and Dr. Anthony Kong, for their careful supervision, guidance and continuous support on this study. I would also like to extend my heartfelt thanks to my family for their encouragement and support throughout the year.

Reference

- April, R.S., & Han, M. (1980). Crossed aphasia in a right-handed bilingual Chinese man. *Archives of Neurology*, 37, 342-346.
- April, R.S., & Tse, P.C. (1977). Crossed aphasia in a Chinese bilingual dextral. *Archives of Neurology*, 34, 766-770.
- Berndt, R.S., Wayland, S., Rochon, E., Saffran, E., & Schwartz, M. (2000). *Quantitative production analysis: a training manual for the analysis of aphasic sentence production*. Hove, UK: Psychology Press.
- Chen, I.-R., Liao, S.-F., & Wei, T.-S. (2004). Differential impairment and recovery of two languages in a bilingual aphasia patient: a case report. *Taiwan Journal of Physical Medicine and Rehabilitation*, 32(2), 97-102.
- De Bot, K. (1992). A bilingual processing model: Levelt's speaking model adapted. *Applied Linguistics*, 13, 1-24.
- Druks, J., & Masterson, J. (2000). *An object and action naming battery*. Hove, UK: Psychology Press.
- Fabbro, F. (2001). The bilingual brain: bilingual aphasia. *Brain and Language*, 79, 201-210.
- Feyereisen, P., Van der Borgh, F., & Seron, X. (1988). The operativity effect in naming: a re-analysis. *Neuropsychologia*, 26, 401-415.
- Fung, R. S.-Y. (2009). Characteristics of Chinese in relation to language disorders. In S.-P. Law, B.S. Weekes & A. M.-Y. Wong (Eds.), *Language disorders in speakers of Chinese* (pp.1-18). Bristol, UK: Multilingual matters.
- Gibbons, J. (1987). *Code-mixing and code choice: a Hong Kong case study*. Clevedon:

Multilingual matters.

- Gilhooly, K.J. & Logie, R.H. (1980). Age-of-acquisition, imagery, concreteness, familiarity and ambiguity measures for 1944 words. *Behaviour Research Methods and Instrumentation*, 12, 395-427.
- Grosjean, F. (1994). Individual bilingualism. In R.E. Asher (Ed.), *The encyclopedia of language and linguistics* (pp.1656-1660). Oxford, UK: Pergamon Press.
- Hernandez, M., Cano, A., Costa, A., Sebastian-Galles, N., Juncadella, M., & Gascon-Bayarri, J. (2008). Grammatical category-specific deficits in bilingual aphasia. *Brain and Language*, 107 (1), 68-80.
- Hirsh, K.W., & Ellis, E.W. (1994). Age of acquisition and lexical processing in aphasia. *Cognitive Neuropsychology*, 11, 435-458.
- Kambanaros, M. (2010). Action and object naming versus verb and noun retrieval in connected speech: comparisons in late bilingual Greek-English anomic speakers. *Aphasiology*, 24(2), 210-230.
- Kambanaros, M., & van Steenbrugge, W. (2006). Noun and verb processing in Greek-English bilingual individuals with anomic aphasia and the effect of instrumentality and verb-noun name relation. *Brain and Language*, 97(2), 162-177.
- Kong, A.P.-H. (2009). The use of main concept analysis to measure discourse production in Cantonese-speaking persons with aphasia: a preliminary report. *Journal of Communication Disorders*, 42, 442-464.
- Kong, A. P.-H., & Law, S.-P. (2004). A Cantonese linguistic communication measure for evaluating aphasic narrative production: normative and preliminary aphasic data.

Journal of Multilingual Communication Disorders, 2, 124-146.

Kroll, J.F., & Stewart, E. (1994). Category interference in translation and picture naming: evidence for asymmetric connections between bilingual memory representations.

Journal of Memory and Language, 33, 46-174.

Law, S.-P. (2001). A quantitative analysis of Cantonese aphasic production. *Journal of Psychology in Chinese Societies*, 2(2), 211-237.

Law, S.-P., Weekes, B.S., Yeung, O., & Chiu, K. (2009). Age of acquisition effects on picture naming in Chinese anomia. In S.-P. Law, B.S. Weekes & A. M.-Y. Wong (Eds.), *Language disorders in speakers of Chinese* (pp.222-239). Bristol, UK: Multilingual matters.

Lebrun, Y. (1995). The study of bilingual aphasia: Pitres' legacy. In M. Paradis (Ed.), *Aspects of bilingual aphasia* (pp.11-22). Oxford, UK: Pergamon.

Li, C.N., & Thompson, S.A. (1981). *Mandarin Chinese: a functional reference grammar*. Berkeley, CA: University of California Press.

Masterson, J., & Druks, J. (1998). Description of a set of 164 nouns and 102 verbs matched for printed word frequency, familiarity and age of acquisition. *Journal of Neurolinguistics*, 11(4), 331-354.

Nickels, L., & Howard, D. (1995). Aphasic naming: what matters? *Neuropsychologia*, 33, 1281-1303.

Nilipour, R., & Parada, M. (1995). Breakdown of functional categories in three Farsi-English bilingual aphasic patients. In M. Paradis (Ed.), *Aspects of bilingual aphasia* (pp.123-138). Oxford, UK: Pergamon.

- Paivio, A., Yuille, J.C., & Madigan, S. (1968). Concreteness, imagery, and meaningfulness values for 925 nouns. *Journal of Experimental Psychology*, *76*, 1-25.
- Paradis, M. (1987). *The assessment of bilingual aphasia*. Hillsdale, NJ: Erlbaum.
- Paradis, M. (1993). Bilingual aphasia rehabilitation. In M. Paradis (Ed.), *Foundations of aphasia rehabilitation* (pp.413-419). Oxford, UK: Pergamon Press.
- Paradis, M. (2004). *A neurolinguistic theory of bilingualism*. Amsterdam: John Benjamins.
- Paradis, M. (2008). Language and communication disorders in multilinguals. In B. Stemmer, H.A. Whitaker (Eds.), *Handbook of the neuroscience of language* (pp.341-350). London, UK: Academic press.
- Pearce, J.M.S. (2005). A note on aphasia in bilingual patients: Pitres' and Ribot's laws. *European Neurology*, *54*, 127-131.
- Penn, C., Frankel, T., Watermeyer, J., & Russell, N. (2010). Executive function and conversational strategies in bilingual aphasia. *Aphasiology*, *24*(2), 288-308.
- Poncelet, M., Majerus, S., Raman, I., Warginaire, S., & Weekes, B.S. (2007). Naming actions and objects in bilingual aphasia: a multiple case study. *Brain and Language*, *103*, 158-159.
- Roberts, P.M., & Deslauriers, L. (1999). Picture naming of cognate and non-cognate nouns in bilingual aphasia. *Journal of Communication Disorders*, *32* (1), 1-22.
- Ross, C., & Ma, J-H S. (2006). *Modern Mandarin Chinese grammar: a practical guide*. London; New York: Routledge.
- Ulatowska, H.K., Freedman-Stern, R., Doyel, A.W., Macaluso-Haynes, S., & North, A.J. (1983). Production of narrative discourse in aphasia. *Brain and Language*, *19*, 317-334.

- Ulatowska, H.L., North, A.J., & Macaluso-Haynes, S. (1981). Production of narrative and procedural discourse in aphasia. *Brain and Language*, 13, 345-371.
- Weekes, B.S. (2005). Acquired disorders of reading and writing: cross-script comparisons. *Behavioural Neurology*, 16, 51-57.
- Weekes, B.S. (2010). Issues in bilingual aphasia. *Aphasiology*, 24(2), 123-125.
- Weekes, B.S., & Chen, M.J. (1998). Issues in Chinese aphasia. *Aphasiology*, 12(1), 1-3.
- Weekes, B.S., & Raman, I. (2008). Bilingual deep dysphasia. *Cognitive Neuropsychology*, 25(3), 411-436.
- Weekes, B.S., Su, I.F., Yin, W.G., & Zhang, X.H. (2007). Oral reading in bilingual aphasia: evidence from Mongolian and Chinese. *Bilingualism: Language and Cognition*, 10(2), 201-210.
- Whitworth, A., Perkins, L., & Lesser, R. (1997). *Conversation analysis profile for people with aphasia*. London: Whurr.
- Xiandai Hanyu Cidian* (10 th ed.). (2010). Beijing: Commercial Press.
- Xinhua Zidian* (10 th ed.). (2006). Beijing: Commercial Press.
- Yiu, E. M.-L. (1992). Linguistic assessment of Chinese-speaking aphasics. *Journal of Neurolinguistics*, 7(4), 379-424.
- Yiu, E. M.-L., & Worrall, L.E. (1996). Sentence production ability of a bilingual Cantonese/English agrammatic speaker. *Aphasiology*, 10(5), 505-522.

Appendix A Instructions for Age-of-acquisition, Familiarity and Imageability

Age-of-acquisition/首次接觸此詞語的年齡 (Gilhooly & Logie, 1980): Please select the age at which you understood that word if somebody had used it in front of you, even if you did not use, read or write it at the time. Each number (1 to 7) on the scale spans the period of 2 years. Please use the full range of the scale. 請選出您在哪一個年齡如果有人在您面前說出/寫出此詞語，您會明白它的意思；並不一定表示您在那一個年齡，您要用、閱讀/寫出那個詞語。每一個在評定量表上的數字（1 至 7）代表兩年的歲數。請您使用整個評定量表的範圍。

Familiarity/對此詞語的熟悉程度 (Gilhooly & Logie, 1980): Please rate each word as to how often you came in contact with it, with a lower familiarity rating (towards no 1) being assigned to words you rarely seen and a higher familiarity rating (towards no 7) to words you had seen nearly every day. Please use the full range of the scale. 請您根據在日常生活有多常接觸該事物/動作來評定對每一個詞語的熟悉程度。如果您常常會想到/接觸那理念，請給那詞語一個較高的熟悉程度評分（偏向數字 7）；相反的請給一個較低的熟悉程度評分（偏向數字 1）。請您使用整個評定量表的範圍。

Imageability/此詞語的可想像性 (Paivio et al., 1968): Please rate each word as to the ease or difficulty with which it arouses mental images (a mental picture/sound/other sensory experience). Please give a high imageability rating (towards no 7) to words that arouse a mental image very quickly & easily whereas opposites are given a low imagery rating (towards no 1). Please use the full range of the scale. 請您根據每個詞語有多容易喚起相對的感官圖像/聲音來評定它的可想像性。如果那詞語很容易喚起相對的感官圖像或聲音，請給它一個較高的可想像性評分（偏向數字 7）；相反的請給它一個較低的可想像性評分（偏向數字 1）。請您使用整個評定量表的範圍。

Appendix B Bilingual Aphasia Test Results

Comprehension Tasks	L1	L2
Pointing	100% (10/10)	80% (8/10)
Simple and semi-complex commands	100% (10/10)	80% (8/10)
Complex commands	60% (3/5)	40% (2/5)
Verbal auditory discrimination		
----- <i>nouns</i>	94.1% (16/17)	78.6% (11/14)
----- <i>verbs</i>	100% (1/1)	0% (0/4)
<u>Total</u>	94.4% (17/18)	61.1% (11/18)
Syntactic comprehension		
----- <i>negative active & passive sentences</i>	54.2% (13/24)	0% (0/24)
----- <i>non-negative sentences</i>	66.7% (42/63)	84.1% (53/63)
<u>Total</u>	63.2% (55/87)	60.9% (53/87)
Odd-one-out	80% (4/5)	100% (5/5)
Synonym judgment of nouns	20% (1/5)	0% (0/5)
Antonym judgment of adjectives	40% (4/10)	10% (1/10)
Production Tasks	L1	L2
Repetition		
----- <i>words</i>	100% (20/20)	100% (20/20)
----- <i>non-words</i>	80% (8/10)	100% (10/10)
<u>Total</u>	93.3% (28/30)	100% (30/30)
Lexical-decision		
----- <i>words</i>	100% (20/20)	100% (20/20)
----- <i>non-words</i>	30% (3/10)	0% (0/10)
<u>Total</u>	76.7% (23/30)	66.7% (20/30)
Sentence repetition	100% (7/7)	100% (7/7)

Note. L1 = Cantonese, L2 = Mandarin.

Appendix C Modified Quantitative Production Analysis

Transcription of the discourse production (Berndt et al., 2000): (i) recognizable but misarticulated words were transcribed as their well-formed equivalents, (ii) no punctuation was used, (iii) pauses of more than one second were marked, and (iv) the examiner's and participant's utterances were transcribed on separate lines and they were clearly marked.

Quantitative analysis of the discourse production (Berndt et al., 2000): (i) false starts that resulted in partial words were not counted, (ii) total no of narrative words included all the word classes except fillers, errors, and pause. Categorization of word classes (Ross & Ma, 2006; Li & Thompson, 1981; *Xinhua Zidian*, 2006; *Xiandai Hanyu Cidian*, 2010):

Word classes	Cantonese examples	Mandarin examples
Exclamation	哦，噲，哼	哦，噲
Filler	噲，這個	噲，這個
Auxiliary verb	有	有
Copula	係	是
Modal verb	可以，應該	會，可以
Verb	講，睇	講，看
Pronoun	乜野，邊個，佢，嗰啲	我，你自己，這些
Proper noun	基督教，以色列	基督教，以色列
Noun	入面，朝侯早	裡面，早上
Negation	冇，唔，未，非	不，沒
Particle	呢，呀，丫，嘅	的，之，呀
Determiner	呢(個)	那(個)，這(個)
Classifier	個，點，年	個，點，遍
Adverb	就，曾經，已經，必定	就，曾經，很
Preposition	自從，被，為	自從，在
Verb suffix	(睇)吓，(做)過，(番)黎，(揸)住	過，了
Resultative suffix	(講)完，(食)咗，(食)埋，(睇)倒，(開)着	(說)完，(看)到，(睡)著，(打)開，(學)會
Conjunction	但係，同埋，如果	但是，然後
Adjective	唔同，深刻	不同，深刻
Prefix	阿(婆)，第(一)	第(一)
Numeral	一，十，半	一，半，兩

Appendix D Results of Informal Assessment Tasks

	L1	L2
Synonym judgment (nouns)	100% (5/5)	80% (4/5)
Sentence construction of Chinese idioms	0% (0/6)	0% (0/6)
Definition giving of Chinese idioms	0% (0/6)	0% (0/6)
Judgment of Chinese idioms		
----- <i>common Chinese idioms</i>	66.7% (4/6)	83.3% (5/6)
----- <i>uncommon Chinese idioms</i>	50% (3/6)	33.3% (2/6)
<u><i>total</i></u>	58.3% (7/12)	58.3% (7/12)
Semantic fluency		
----- <i>animals</i>	7 items	8 items
----- <i>dim sum</i>	3 items	3 items
----- <i>stationeries</i>	6 items	4 items
----- <i>musical instrument</i>	5 items	6 items
----- <i>vegetables</i>	4 items	3 items
Oral narrative		
----- <i>total number of narrative words</i>	176	235
----- <i>total number of utterances</i>	32	37
----- <i>average number of narrative words</i> <i>per minute</i>	34.62	44.76
----- <i>average number of utterances per minute</i>	6.3	7.05
----- <i>average number of narrative words per</i> <i>Utterance</i>	5.5	6.35
----- <i>proportion of closed class words over</i> <i>narrative words</i>	0.54	0.38
----- <i>proportion of pronouns: pronoun/(noun +</i> <i>pronoun)</i>	0.18	0.07
----- <i>proportion of verbs: verb/(noun + verb)</i>	0.61	0.51

Note. L1 = Cantonese, L2 = Mandarin.

Appendix E Instructions for the Object and Action Naming Battery

Instructions for object naming, adopted from Druks and Masterson (2000): the participant was asked to name the object. If the participant's response is given to the wrong part of the picture, the examiner should point to the to-be-named part of the picture; if the participant gives a superordinate response, he/she should be asked to be more specific (Cantonese: 要明確啲; Mandarin: 要明確一點); if the participant gives a non-target subordinate response, he/she should be asked to give a more general response (Cantonese: 可籠統啲; Mandarin: 可籠統一點); if the participant gives a correct, but non-target response, he/she should be told the response is correct but asked to give an alternative (Cantonese: 呢個答案係啱嘅, 但有冇另一個講法?; Mandarin: 這個答案是正確的, 但有沒有另一個說法?)

Instructions of action naming, adopted from Druks and Masterson (2000): the participant was asked to say what the person in the picture was doing/what was happening in the picture. If the participant's response is given to the wrong part of the picture (e.g., naming the object instead of naming the action in the picture), the examiner should remind him/her to tell in one word what the person in the picture is doing, or what is happening in the picture (Cantonese: 請用一個詞語說明圖中嘅人物係度做乜野或者形容圖中發生的事; Mandarin: 請用一個詞語說明圖中的人物在做什麼或者形容圖中發生的事); if the participant gives a superordinate response, he/she should be asked to be more specific (Cantonese: 可籠統啲; Mandarin: 可籠統一點); if the participant gives a correct, but non-target response, he/she should be told the response is correct but asked to give an alternative (Cantonese: 呢個答案係啱嘅, 但有冇另一個講法?; Mandarin: 這個答案是正確的, 但有沒有另一個說法?)

Appendix F Modified Conversation Analysis Profile for People with Aphasia

Indices taken from the Conversation Analysis Profile for People with Aphasia (Whitworth et al., 1997) and their implications

Indices	Implications
<u>Section one: Linguistic abilities</u>	
Failure in word retrieval	struggle & give up during word finding
Production of circumlocutions	use a longer way to get his message across
Production of uncorrected semantic paraphasias	use the wrong word or name for something, without correcting
Production of phonemic paraphasias	muddle up the sounds, but still know what he means
Production of apraxic errors	struggle to get the sounds out in a word
Overuse of pronouns	use words like “him/her” or “here/there” without you knowing who or what he is referring to
Difficulty indicating yes and no reliably	say “yes” when he means “no”
Production of agrammatic speech	miss out words in sentences, so they sound like telegram
Production of neologisms	make-up words that don’t make sense
Production of jargon	produce long sentences that don’t make sense as a whole, even though each word is clear
Failure in comprehension	difficulties understanding what the conversational partner has said to him
(Repetition of words)	words are repeated
<u>Section two: Repair</u>	
Ability to initiate repair on conversational partner’s turn	able to indicate when he hasn’t followed

(to be continued)

Indices	Implications
<u>Section two: Repair</u>	
Ability to initiate repairs on own errors	pick up mistakes in speech and try to correct them himself
Ability after self initiation to repair own errors without help	when trying to correct mistakes, did he manage to correct them without help?
Ability to repair own turn when initiated by conversational partner	can he make his speech more specific?
<u>Section three: Initiation and turn taking</u>	
Ability to initiate conversations	will he start up a conversation with you?
Delay in responding when selected as next speaker	presence of long pauses or fillers before replying
Production of long pauses in the middle of turns	presence of long pauses or fillers in between his reply
Violation of conversational partner's turns	interrupt the conversational partner's turn
<u>Section four: Topic management</u>	
Ability to maintain topics	continue talking about the same thing
(Off-topics)	respond by talking about unrelated things
<u>(Code-switching patterns)</u>	
(Use of Cantonese words in an utterance)	e.g., use of Cantonese words during Mandarin discourse production
(Use of English words in an utterance)	e.g., use of English words during Cantonese discourse production
(Use of English words, with self-repair to Chinese, in an utterance)	original use English words during Cantonese/Mandarin discourse production, but manage to self-change them into their corresponding Chinese words
(Presence of inappropriate combination of foreign words)	incorrect combination of words within a sentence, but it is comprehensible
(Use of Mandarin words in an utterance)	e.g., use of Mandarin words during Cantonese discourse production

Note: Indices in parenthesis are new indices modified from the original conversation analysis profile.

Appendix G Results of the modified Quantitative Production Analysis

	News & his comments		Daily agenda		Countries visited	
	L1	L2	L1	L2	L1	L2
Word classes:						
Adjective	1.62	1.20	0.18	0.00	0.63	1.59
Adverb	2.16	2.31	1.62	0.51	1.71	1.96
Auxiliary verb	0.99	1.20	0.27	0.26	0.41	1.18
Classifier	0.72	0.46	2.52	1.79	1.13	1.21
Conjunction	0.99	0.65	0.18	1.28	0.41	0.48
Copula	3.15	1.94	1.35	1.03	2.97	2.02
Determiner	0.27	0.19	0.36	0.00	0.41	0.35
Exclamation	1.98	2.59	4.05	3.85	2.97	2.04
Filler	9.73	6.85	7.12	6.41	5.86	8.52
Modal verb	0.00	0.28	0.27	0.26	0.09	0.05
Noun	7.03	5.46	6.58	3.08	3.51	5.40
Negation	2.43	0.83	0.99	0.77	1.04	0.91
Numeral	0.27	1.39	1.80	2.05	0.95	1.08
Particle	3.69	4.72	2.88	2.05	2.16	3.23
Pause	1.53	0.65	0.72	0.26	1.04	0.75
Prefix	0.00	0.09	0.00	0.00	0.05	0.05
Preposition	0.63	0.00	0.45	0.26	0.18	0.46
Pronoun	2.07	1.20	1.26	0.51	1.22	1.72
Proper noun	1.62	1.57	1.35	2.31	3.20	3.90
Resultative suffix	0.54	0.00	0.90	0.00	0.23	0.54
Verb	5.86	3.89	7.57	5.13	3.11	3.74
Verb suffix	0.27	0.09	0.99	0.51	0.32	0.38
Error	0.18	0.00	0.09	0.00	0.27	0.16
QPA indices:						
Average number of narrative words/min	36.31	30.09	35.59	32.05	26.67	38.31
Average number of utterances/min	9.55	7.96	10.72	10.51	7.97	9.52
Average number of narrative words/utterance	0.34	0.35	0.30	0.78	0.15	0.11
Closed class words/narrative words	0.05	0.05	0.04	0.09	0.02	0.02
Pronoun/(noun+pronoun)	0.02	0.01	0.01	0.02	0.01	0.00
Verb/(noun+verb)	0.04	0.03	0.04	0.13	0.01	0.01

Note. L1 = Cantonese, L2 = Mandarin.

Appendix H Results of the Modified Conversation Analysis Profile for People with Aphasia

	News & his comments		Daily agenda		Countries visited	
	L1	L2	L1	L2	L1	L2
<u>Section One: Linguistic abilities</u>						
Failure in word retrieval	0.00	0.09	0.00	0.26	0.09	0.24
Production of circumlocutions	0.00	0.00	0.00	0.00	0.05	0.05
Production of uncorrected semantic paraphasias	0.18	0.00	0.09	0.00	0.00	0.00
Production of phonemic paraphasias	0.00	0.00	0.00	0.00	0.00	0.00
Production of apraxic errors	0.09	0.00	0.00	0.00	0.00	0.00
Overuse of pronouns	0.54	0.37	0.27	0.00	0.09	0.05
Difficulty indicating yes and no reliably	0.00	0.00	0.09	0.00	0.00	0.00
Production of agrammatic speech	0.63	0.37	0.45	0.77	0.63	0.48
Production of neologisms	0.09	0.00	0.09	0.00	0.14	0.11
Production of jargon	0.54	0.93	0.09	0.00	0.32	0.40
Failure in comprehension	0.18	0.00	0.54	0.00	0.18	0.08
(Repetition of words)	1.35	0.09	0.72	0.26	0.45	0.24
<u>Section Two: Repair</u>						
Ability to initiate repair on conversational partner's turn	0.09	0.00	0.36	0.00	0.14	0.03
Ability to initiate repairs on own errors	0.00	0.00	0.09	0.26	0.00	0.03
Ability after self initiation to repair own errors without help	0.00	0.00	0.09	0.26	0.00	0.05
Ability to repair own turn when initiated by conversational partner	0.00	0.00	0.00	0.00	0.00	0.03

(to be continued)

	News & his comments		Daily agenda		Countries visited	
	L1	L2	L1	L2	L1	L2
<u>Section Three: Initiation and turn taking</u>						
Ability to initiate conversations	0.00	0.09	0.00	0.00	0.00	0.00
Delay in responding when selected as next speaker	0.81	0.56	0.72	1.03	0.77	0.89
Production of long pauses in the middle of turns	3.69	3.61	2.88	3.08	2.61	3.90
Violation of conversational partner's turns	0.18	0.00	0.18	0.26	0.14	0.03
<u>Section Four: Topic management</u>						
Ability to maintain topics	9.46	7.96	10.72	10.51	7.97	9.46
(Off-topics)	0.09	0.00	0.00	0.00	0.00	0.05
<u>(Code-switching patterns)</u>						
(Use of Cantonese words in an utterance)		0.19		0.77		0.22
(Use of English words in an utterance)	0.63	0.00	0.63	0.26	0.09	1.61
(Use of English words, with self-repair to Chinese, in an utterance)	0.00	0.00	0.00	0.00	0.09	0.05
(Presence of inappropriate combination of foreign words)	1.35	1.02	1.35	1.28	0.90	0.99
(Use of Mandarin words in an utterance)	0.45		0.45		0.27	

Note. Indices in parenthesis are new indices modified from the original conversation analysis profile. L1 = Cantonese, L2 = Mandarin.