COURSE OF IMPROVEMENT OF NEOLOGISTIC JARGON: AN INVESTIGATION OF THREE CASES

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We investigated the mechanism underlying neologistic jargon in three patients who exhibited acute-phase neologistic jargon that later resolved. Regarding the recovery from jargon, Alajouanine’s three-step recovery theory is well-known. Case 1 followed this recovery course, and the outcome was atypical aphasia. The two-stage theory is considered useful in explaining the occurrence of the neologisms. The outcome of Case 2 was a condition resembling conduction aphasia. Conduction theory was useful in explaining the mechanisms underlying the clinical course in this patient. Case 3 exhibited symptoms of both transcortical sensory aphasia and nonaphasic misnaming. Neologisms including monemes and monemic paraphasia were common. The outcome was anomic aphasia. The hybrid lexical error hypothesis was useful in explaining the occurrence of these neologisms. We confirmed that the mechanisms underlying the occurrence of neologistic jargon are not uniform and are difficult to predict the courses of recovery in the early stages of the disease.

Key words: neologistic jargon, Alajouanine’s three-step recovery theory, two-stage theory, conduction theory, hybrid lexical error hypothesis

INTRODUCTION

Neologistic jargon is defined as unintelligible pathological speech consisting of unidentifiable words, with retention of inflection and phonemes (Kertesz & Benson, 1970). A neologism is a word that is unidentifiable and does not exist in the target language. Neologisms are often observed in severe fluent aphasia in the acute phase following brain injury.

Various theories have been proposed regarding the mechanism underlying the occurrence of neologisms, including conduction theory (Kertesz & Benson, 1970), two-stage theory (Brown, 1972, 1977), and the hybrid lexical error hypothesis (Buckingham, 1981), in addition to attention disorder and self-monitoring disorder theories.
Conduction theory suggests that neologisms appear via the mechanism underlying phonological paraphasia in conduction aphasia.

The two-stage theory suggests a disorder in the initial stage of selecting the target word from the lexicon. At this point, semantic substitution occurs. There is also disorder at a subsequent stage where the phonological form is given. As a result of the additional phonological deficiency in verbal paraphasia, a neologism occurs.

The hybrid lexical error hypothesis is based on the theory that words are formed through a filter according to word formation rules from the moneme vocabulary (Halle, 1973). This hypothesis suggests that inappropriate hybrid blends occur due to a disorder of this function, leading to the utterance of neologisms.

Neologistic jargon is a linguistic symptom of severe aphasia, and it is possible that this symptom will fluctuate over the course of recovery from aphasia. Alajouanine (1956) categorized jargon into three types, undifferentiated, asemantic, and paraphasic, and stated that symptoms progress in this order. Asemantic jargon and paraphasic jargon correspond to the terms neologistic jargon and semantic jargon, respectively, (Brown, 1972, 1977) used in this paper. The patient may exhibit undifferentiated jargon early in the acute phase before neologistic jargon appears. Furthermore, after neologistic jargon has improved and neologisms have disappeared, the patient may develop semantic jargon, where they constantly misuse words. In addition, Kertesz and Benson (1970) discussed the evolution of jargon aphasia and showed that the clinical picture often follows a “regular pattern.” They stated that “the clinical picture changes from the more severe stage of jargon, where much of the speech is neologistic, to semantic jargon where most words are recognizable although inappropriate, and finally, to anomic circumlocutory speech with meaningful sentences which are deficient however, in information-containing words.”

It is uncertain whether the recovery course of all patients with neologistic jargon can be explained by Alajouanine’s three-step recovery theory or Kertesz and Benson’s (1970) ideas concerning a “regular pattern,” and whether outcomes can be divided into multiple classifications. Therefore, we performed an investigation based on the course and outcome of three patients that presented with acute-phase neologistic jargon.

**CASES AND METHOD**

In this study, we retrospectively compared the course and outcome of three patients that presented with acute-phase neologistic jargon followed by the disappearance of neologisms.

**Cases**

Case 1: Right-handed female, 47 years old at time of onset. Subarachnoid hemorrhage due to ruptured aneurysm. Aneurysm clipping surgery was performed but cerebral infarction occurred due to intraoperative ischemia. Right hemiplegia and somatosensory disorder were observed. Aphasia, orofacial apraxia, and ideomotor apraxia were present. Raven’s Colored Progressive Matrices (RCPM): 27/36, Kohs Block Design Test. IQ: 57.

Case 2: Right-handed (history of handedness correction) male, 49 years old at time of onset. Cerebral infarction due to left cervical internal carotid artery occlusion from idiopathic atrial fibrillation. Right
CT of Case 1 (4.9 months after the onset of the disease)

CT of Case 2 (3.6 months after the onset of the disease)

CT of Case 3 (1.5 months after the onset of the disease)

Fig. 1. Head x-ray CT scans of three cases
Fig. 2. SLTA profiles for the three cases
hemiplegia, aphasia and orofacial apraxia were observed. RCPM: 32/36, Kohs Block Design Test. IQ: 101.

Case 3: Right-handed male, 54 years old at time of onset. Subarachnoid hemorrhage due to ruptured aneurysm. Clipping surgery was conducted to treat the aneurysm and external decompression was performed. Right hemiplegia, and somatosensory disorder were present. Aphasia, disorientation, and memory disorder were observed, along with denial of the condition. RCPM: 29/36, Kohs Block Design Test IQ: 81.3.

Head X-ray and computed tomography (CT) scans from the three cases are shown in Fig. 1.

Methods
The following three time periods were defined for each case.
Period 1: The period in which neologisms appeared frequently.
Period 2: The period in which neologisms had nearly disappeared.
Period 3: The period in which the naming score on the Standard Language Test of Aphasia (SLTA) exceeded the average for aphasia patients (65%).

Period 3 was determined by this standard because, according to the SLTA, the period in which the naming deficit had clearly improved and speech was no longer jargon could be captured. In this paper, the Period 3 phase is defined as the outcome for the cases of neologistic jargon.

To evaluate the appearances of neologisms, paraphasias or other speech symptoms, we analyzed the patients’ speech in the visual confrontation naming task of the SLTA. The details of speech in the naming task were analyzed for each period for the three cases. Speech analysis followed Hadano’s (1991) method and was conducted using the following procedure. (1) Speech in the naming task was divided into clauses, (2) clauses were categorized into eight categories (correct word, word included in circumlocution, verbal paraphasia [semantic paraphasia\(^1\), irrelevant word\(^2\)], phonological paraphasia\(^3\), neologism\(^4\), monemic paraphasia\(^5\), fragmental syllable, and word included in empty phrases), and (3) the speech construction for each period in the three patients was compared. Regarding the definition of the misused words, in this study we followed that used in previous studies of these patients (Higashikawa & Hadano, 2008; Motoki, Takei, Higashikawa, & Hadano, 2017).

We examined the mechanisms of improvement and occurrence of neologisms in the three patients based on the analysis results and course of other symptoms, and tried to categorize the outcome and course of neologistic jargon.

The SLTA profiles for the three patients from Period 1 to Period 3 are presented in Fig. 2.

Results
The analyses of the results for speech during the naming task in each period for each patient are provided in Fig. 3. The course of linguistic symptoms for each patient is mentioned in order.

Case 1
According to the attending speech-language-hearing therapist for the hospital, acute-

\(^1\) Semantic paraphasia is defined as a word that corresponding to any of the following conditions, 1) a word which belongs to the same category as the target word (e.g., pencil→ballpoint pen), 2) a word which correspond to the broader term (e.g., horse→animal), or 3) a word which related to the situation to be used (e.g., dish→table).

\(^2\) An irrelevant word is a verbal paraphasia that does not fit the definition of semantic paraphasia.

\(^3\) Phonological paraphasia is defined as a non-word that shares more than 50% of its phonemes with the target word.

\(^4\) Neologism is defined as a non-word that shares less than 50% of its phonemes with the target word.

\(^5\) Monemic paraphasia is defined as a non-word formed by the combinations of multiple monemes. We regarded only monemes consisting of two or more as a moneme.
**Fig. 3.** The analysis results for the speech details concerning naming in each period of three ases.
phase jargon, which was difficult to express in writing, was observed.

At the time of the initial linguistic treatment under our observation (1.4 months after onset), the patient had severe aphasia with multiple neologisms. This period was defined as Period 1 in Case 1. Nonetheless, apraxia of speech was present in speech, including features such as repetition during which the patient was conscious of articulation. Initially, there were no grammatical function words appended to the neologisms, but the patient began to add them after one month. In the analysis of speech during the naming task for Period 1, neologisms were most common at 32.2%. Syllable fragments (30.4%) and empty phrases (26.3%) were also evident, and verbal paraphasia was occasionally observed, but mostly consisted of irrelevant words with no semantic relationship to the target word (10.4%). An example of Period 1 speech is provided below.

The speech is described in Roman letters and the corresponding English is put in the following parentheses. In the examples of speech in this paper, areas of neologism and monemic paraphasia are shown in bold and italics, respectively. Speech that was unclear and difficult to transcribe are shown with an asterisk.

Case 1 Speech Example (Period 1): Naming (1.5 months after onset)
Inu (Dog): kore mo… (this is also...), oku, oku, oku, okuma, yoku, okuma, rigo, ringo (apple), ringo (apple), ringo (apple).
Tokei (Clock): kore wa… (this is...), ano (um), kore (this), roko, roko, ano (um), ri, ri, ri, ri, ririmo, rimo, ri, rimoora, **raku, raku.

In Period 2, at 5 months after onset, neologisms had nearly disappeared. In addition, stereotypical irrelevant words (“grandpa”) were frequently observed in her narrational or conversational speech. On the other hand, the amount of speech decreased and not only the number of neologisms, but also other misused words, gradually reduced in the naming task. The results of speech analysis concerning naming revealed that neologisms had mostly disappeared, a few irrelevant words remained (9.3%), and syllable fragments (55.8%) and empty phrases (30%) were common. An example of Period 2 speech is provided below. All spoken nouns have no relation to the presented four-frame cartoon story.

Case 1 Speech Example (Period 2): Naming (5.3 months after onset)

Enpitsu (Pencil): ka, ka, ka, ka, ka, …nan dakke na ...(I can’t remember...).
Shika (Deer): kono hito (this man).

Excerpt from narration (Narration of a four-frame cartoon, 5.3 months after onset)

Yosshi no nani (Yosshi’s what), hashi ga nakute (there was no bridge), de (and), zhiichan (grandpa) kuru (comes), zhiichan (grandpa), ko, kono (this) zhiichan (grandpa) wo, o, o, kore denain da (I can’t say this).

In Period 3, irrelevant words stopped appearing, and speech became meaningless with only empty phrases and no substantial words (28 months after onset). Linguistic
treatment continued on an outpatient basis, but recovery of speech in the naming task in Case 1 was prolonged, exceeding the average performance for aphasia patients at 92 months after onset. Noun word finding improved from moderate to mild levels, but there was no improvement for verbs (0%). Mistaken words were almost nonexistent in conversations in this period. Frequent use of empty phrases and demonstrative pronouns were observed, but there was very little circumlocution. In naming tasks, apraxia of speech and phonetic substitution were observed. Speech analysis revealed that, in addition to correct words (21.9%), phonological paraphasia was present, for which the effect of apraxia of speech cannot be ruled out (4.7%). Syllable fragments (23.4%) and empty phrases (50.0%) were also observed. An example of Period 3 speech is provided below.

Case 1 Speech Example (Period 3): Naming (97.3 months after onset)
Tokei (Clock): eto (um), to, tokai, to, kei, tokei (clock).
Tyouchin (Paper lantern): kore dame (I can’t say it), wakan naku te (I don’t know), kore wakan nai (I don’t know this), itsumo suimasen (always sorry).

Case 2
Linguistic treatment commenced 1.6 months after onset. His speech was fluent. However, during intentional speech, efforts resembling apraxia of speech were noted. In the SLTA, the patient scored almost no points on speech items and auditory short-term memory was strikingly limited (2 units, 50% correct words). The patient had drastically impaired auditory comprehension and severe atypical aphasia. In speech, neologisms were frequent and phonological paraphasia was evident, but very little semantic paraphasia was observed. This period was defined as Period 1 and an example of speech concerning naming is provided below. Speech analysis revealed that empty phrases were most frequent (62.2%), followed by neologisms (17.6%), syllable fragments (10.8%), phonological paraphasia (5.4%), irrelevant words (2.7%), and correct words (1.4%).

Case 2 Speech Example (Period 1): Naming (1.6 months after onset)
Enpitsu (Pencil): inchitsu, enpitsu (pencil).
Inu (Dog): un (yeah), un (yeah), eeto (umm), unpyu, i, inpityu.
Gohan (Rice): chu, eeto (umm), chenu, atashi no dakedo (It’s mine, but) … ochnkeeburyoo

At 6.9 months after onset, when neologisms disappeared, the number of correct answers on the SLTA naming task improved to 70%, exceeding the average for aphasia patients. Speech analysis concerning naming revealed the frequency of correct words (50.0%), empty phrases (29.2%), phonological paraphasia (12.5%), and verbal paraphasia (8.3%). Furthermore, in situations where the patient struggled with naming, conduite d’approche of searching for phonemes was often observed. This was considered to be Period 2/3.

An example of Period 2/3 speech is provided below.
Case 2 Speech Example (Period 2/3): Naming (6.9 months after onset)
Enpitsu (Pencil): menpitsu, enpitsu(pencil).
Gohan (Rice): gokan.
Kingyo (Goldfish): eeto (umm), eto (um), kingyo (goldfish).

Case 3
Linguistic treatment commenced 1.5 months after onset. The patient was awake, but acted somewhat absentmindedly, exhibited reduced activity, and was disoriented with respect to time and place. Confabulation and impaired episodic memory were observed. When the linguistic impairment was brought to his attention, he would create an excuse using random speech, and the signs of denial of the condition were severe. Speech was fluent and included irrelevant words, frequent neologisms, monemic paraphasia, and empty phrases. However, phonological paraphasia was absent. Repetition was good, and mitigated echolalia was occasionally observed. Comprehension of word meaning was impaired and paralexia of similar sounding words was observed when reading aloud. The aphasia type resembled transcortical sensory aphasia. Analysis of speech in the naming task in this period revealed that mistaken words were largely composed of neologisms (28.6%) and irrelevant words (15.6%). Empty phrases (28.1%) and syllable fragments (26.3%) were also common. The period in which neologisms occurred frequently was established as Period 1, and an example of Period 1 speech in the naming task is provided below.

Case 3 Speech Example (Period 1): Naming (1.5 months after onset)
Roketto (Rocket): kore wa (this is), byuuun (whoosh), gacha, chihoutoshi, chihoumame.
Toudai (Lighthouse): biru (building), fuuta, fuutara, chau noka (it isn’t right), se, sekushi.
Uma (Horse): Choukoku (sculpture), chou, chou, chouroyasumi, chouyasumi

In Period 2, comprehension of word meaning rapidly improved. The frequency of neologisms gradually decreased, and there was a period in which monemic paraphasia became dominant (2.5–5.4 months after onset). Phonological paraphasia was absent, but semantic paraphasia and circumlocution increased. The period at 6 months after onset, when neologisms and monemic paraphasia disappeared, was established as Period 2. Speech analysis revealed the frequency of empty phrases (47.3%), syllable fragments (11.0%), circumlocution (22.4%), semantic paraphasia (7.3%), irrelevant words (5.3%), and correct words (6.5%). Additionally, inappropriate phrases, such as including irrelevant words (e.g. drum→a person that makes a banging sound) and stacking multiple words with the same meaning (e.g., clock→time of clock), were characteristic.

Case 3 Speech Example (Period 2): Naming (5.9 months after onset)
Tokei (Clock): kore wa, kore (this is, this), nan tsuu kana (what is it I wonder), uun (hmm), tokei no zikan (time of clock).
Taiko (Drum): pan pan oto ga naru ningen (a person that makes a banging sound),
zya nee na (that is incorrect).

In Period 3, at 15 months after onset, the SLTA naming score exceeded the average score for aphasia patients. The disorientation and memory impairment had improved. Linguistic symptoms had generally improved, although impairment in naming and writing remained. Speech analysis revealed the frequency of empty phrases (41.1%), syllable fragments (6.4%), circumlocution (32.7%), correct words (10.4%), verbal paraphasia (6.9%), and irrelevant words (2.5%). Although paraphasia remained, it was frequently accompanied by expressions that negated it, suggesting that the trial and error process of word finding was being spoken aloud.

Case 3 Speech Example (Period 3): Naming (15 months after onset)
Ito (String): kore wa, ito (this is, string).
Toudai (Lighthouse): kore wa, umi ni aru (this is, on the sea), nan dakke na (what was it again), umi ni aru (on the sea), hikatte misen no (shining thing), nan dakke na (what was it again).
Puroresu (Professional wrestling): kore wa sumo (this is sumo), sumo de ii no kana (can it be called sumo), ashi wo motteru (holding legs), sumo zya nai (it’s not sumo), kore wa puroresu (this is professional wrestling).

**DISCUSSION**

Each case that presented with acute phase neologistic jargon demonstrated a different course of recovery. We considered the course, outcome, and mechanism underlying the occurrence of neologisms in each case.

Case 1 followed a course that supports Alajouanine’s three-step recovery theory.

Prior to the appearance of neologistic jargon symptoms, incomprehensible speech with impaired articulation was evident, and the speech was regarded as mumbling jargon (Kertesz, 1982) or untranscribable jargon (Matsuda, Suzuki, Nabatame, Nakamura, & Nakaya, 1997). There were multiple occurrences of neologism in speech in Period 1, but grammatical function words were lacking, and the condition corresponded to undifferentiated jargon. One month later, grammatical function words were appended to the neologisms, with a concurrent decrease in the number of neologisms. The patient switched from undifferentiated jargon to neologistic jargon. Improvement progressed, and the number of neologisms continued to decrease. Three months later, Period 2 speech corresponded to semantic jargon. As neologisms disappeared, empty phrases and irrelevant words were frequent, and irrelevant words were highly stereotypic (“grandpa”). The condition differed from that of general semantic jargon. However, we have previously reported that there are multiple subtypes of semantic jargon with such symptoms (Higashikawa & Hadano, 2008). We considered the above course to follow that of the three steps in Alajouanine’s three-step recovery theory (Higashikawa, Shimodaira, Akai, Hadano, &
Hatta, 2010). Approximately 20 months later, the production of irrelevant words ceased, and only anomaia remained. Considering only impaired word finding, the course of recovery is consistent with the pattern detailed by Kertesz and Benson (1970). However, as impaired comprehension was clearly present in the final stage, it cannot be said that this stage corresponds to anomic aphasia, the final stage of the “regular pattern.” Matsuda, Suzuki, and Mizuta (1999) reported speech with no paraphasia in Wernicke’s aphasia and transcortical sensory aphasia, in which there are only empty phrases with no substantial words to convey concrete information, i.e., no content word jargon. We believe the condition in this period is similar to no content word jargon.

Furthermore, in Period 3, at 8 years after onset, clear improvement was noted in word finding ability. It was thought that the no content word jargon concept was no longer applicable. Additionally, the improvement in word finding ability was limited to nouns and did not include verbs, and there was no improvement in syntactic ability. Circumlocution was completely absent. Furthermore, impaired comprehension remained, and this did not correspond to the final stage of the “regular pattern”, circumlocutory anomic speech.

Regarding the mechanism underlying the occurrence of neologisms in Case 1, from the observation of consistent phonological and semantic improvements, it is thought that both disorders of phonology and semantics existed. This condition can be explained by the two-stage theory. The outcome of Case 1 was moderate atypical aphasia.

Lastly, we will add a consideration regarding the suspected injury site based on the head X-ray and CT scan in Case 1. The brain injury site in Case 1 included a section of the frontal lobe (inferior frontal gyrus, etc.) in addition to Wernicke’s area (superior temporal gyrus, transverse temporal gyrus, etc.). It was thought that a diagnosis of severe Wernicke’s aphasia accompanied by jargon complicated by symptoms of apraxia of speech were consistent with this site of injury. It can be confirmed from the injury site that jargon and highly stereotyped irrelevant words appeared on a background of severe aphasia close to total aphasia.

Marked improvement was observed in the early stages of Case 2 compared to that seen in Case 1. Even in Period 1, when neologisms were frequent, phonological paraphasia was evident and semantic paraphasia was scarce. In Period 2/3, approximately 5 months after Period 1, in which neologisms disappeared and substantial improvement was observed in naming, semantic paraphasia was limited, phonological paraphasia was frequently observed, and conduite d’approche was observed. Semantic impairment was inconspicuous, and phonotactic impairment was evident. Furthermore, there was a marked limitation of auditory short-term memory and the clinical opinion was indicative of conduction aphasia. Over the course of Case 2’s recovery, neologistic jargon did not progress to semantic jargon, but developed into a condition resembling conduction aphasia. This type of course has also been noted in cases such as Buckingham (1981) and Funayama, Kojima, Inaba, and Kawashima (2010). We believe that the neologisms observed in his acute phase reflect a severe impairment at the phoneme level. This is considered a case wherein the course supports conduction theory. Nonetheless, in Case
2, apraxia of speech could also be observed depending on the situation. With regard to the outcome, the confirmed condition was moderate atypical aphasia, which resembled conduction aphasia.

The injury site in Case 2 was the middle and inferior frontal gyri, a section of the temporal lobe, and parietal lobe, including the supramarginal gyrus. This injury site is thought to be consistent with the atypical case outcome combined with non-fluent elements, rather than typical conduction aphasia. Unlike typical conduction aphasia due to localized injury in the parietal lobe, it is believed that the severe aphasia with jargon appeared as a result of extensive damage to areas such as the anterior speech cortex.

In Case 3, in contrast to Case 2, phonological errors were absent throughout recovery. In Period 1, transcortical sensory aphasia and non-aphasic misnaming were combined. In Period 2, although both the aphasia and non-aphasic misnaming improved, the marked increase in aphasia suggested that the non-aphasic misnaming was predominant (Motoki et al., 2017). In Period 3, the psychological disturbance improved and, conversely, the existence of non-aphasic misnaming reduced to the level of a negative symptom. Comprehension was good; however, aphasia with anomia and dysgraphia remained.

We considered the mechanism underlying the occurrence of neologisms observed in Case 3 with respect to the course of recovery from Period 1 to Period 2. The majority of neologisms were partially included monemes. The neologisms soon decreased, and the monemic paraphasia became predominant. Phonological paraphasia was not observed throughout the course, and it was thought that phonotactic level errors were not involved in the occurrence of neologisms. From this, an explanation based on the hybrid lexical error hypothesis was considered reasonable. This hypothesis suggests that the neologisms in Case 3 occurred due to the incorrect combination of monemes.

We will summarize the course of jargon in Case 3. Period 1 was neologic jargon. In Period 2, neologisms had disappeared. Inappropriate phrases were occasionally observed that took the form of semantic jargon-like speech. However, considering comprehension had improved and irrelevant words were scarce (5.8%), the condition did not strictly match the semantic jargon in Kertesz and Benson’s (1970) “regular” pattern still in this period. Subsequently, speech in Period 3 was thought to correspond to the final stage of Kertesz and Benson’s “regular pattern,” which comprises circumlocutory anomic speech.

The site of brain injury in Case 3 was limited to the left inferior temporal lobe and a section of the left frontal lobe. Minor damage was sustained in the Sylvian area of the speech cortex, including Wernicke’s area and Broca’s area. This did not conflict with the possibility of transcortical sensory aphasia in the acute phase. This patient was surgically treated for subarachnoid hemorrhage. We believe that overall functional decline occurred in the brain in the acute phase, giving rise to the complex linguistic condition with transcortical sensory aphasia with non-aphasic misnaming, which then resolved.
GENERAL DISCUSSION

The course of symptoms of the three patients exhibiting neologicistic jargon in the period immediately following the onset of cerebrovascular impairment are summarized in Table 1. The first conclusion of this paper supports the order of symptom appearance presented by Alajouanine (1956) and suggested in the regular pattern of Kertesz and Benson (1970). That is, during the course of recovery, the appearance of each type of jargon and anomic symptoms were in this order in Case 1 and Case 3. However, not all symptoms appeared in these cases. The symptom occasionally appeared part way through the course (e.g., Case 3 did not have an undifferentiated jargon period, and neologicistic jargon was the first presenting symptom) or a symptom resembling the symptom predicted by the models appeared (Period 3 in Case 1, Period 2 in Case 3). Regardless, it was inferred that the progression from a positive symptom of jargon that then resolves, leaving a negative symptom, anomia, is a highly universal course of disease. Regarding the neologisms observed in Case 1, semantic improvement was observed following improvement of the phonological impairment. This improvement proceeded sequentially, the positive symptoms such as irrelevant words resolved, and only anomia remained. In Case 3, the phonological impairment was mild, and neologisms resembling monemic paraphasia occurred frequently. Along with semantic improvement, the positive symptoms resolved, and anomia remained.

The case of neologicistic jargon explained by conduction theory (Case 2) was considered as an exception to the disease progressions proposed by Alajouanine (1956) and Kertesz and Benson (1970). It did not progress to semantic jargon and the outcome was conduction aphasia (or aphasia similar to conduction aphasia). This result was consistent with that reported by Brown’s model (Brown, 1977) in which neologicistic jargon transitions to either semantic jargon or phonemic aphasia (conduction aphasia).

Finally, we discuss the theories of the mechanism underlying the occurrence of neologisms. When considering the mechanism underlying the neologisms observed in the three cases, the two-stage theory, conduction theory, and hybrid lexical error hypothesis were useful. We can confirm that it is reasonable to think that neologisms have multiple origins, and it is difficult to predict in the early stage of the disease (Hadano, 1991).

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Table 1. The outcomes and courses of symptoms for the three cases exhibiting neologistic jargon

| Course of symptoms | Alajouanine’s three-step recovery theory | Kertesz & Benson’s regular pattern | Outcome | Period from onset to outcome (months) |
|--------------------|----------------------------------------|-----------------------------------|---------|--------------------------------------|
|                    |                                        |                                   |         |                                      |
| mumbling J          |                                        |                                   |         |                                      |
| undifferentiated J  |                                        |                                   |         |                                      |
| neologic J          |                                        |                                   |         |                                      |
| semantic J          |                                        |                                   |         |                                      |
| anomic aphasia      |                                        |                                   |         |                                      |
| Case 1              | ○                                      | ○                                 | ○ △     | atypical aphasia with apraxia of speech | 97.3 |
| Case 2              |                                        | ○                                 | ○       | atypical aphasia resembling conduction aphasia with apraxia of speech | 6.9 |
| Case 3              |                                        | ○ △                               | ○       | anomic aphasia                       | 15  |

○: the symptom appeared  △: a symptom similar to the symptom appeared
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