Comparison of the Speech Performance of Thai Adults with Apraxia of Speech and Thai Adults with Normal Speech by Using the Apraxia Test for Thai Adults

Pitcharpa Dejket BSc[1]
Jeamjai Jeeraumporn PhD[1*]
Sumalee Dechongkit PhD[1]
Montip Tiensuwan PhD[2]

[1] Department of Communication Sciences and Disorders, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Thailand
[2] Department of Mathematics, Faculty of Science, Mahidol University, Bangkok, Thailand
* Corresponding author, e-mail address: jeamjai.jee@mahidol.ac.th
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Abstract

Objective: To measure and analyze the speech performance score of adults with apraxia of speech (AOS) and adults with normal speech and to compare the speech performance scores of both groups.

Methods: The study was conducted at the Speech Clinic in Ramathibodi Hospital. Participants were divided into two groups. The measurements of speech performance were obtained by using the Apraxia Test for Thai Adults. The test results were analyzed by using descriptive statistics and a Mann-Whitney U test for a comparison of the speech performance scores of both groups.

Results: The results showed that the group of adults with normal speech had higher scores on all subtests than the group of adults with apraxia of speech (AOS). The results also showed that the group of adults with normal speech had statistically significant differences (p-value < .05) on subtests I, II, III, IV, and some tasks in subtests V, VI, and VII. The group of adults with AOS had more difficulties with both speech and nonspeech tasks than the group of adults with normal speech.

Conclusion: Adults with AOS showed the adverse effects of the impairment on their speech performance scores. They had more difficulties in moving their articulators to produce speech sounds while adults with normal speech did not have impaired movements of their articulators or restricted speech production.

Keywords: apraxia of speech, apraxia test, speech performance

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การศึกษาเปรียบเทียบความสามารถทางการพูดของผู้ใหญ่ที่มีภาวะเสียการรู้ปฏิบัติด้านการพูดและผู้ใหญ่ที่พูดปกติโดยใช้แบบประเมินภาวะเสียการรู้ปฏิบัติด้านการพูดฉบับภาษาไทย

พิชญ์อาภา เดชเกตุ วท.บ.[1] **เจียมใจ จีระอัมพร ปร.ด.**[1*]
สุมาลี ดีจงกิจ Ph.D.[1] **มนต์ทิพย์ เทียนสุวรรณ Ph.D.**[2]

[1] ภาควิชาวิทยาศาสตร์สื่อความหมายและความผิดปกติของการสื่อความหมาย คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล กรุงเทพมหานคร ประเทศไทย

[2] ภาควิชาคณิตศาสตร์ คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล กรุงเทพมหานคร ประเทศไทย

* ผู้ติดต่อ, อีเมล: jeamjai.jee@mahidol.ac.th

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาการแสดงออกทางการพูดในกลุ่มผู้ใหญ่ที่มีภาวะเสียการรู้ปฏิบัติด้านการพูดและกลุ่มผู้ใหญ่ที่พูดปกติ โดยใช้แบบประเมินภาวะเสียการรู้ปฏิบัติด้านการพูดฉบับภาษาไทย เพื่อเปรียบเทียบความสามารถในการแสดงออกทางการพูดในกลุ่มผู้ใหญ่ที่มีภาวะเสียการรู้ปฏิบัติด้านการพูดและกลุ่มผู้ใหญ่ปกติ

วิธีดำเนินการวิจัย: การศึกษานี้ศึกษาในผู้ใหญ่ที่มีภาวะเสียการรู้ปฏิบัติด้านการพูดจำนวน 7 คน และในผู้ใหญ่ที่พูดปกติจำนวน 36 คน อายุระหว่าง 25 ถึง 72 ปี นับตั้งแต่วันที่เริ่มทำการศึกษา แบบประเมินภาวะเสียการรู้ปฏิบัติด้านการพูดฉบับภาษาไทยประกอบด้วยแบบทดสอบย่อยจำนวน 7 แบบทดสอบ โดยผู้ประเมินจะพูดบอกให้ผู้เข้าร่วมวิจัยทุกรายปฏิบัติตามข้อคำสั่งในแต่ละข้อเรียงลำดับตามในแต่ละแบบทดสอบย่อย การวิเคราะห์ทางสถิติใช้สถิติเชิงพรรณนา ได้แก่ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐานและพิสัยในการหาค่าคะแนนการแสดงออกทางการพูดของกลุ่มตัวอย่างทั้งสองกลุ่ม สถิติทดสอบแมน-วิทนีย์ ยู ใช้เพื่อเปรียบเทียบคะแนนการแสดงออกทางการพูดในทั้งสองกลุ่ม

ผลการศึกษา: ค่าคะแนนการแสดงออกทางการพูดในกลุ่มผู้ใหญ่ที่พูดปกติมีค่าสูงกว่ากลุ่มผู้ใหญ่ที่มีภาวะเสียการรู้ปฏิบัติด้านการพูดในทุกแบบทดสอบย่อย ผลการศึกษายังแสดงให้เห็นว่า ในกลุ่มผู้ใหญ่ที่พูดปกติมีค่าคะแนนที่สูงกว่าอย่างมีนัยสำคัญทางสถิติในแบบทดสอบย่อยที่ 1 (การควบคุมอวัยวะที่ใช้ในการพูดโดยอัตโนมัติ) แบบทดสอบย่อยที่ 2 (การเคลื่อนไหวอวัยวะที่เกี่ยวข้องกับการพูดอย่างตั้งใจ) แบบทดสอบย่อยที่ 3 (การทดสอบภาวะเสียการรู้ปฏิบัติในการควบคุมอวัยวะในช่องปาก) แบบทดสอบย่อยที่ 4 (การทดสอบภาวะเสียการรู้ปฏิบัติในการควบคุมแขนขา) บางหัวข้อในแบบทดสอบย่อยที่ 5 (การลากเสียงสระและอัตราการเคลื่อนไหวอวัยวะในการออกเสียงอย่างเป็นลำดับ) แบบทดสอบย่อยที่ 6 (การพูดตาม) และแบบทดสอบย่อยที่ 7 (การพูดต่อเนื่องและการพูดอย่างอัตโนมัติ) ที่ระดับความเชื่อมั่น 0.05 ($p < 0.05$)

สรุป: กลุ่มผู้ใหญ่ที่มีภาวะเสียการรู้ปฏิบัติด้านการพูดมีความบกพร่องในคะแนนความสามารถทางการพูดโดยมีความลำบากในการเคลื่อนไหวอวัยวะที่ใช้ในการพูดมากกว่ากลุ่มผู้ใหญ่ที่มีการพูดปกติ

คำสำคัญ: การพูดอะแพรกเซีย, แบบทดสอบอะแพรกเซีย, การแสดงออกทางการพูด

วันที่รับบทความ 28 มิถุนายน 2564 **วันแก้ไขบทความ** 29 พฤศจิกายน 2564 **วันตอบรับบทความ** 1 มีนาคม 2565

Introduction

Apraxia of speech (AOS) is an impairment in speech production caused by damage in the neurological systems that control speech. This impairment occurs in both speech programming and speech sequencing of the articulators. Apraxia of speech is not related to weakness, slowness, or coordination of the articulators. This disorder directly affects voluntary speech but does not affect reflex and automatic speech[1-2]. Apraxia of speech is caused by brain injury from a stroke which lesion in the frontal lobe[1,3] or parietal lobe, or a subcortical lesion in the left hemisphere[3].

Duffy reported that AOS was identified in eight percent of 6,101 adults with motor speech disorders at the Mayo Clinic in the United States[4]. In Thailand, the patient statistical data from Information department of Ramathibodi Hospital for 2015 showed that 16.5% of all patients with neurological disorders in Speech Clinic had AOS. Based on the prevalence of AOS, it is not a common disorder when compared to other speech problems caused by motor speech disorders.

Apraxia of speech affects the speech characteristics of people in several aspects: 1) articulation, 2) rate and prosody, 3) fluency, 4) other speech characteristics such as alternating motion rates (AMRs) and sequential motion rates (SMRs).

The AOS test in the Thai language was initially developed in 1988 by Akamanon and, in 2002, Sarankawin studied in Thai normal adults aged 20-65 in order to determine its reliability. The reliability of this test was adequate (0.71-0.97 (p-value<.05))[5]. Although the reliability of the AOS test was adequate for adults with normal speech, the AOS test was not used to evaluate adults with AOS. Accordingly, there were no speech performance scores from these adults with AOS. Therefore, the present research evaluated the speech performance scores of Thai adults with apraxia of speech. Moreover, this AOS test was administered to Thai adults with the normal speech in order to compare the speech performance scores of both groups.

Methods

Study design and participants

The study was conducted at the Speech Clinic in Ramathibodi Hospital from August 2016 to October 2017. The samples sizes calculated using the two independent means. The ratio of normal speech versus AOS groups set at 4:1 (36:9 participants). There were 36 adults with normal speech, but there were only 7 instead of 9 adults with AOS because 2 adults with AOS were excluded from the study. Because they could not reach the inclusion criteria. In addition, participants with AOS could not be found more at that time. All Thai adults with AOS in this study had aphasia with varying degrees of severity. They were diagnosed by speech and language pathologist using WAB test. The duration of illness, it was 2 to 30 months, the mean duration of illness was 15.14 months. Adults with pure AOS were not patients in the Speech Clinic at that time because pure AOS is rare. The eligible adults with AOS were able to produce at least 3 long syllables per sentence and could follow at least 1-step commands. The age range of adults with AOS was from 41 to 69 years, the mean age was 55.55 years. For the group of adults with normal speech, the participants did not have any prior speech problems such as stuttering, cluttering or other voice disorders and did not have a history of neurological problems. The group of adults with normal speech were matched for age as closely as possible with the adults who had apraxia of speech. The age range of adults with normal speech was from 25 to 72 years, the mean age was 53.74 years. All of the participants in this study were Central Thai Native speakers and they demonstrated normal hearing ability during a conversation with the researcher. These participants did not have a history of psychiatric problems, a history of delayed speech and

language development, or articulation disorders. The demographic data of participants are shown in Table 1.

Instruments

The instruments used in this study consisted of the Apraxia Test for Thai Adults and its record form[5], a video recorder was used for, and video clips were investigated when there was any suspicious output in the recorded data, and a stopwatch was used for measuring time durations. The Apraxia Test for Thai Adults consisted of seven subtests as follow:

Subtest I: Automatic control of articulators such as coughing, sneezing, and chewing. This subtest included 10 items.

Subtest II: Voluntary movement such as protruding the tongue, showing teeth, and puffing the cheeks. This subtest included 9 items.

Subtest III: Oral apraxia is an impairment of nonspeech volitional movements of the lips, tongue, jaw, and other articulators[4]. Rounding the lips, smiling, and clicking the tongue are examples of the evaluation tasks. This subtest included 30 items.

Subtest IV: Limb apraxia is an impairment of the purposive motions of the upper and/or lower limbs that are related to left frontal hemisphere damage without association with weakness, sensory impairment, loss of coordination of movements, or lack of comprehension of commands[6-8]. Clapping hands, waving a hand, and standing on one leg are examples of the evaluation tasks for limb apraxia. This subtest included 15 items.

Subtest V: Vowel prolongation and diadochokinetic rate. This subtest included 7 items and was divided into 2 parts. The diadochokinetic rate is a speech task that is concerned with the repetition of syllables consisting of consonants and vowels[9]. The diadochokinetic rate consists of 2 tasks: 1) for alternating motion rate (AMR), participants were asked to produce sounds such as /p^hɤ-p^hɤ-p^hɤ/, /t^hɤ-t^hɤ-t^hɤ/, /k^hɤ-k^hɤ-k^hɤ/ in 5 seconds for each sound, 2) for sequential motion rate (SMR), participants were asked to produce sounds /p^hɤ-t^hɤ-k^hɤ/ in 5 seconds[9-14].

Subtest VI: Repetition. This subtest included 34 items and was divided into 4 tasks. The tasks in this subtest are repetitions of monosyllabic words, multisyllabic words, words with increasing lengths, and sentences.

Table 1:
Details of demographic data of adults with AOS (n=7)

No.	Gender	Age (years-months)	Type of aphasia	Duration of illness (months)
1	Male	57-0	Anomic	30
2	Male	50-2	Anomic	2
3	Male	59-6	Global	17
4	Male	67-0	Wernicke's	20
5	Male	69-9	Global	25
6	Male	41-1	Anomic	3
7	Male	44-1	Global	9

Subtest VII: Spontaneous speech and automatic speech. This subtest included 6 items and was divided into 2 parts. For spontaneous speech, the participant produced contextual speech by describing a picture. For automatic speech, the participant was asked to count from 1 to 20 and tell the days of the week forwards and backwards, forwards and backwards.

Procedure

The test session began with subtest I and continued through subtest VII. For subtests I, III, and IV, each participant was asked to follow commands. The participant's responses were scored. If the participant did not understand or did not respond, the command was repeated only once. If the participant did not respond again, the item was omitted. For subtest II, the participant was asked to move their articulators following the presentation of the target by the researcher and to respond. If the participant did not respond, the articulator movement was demonstrated only once. If the participant did not respond again, the item was omitted. For subtest V: Vowel prolongation, the participant was asked to take a deep breath and then prolong vowel sounds as long as he/she could. The times of vowel prolongations were recorded. For diadochokinetic rate, the participant was asked to produce /p^hɤ/, /t^hɤ/, /k^hɤ/ and /p^hɤ-t^hɤ-k^hɤ/ sounds in 5 seconds. The rate of repetition responses was recorded. For subtest VI, the participant was asked to repeat certain words one time. If the participant did not understand or did not respond, the researcher repeated words only once. If the participant did not respond or respond incorrectly, the item was omitted. For the first part of subtest VII: Spontaneous speech and automatic speech, the participant was asked to describe a picture. For the second part, the participant was asked to count from 1 to 20 forwards and backwards. After that, the participant was told to name the days of the week forwards and backwards and their responses were recorded.

The scoring system of each subtest was shown in Table 2-5.

Ethical consideration

This study was approved by the Ethical Clearance Committee of the Faculty of Medicine, Ramathibodi Hospital, Mahidol University (ID 08-59-16). The participants, or close relatives of participants who were willing to participate in this study, were informed about the purposes of this study and the procedure for administering the Apraxia Test for Thai Adults. They were required to sign the informed consent form.

Table 2:
The scoring system of the Apraxia Test for Thai Adults for Subtest I and subtest II.

Score	Response
2	Immediately correct response or correct response after incorrect response.
1	Partially correct response.
0	Incorrect response or no response.

Table 3:

The scoring system of the Apraxia Test for Thai Adults for Subtest III and subtest IV.

Score	Response
11	Immediately correct response.
10	Accurate response but delayed not to exceed 5 seconds.
9	Correct response after incorrect response.
8	Partially correct response.
7	Multiple responses to a command.
6	Articulatory groping, trial and error before a correct response.
5	Incorrect response.
4	Articulatory groping, trial and error but an incorrect response.
3	Repeat the preceding command.
2	Irrelevant responses and less attention.
1	No response.
0	No awareness.

Table 4:

The scoring system of the Apraxia Test for Thai Adults for Subtest VI.

Score	Response
2	The immediately correct response, effortlessly produced sounds.
1	Self-correction, delayed, trying to produce sounds, one or more articulatory errors.
0	No response or failed to attempt to produce the word but no sound or incorrect response without awareness of sounds.

Table 5:

The scoring system of the Apraxia Test for Thai Adults for Subtest VII.

Score	Response
3	Produce two-word phrases or four-word sentences, using appropriate grammar.
2	Partially correct response.
1	Articulatory errors, trial-and-error response.
0	No response.

Statistical analysis

The data were categorized and analyzed by using SPSS for Windows, version 24.0. Descriptive statistics, including means and standard deviations, were used to describe the speech performance scores of both groups. The Mann-Whitney U test was used to compare the differences in means relative to the speech performance scores of adults with apraxia of speech and adults with normal speech. The level of significance was set at .05.

Results

The speech performance scores of adults with apraxia of speech and adults with normal speech and the differences in the speech performance scores of both groups are shown in Table 6.

Table 6:

Means, standard deviations, and the comparison of speech performance scores between adults with apraxia of speech and adults with normal speech and by using the Mann-Whitney U test.

No. of subtest	Subtests	Total score	Normal (n = 36)		AOS (n = 7)		Z	p-value
			Mean	S.D.	Mean	S.D.		
I	Automatic control of articulators	20.00	19.97	0.17	14.86	3.63	-6.11*	.00
II	Voluntary movement	54.00	54.00	0.00	48.43	4.32	-5.90*	.00
III	Oral apraxia	330.00	326.42	3.99	258.71	41.34	-4.31*	.00
IV	Limb apraxia	165.00	165.00	0.00	140.86	26.61	-5.32*	.00
V	Vowel prolongation (seconds)							
	/a:/		13.58	2.14	11.71	3.55	-1.23	.22
	/u:/		13.33	2.72	12.86	4.74	-.66	.51
	/i:/		13.36	2.43	12.00	5.10	-1.39	.16
	Diadochokinetic rate (times/5 secs)							
	/p^hɤ/		19.11	1.97	17.43	4.20	-1.56	.12
	/t^hɤ/		18.69	2.51	15.43	3.16	-2.39*	.02
	/k^hɤ/		17.61	2.51	15.86	4.22	-1.16	.25
	/p^hɤ-t^hɤ-k^hɤ/		11.78	2.17	6.43	2.82	-3.70*	.00
VI	Repetition	108.00	107.56	0.91	72.14	23.97	-4.87*	.00
VII	Spontaneous speech and automatic speech	14.00	14.00	0.00	8.43	2.70	-6.45*	.00

* Significant at p-value < 0.05, AOS = apraxia of speech, Z = Z-test

The mean speech performance scores of adults with AOS for subtest I was 14.86 points out of 20.00 points, for subtest II was 48.43 points out of 54.00 points, for subtest III was 258.71 points out of 330.00 points, for subtest IV was 140.86 points out of 165.00 points. For subtest V, the mean prolongation time for /a:/ was 11.71 seconds, for /u:/ 12.86 seconds, and for /i:/ 12.00 seconds, and the mean times per 5 seconds for /p^hɤ/ was 17.43 times, for /t^hɤ/ 15.43 times, for /k^hɤ/ 15.86 times, and for /p^hɤ-t^hɤ-k^hɤ/ 6.43 times. For subtest VI, 72.14 points out of 108.00 points, and for subtest VII 8.43 points out of 14.00 points.

The mean speech performance scores of adults with normal speech for subtest I was 19.97 points out of 20.00 points, for subtest II was 54.00 points out of 54.00 points, for subtest III was 326.42 points out of 330.00 points, for subtest IV was 165.00 points (full score), for subtest V, mean prolongation time for /a:/ was 13.58 seconds, for /u:/ 13.33 seconds, and for /i:/ 13.36 seconds, and the mean times per 5 seconds for /p^hɤ/ was 19.11 times, for /t^hɤ/ 18.69 times, for /k^hɤ/ 17.61 times, and for /p^hɤ-t^hɤ-k^hɤ/ 11.78 times. For subtest VI, 107.56 points out of 108.00 points, for subtests VII, 14.00 points out of 14.00 points. For subtests II, IV, and VII, the mean speech performance scores of adults with normal speech were full.

The mean speech performance scores of adults with AOS and adults with normal speech were analyzed by using the Mann-Whitney U test to compare the differences. This comparison showed that differences in speech performance scores of both groups were statistically significant for subtests I, II, III, and IV (p-value = 0.00 for each subtest), subtest V: Diadochokinetic rates for /t^hɤ/ and /p^hɤ-t^hɤ-k^hɤ/ (p-value = 0.02, p-value = 0.00), subtest VI (p-value = 0.00), and subtest VII (p-value = 0.00). There were statistically nonsignificant differences between the scores of the adults in the AOS group and the adults in the normal speech group for subtest V: Vowel prolongation /a:/, /u:/, /i:/, and diadochokinetic rates of /p^hɤ/ and /k^hɤ/.

Discussion

For subtest I: Automatic control of articulators, the mean speech performance score of adults with AOS was less than the mean score of adults with normal speech. The difference in mean scores between the two participant groups was statistically significant. The results of this subtest disagreed with the results of Duffy[4] and McNeil et al.[15] who reported that adults with AOS produced normal automatic movements[4, 15]. However, the adults with AOS in the present study had aphasia. In the study of Square-Storer et al., adults with AOS plus aphasia had impairments in movements of articulators and had difficulty in carrying out the required automatic control movements while the adults with pure AOS were normal regarding those processes[16].

For subtest II: Voluntary movement, the mean speech performance score of adults with AOS was less than the mean score of adults with normal speech. The difference in mean scores between the two groups was statistically significant. The adults with AOS in the present study had problems with voluntary movements in terms of accuracy, speed, and strength of movement. The results of this subtest agreed with the results of Code[17], McNeil et al.[18]. They reported that the voluntary movements of adults with AOS were impaired[17-18]. The results of adults with normal speech agreed with those of Sarankawin[5] and McNeil et al.[15]. They reported that adults with normal speech could move their articulators correctly[5,15]. Adults with normal speech did not have an impairment restricting voluntary movements[5], while adults with AOS had problems with the intended movements[15,19] although they had normal neuromuscular control[17].

For subtest III: Oral apraxia, the mean speech performance score of adults with AOS was less than the mean score of adults with normal speech. The

difference in mean scores between the two groups was statistically significant. The adults with AOS in the present study had problems with this subtest in different degrees. The results of this subtest agreed with the results of Duffy[4], Ziegler[20], McCaffrey[21], DeRenzi et al.[22], and LaPointe and Wertz[23]. They reported that oral apraxia was common among adults with AOS[4, 20-23]. The results of adults with normal speech who did not receive a full score agreed with those of Sarankawin[5]. She reported that most tasks in this subtest were used in daily life and were easy to do but some tasks were not used in daily life so they were difficult to do properly[5]. The task 'furling the sides of the tongue' is an inherited genetic ability so some participants in her study could not do this. Sturtevant reported results which showed that seventy percent of adults could furl the sides of their tongue[24].

For subtest IV: Limb apraxia, the mean speech performance score of adults with AOS was 140.86 points. The adults with normal speech received the full score. The difference in mean scores between the two groups was statistically significant. The results of the present study agreed with the results of Roy et al.[6] who reported that adults with normal speech received higher scores than adults with AOS[6], and adults with AOS also had limb apraxia[4]. Although adults with AOS may have limb apraxia, two adults with AOS in the present study received a full score. The results of some adults with AOS in the present study possibly occurred from aphasia which affected language comprehension and body movement[25]. Because of stroke, adults with aphasia in the present study also had unilateral weakness. Accordingly, they had problems with coordination and balance, and with speech abnormality. However, the most common symptoms of adults with AOS were not related to weakness, slowness, and coordination of movements[1,2, 26].

For subtest V: Vowel prolongation and diadochokinetic rate. The mean vowel prolongation time for /a:/, /u:/, /i:/ of adults with AOS was less than the mean time of adults with normal speech, but the difference in mean times between the two groups was statistically nonsignificant. Vowel prolongation of adults with AOS was normal or near normal because these adults had impairments of movements and coordination of their articulators but not relative to weakness, slowness, or incoordination of the speech mechanism[1,4]. The results of vowel prolongation tasks agreed with those in the study of Ogar et al. They reported that adults with AOS had less difficulty in vowel prolongation because it was a simple task for adults with AOS[27]. Regarding diadochokinetic rate, which consisted of measuring the alternating motion rates (AMRs) and the sequential motion rates (SMRs), the mean number of times per 5 seconds for /p^hɤ/, /t^hɤ/, /k^hɤ/, and /p^hɤ-t^hɤ-k^hɤ/ of adults with AOS were 17.43, 15.43, 15.86 and 6.43 times respectively, and of adults with normal speech were 19.11, 18.69, 17.61, and 11.78 times respectively. The differences in the mean number of times per 5 seconds of both groups for /t^hɤ/ and /p^hɤ-t^hɤ-k^hɤ/ were statistically significant, while the differences in the mean number of times per 5 seconds of both groups for /p^hɤ/ and /k^hɤ/ were statistically nonsignificant. These results agreed with those of Mlcoch and Square[28]. They reported that adults with AOS had more difficulty in articulating a lingua-dental sound (/t^hɤ/) than other types of articulation. Accordingly, the adults with AOS in their study could not articulate properly[28]. Adults with AOS in the present study had more difficulty with SMRs than AMRs. These results agreed with the results of Darley et al. and Duffy. They reported that adults with AOS had more impairments in sequential movements (SMRs) than in repeating the same movements (AMRs.)[1, 4]. Josephs et al. reported that the speech rates of adults with AOS were slow and also had distortions in their SMRs when compared to their AMRs[2].

For subtest VI: Repetition, the mean speech performance score of adults with AOS was 72.14 points and was 107.56 points for adults with normal speech. The difference in mean scores between the two groups was statistically significant. Adults with AOS in the present study had problems in repeating words and sentences and made more errors in repeating multisyllabic words than single words. These results agreed with the results of McNeil et al., Ogar et al., and Ziegler. They reported that adults with AOS made errors when they repeated words or sentences[18, 27, 29]. The results of this subtest also agreed with the results of Darley et al., Duffy, Ogar et al., and Mlcoch et al. They reported that adults with AOS made more errors in producing complex words and sentences[1, 4, 27, 28].

For subtest VII: Spontaneous speech and automatic speech, the mean speech performance score of adults with AOS was less than the mean score of adults with normal speech. The difference in mean scores between the two groups was statistically significant. For the spontaneous speech task, the results showed that all adults with AOS had problems with telling a story from a picture. In general, severe AOS restricted the completion of spontaneous speech tasks[4]. Moreover, all AOS participants in the present study had aphasia. Adults with aphasia had reduced or limited spontaneous speech[30]. Thus, the adults with AOS in the present study had an apparent narrative impairment. On the second task, automatic speech, only one adult with AOS received a full score. Other adults with AOS did not have a problem in counting forward from 1 to 20 and telling the days in a week consecutively but they had problems counting from 1 to 20 backwards and telling the days in a week backwards. Counting from 1 to 20 backwards and telling the days in a week backwards were regarded as intentional speech. This meant that these adults with AOS had difficulty with their automatic speech, backward counting, and telling the days in a week than simply counting forward from 1 to 20 and telling the days in a week. The results on the second task, automatic speech, agreed with the explanations of Darley et al., Darley and Spriestersbach, and Duffy. They reported that automatic speech (counting forwards and telling the day forwards) of adults with AOS was easier to articulate than intentional speech (counting backwards and telling the day backwards)[1, 4].

Conclusion

A comparison of the speech performances of adults with normal speech and adults with apraxia of speech showed statistically significant differences on subtests I, II, III, IV, and on some tasks of subtests V, VI, and VII. The results of this study might be used as a guideline for screening and preparing of treatment plans. However, the numbers of adults with AOS in this study were small and there was no participant of pure AOS. Therefore, a future study should have more adults with AOS in order to collect enough data to better evaluate their speech performance test scores, and participants with pure AOS should be included in order to study the characteristics of pure AOS.

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Conflict of interest

No likely conflict of interest relevant to this article was reported.

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