

令和 5 年 4 月 18 日現在

機関番号：12501

研究種目：研究活動スタート支援

研究期間：2019～2022

課題番号：19K24192

研究課題名（和文）国際的な比較を可能とする新しい言語障害スクリーニング検査の開発

研究課題名（英文）Development of a new screening test for communicative disorders that allows international comparisons

研究代表者

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交付決定額（研究期間全体）：（直接経費） 2,200,000円

研究成果の概要（和文）：私たちはこれまでの一連の研究において患者の負担少なく簡易に行える言語障害スクリーニング検査（Screening Test for Aphasia and Dysarthria；STAD）を開発し検査精度の分析と臨床応用について検討した。STADの所要時間は10分（平均9分48秒）と短時間でありベッドサイドなどの環境下でも患者の負担少なく行える。本研究では新たに開発する英語版STADの診断精度を検証している。国際的な比較を可能とするSTADについて2021年Folia Phoniatica et Logopaedicaに受理、研究成果を広く発信するために論文はオープンアクセス化した。

研究成果の学術的意義や社会的意義

研究成果は3つの国際学会、2つの国内学会でも報告した。英語版STADのホームページ及びブログを開設（<https://kentaro-a-lucky.jimdofree.com/>）申請のあった英語を母語とする言語聴覚士49名に英語版STADを配信した。アウトリーチ活動2講演、言語障害スクリーニング『STAD』株式会社Geneリハノメ 2022年、スクリーニング評価法STAD、一般社団法人兵庫県言語聴覚士会2022年。STADの妥当性試験には海外の言語聴覚士8名が参加を表明。今後の英語版STADの国際化に期待される。

研究成果の概要（英文）：The development of a screening test for language disorders after brain injury (STAD) that allows international comparisons was accepted for publication in the international journal Folia Phoniatica et Logopaedica on September 1, 2021. The accepted paper was made open access in order to disseminate the research results widely.

We also reported the study in the international conference ASHA Convention (Washington, D.C., November 2021), and a conference, the 22nd Annual Speech-Language-Hearing Association Conference (Aichi, Japan, June 2021).

We established a website and blog for the English version of the STAD as an outreach activity for the study (<https://kentaro-a-lucky.jimdofree.com/>) and distributed the English version of the STAD to 49 applicants (native English-speaking speech-language pathologists).

研究分野：言語障害スクリーニングテストの開発

キーワード：失語症 構音障害 高次脳機能障害 スクリーニング

## 様式 C - 19、F - 19 - 1、Z - 19 (共通)

### 1. 研究開始当初の背景 (Back ground of the study)

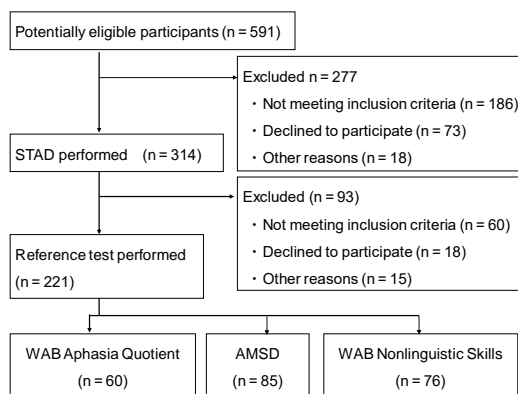
The Screening Test for Aphasia and Dysarthria (STAD) was designed in Japan in 2009 to provide an overview of the cognitive and communicative abilities of patients with brain injury, enable evaluation with a moderate to high degree of reliability and validity, and permit rapid test administration (approximately 10 min). The STAD was designed to be suitable for bedside, home, or examination room administration by speech-language pathologists (SLPs), psychiatrists, or neurologists. One way to ascertain the overall picture of the communicative function across multiple areas is to simultaneously test all the domains of communicative function. Therefore, including three test sections that respond specifically to the three different disorders (aphasia, dysarthria, and cognitive dysfunction) facilitates the estimation of the pivotal domain that inhibits patient communication. Thus, the STAD focuses on language, articulation, and cognitive abilities measured separately in verbal, articulation, and nonverbal sections, respectively.

### 2. 研究の目的 (Aim of the study)

In this study, we aimed to assess the validity of the STAD on a larger scale, with a consecutive series that included over 300 patients with stroke and with physicians' prescriptions, selected from 20 multicenter studies in Japan. We verified the validity of the STAD in three ways. First, we assessed item-level validity and calculated the effectiveness of all the STAD items in detecting the presence or absence of aphasia, dysarthria, and cognitive dysfunction. We expected to observe stronger effect sizes between the items belonging to the verbal section and aphasia, those in the articulation section and dysarthria, and those in the nonverbal section and cognitive dysfunction. Especially, when an item correctly correlates with the target disorder, the effect size of the items related to the target disorder may increase. Second, we calculated the correlations between the patients' scores on the STAD and those on different reference tests to examine concurrent validity. We expected significant correlations between the STAD and the other targeted measures. Third, we examined the test's sensitivity and specificity to determine whether the STAD could differentiate between patients with brain injury with and without communicative disorders. We hypothesized that the sensitivity and specificity of the STAD would be sufficient for screening purposes.

### 3. 研究の方法 (Method)

During the study period, 591 consecutive, potentially eligible participants were recruited (Figure). Of these, 186 were excluded because of their condition(s): 75 (40%), degenerative diseases; 47 (25%), disturbance in consciousness; 32 (17%), medical instability; 17 (9%), transient ischemic attack without neurological signs on admission; and 15 (8%), severe visual or auditory problems. Seventy-three patients declined to participate, and 18 were excluded for other reasons (inability to administer the STAD due to early discharge, SLP's judgment of inappropriateness due to diseases not indicated in the exclusion criteria, such as locked-in syndrome and severe rheumatism, or end of the study period). Finally, 277 patients were excluded from the 591 potentially eligible participants, and 314 patients were enrolled.



Flow diagram

- (1) **Item-level analysis:** To assess how each item on the STAD relates to aphasia, dysarthria, and cognitive dysfunction, we evaluated the effectiveness of each item using the phi coefficient.
- (2) **Classification accuracy:** To assess the accuracy of the three STAD sections, receiver operating characteristic (ROC) curves were calculated to estimate the optimal cutoff point that provides adequate sensitivity and specificity (patients correctly identified as disorder-positive and disorder-negative, respectively) for screening purposes.
- (3) **Correlation with reference standard tests:** All correlations between the three sections of the STAD and the three referenced standard tests were analyzed using Pearson correlation coefficients to assess the concurrent validity of the STAD and measure

whether it is sensitive to disorder severity.

#### 4. 研究成果 (Result and discussion)

**(1) Item-level analysis:** Figure shows the effect size obtained by analyzing pass and fail responses on all the 29 STAD items, in 314 patients, to each participant's characteristics of aphasia, dysarthria, and cognitive dysfunction. When comparing the effect size of each item to the three disorders, 16, seven, and six items belonging to the STAD verbal, articulation, and nonverbal sections, respectively, showed higher values for aphasia, dysarthria, and cognitive dysfunction, respectively.

**(2) Classification accuracy:** The sensitivity (the rate of disorder-present patients correctly identified as disorder-positive) and specificity (the rate of disorder-absent patients correctly identified as disorder-negative) of the three sections of the STAD were assessed for each disorder group. To estimate the classification accuracy of the index test, AUCs were applied to the aphasia-present ( $n = 92$ ) or -absent ( $n = 222$ ) groups for their scores on the STAD verbal section, dysarthria-present ( $n = 154$ ) or absent ( $n = 160$ ) groups for the articulation section, and cognitive dysfunction -present ( $n = 179$ ) or absent ( $n = 135$ ) groups for the nonverbal section. Table 1 provides the AUCs, sensitivity values, specificity values for the index measure across the three disorders. The AUCs for verbal, articulation, and nonverbal sections were 0.91 (95% confidence interval [CI], 0.88–0.94), 0.87 (95% CI, 0.81–0.90), and 0.86 (95% CI, 0.83–0.90), respectively, indicating moderate to high levels of classification accuracy according to the published benchmarks.

**(3) Concurrent validity:** We examined the concurrent validity by computing the correlation between the participants' scores on the three STAD sections and three other reference tests, which were conducted by licensed SLPs within 2 weeks after STAD administration. Of the 212 patients who underwent the reference test, 57, 84, and 71 patients were administered WAB Parts I to IV to calculate AQ, AMSD, and WAB Part VIII for calculating NLS, respectively. Table 2 presents the Pearson's correlation coefficients between all the scores of these measures. Although all correlations showed significance at  $p < 0.01$ , the  $r$  coefficients differed depending on the combination of the STAD section and the reference test.

The STAD takes multiple domains into account, specifically language, articulation, and cognitive function, because all these evaluations are frequently required to assess communicative function after brain injury. This study examined the hypotheses that, in terms of aphasia, dysarthria, and cognitive disorder, the STAD could show acceptable validity. We confirmed the hypotheses with regard to item-level validity, diagnostic accuracy, and concurrent validity using 314 STAD and 212 other reference test data from 20 centers across Japan.

In conclusion, this short screening tool can be very useful in specific contexts, such as in early bedside investigations, to obtain a quick summarized assessment of communicative function prior to the administration of the other tests, and in cases where more in-depth testing is not feasible. By evaluating a wider range of neurological communicative disorders in patients with brain injury, the STAD could be a sensitive tool for these settings and populations.

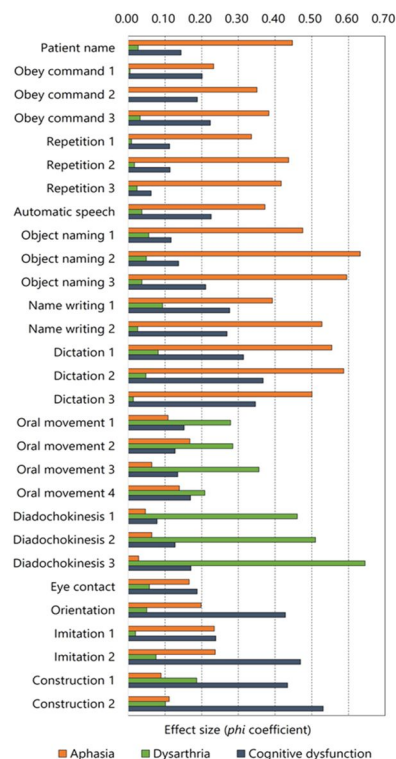


Figure Item responses

STAD	AUC	Sensitivity	Specificity
Verbal	.910	.924	.779
Articulation	.868	.922	.769
Nonverbal	.860	.821	.778

Table 1. Classification accuracy

STAD	WAB AQ	AMSD	WAB NLS
Verbal	.891	.669	.668
Articulation	.456	.702	.563
Nonverbal	.423	.658	.793

Table 2. Pearson's correlation

5. 主な発表論文等

〔雑誌論文〕 計1件（うち査読付論文 1件 / うち国際共著 0件 / うちオープンアクセス 1件）

1. 著者名 Araki Kentaro, Hirano Yoshiyuki, Kozono Machiko, Fujitani Junko, Shimizu Eiji	4. 巻 -
2. 論文標題 The Screening Test for Aphasia and Dysarthria (STAD) for patients with neurological communicative disorders: a large-scale, multicenter validation study in Japan	5. 発行年 2021年
3. 雑誌名 Folia Phoniatrica et Logopaedica	6. 最初と最後の頁 -
掲載論文のDOI（デジタルオブジェクト識別子） 10.1159/000519381	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 -

〔学会発表〕 計5件（うち招待講演 0件 / うち国際学会 3件）

1. 発表者名 Araki Kentaro, Hirano Yoshiyuki, Kozono Machiko, Shimizu Eiji
2. 発表標題 Predicting discharge to home and brain lesions using the Screening Test for Aphasia and Dysarthria (STAD)
3. 学会等名 ASHA Convention, Washinton（国際学会）
4. 発表年 2021年

1. 発表者名 荒木謙太郎、平野好幸、小園真知子、藤谷順子、清水栄司
2. 発表標題 言語障害スクリーニングテスト（STAD）の既知グループ妥当性と予測的妥当性
3. 学会等名 第22回言語聴覚士協会学会、愛知
4. 発表年 2021年

1. 発表者名 Kentaro Araki, Yoshiyuki Hirano, Machiko Kozono, Eiji Shimizu
2. 発表標題 Screening Test for Aphasia and Dysarthria and Prediction of Stroke Patients' Discharge to Home
3. 学会等名 2020 ASHA Convention（国際学会）
4. 発表年 2020年

1. 発表者名 荒木謙太郎, 平野好幸, 小園真知子, 藤谷順子, 清水栄司
2. 発表標題 言語障害スクリーニングテスト (STAD) と脳損傷例における自宅復帰の予後予測
3. 学会等名 第21回日本言語聴覚学会講演会
4. 発表年 2020年

1. 発表者名 Araki Kentaro, Hirano Yoshiyuki, Machiko Kozono, Shimizu Eiji
2. 発表標題 Development of a Worldwide Screening Test for Communicative Disorders Poststroke for International Comparisons
3. 学会等名 Academy of Aphasia 57th Annual Meeting (国際学会)
4. 発表年 2019年

〔図書〕 計0件

〔産業財産権〕

〔その他〕

<p>Screenint Test for Aphasia and Dysarthria  <a href="https://kentaro-a-lucky.jimdofree.com/">https://kentaro-a-lucky.jimdofree.com/</a>          What is STAD?  <a href="https://researchmap.jp/blogs/blog_entries/view/140494/e720b132074367726967aec4f879771b?frame_id=642475">https://researchmap.jp/blogs/blog_entries/view/140494/e720b132074367726967aec4f879771b?frame_id=642475</a></p>
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6. 研究組織		
氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考

7. 科研費を使用して開催した国際研究集会

〔国際研究集会〕 計0件

8 . 本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関
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