

ORIGINAL ARTICLE

Test-retest reliability of Shih-Hsu test of attention (SHTA) for blind employees

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Abstract

Introduction: For blind people, attention is an important occupational performance that affects their work and activities of daily life. The “Shih-Hsu Test of Attention” (SHTA) is a newly attention assessment tool developed by occupational therapists, the assessment tool with acceptable criterion-related validity and high test-retest reliability in recently application. In this study, we intended to investigate the test-retest reliability of Shih-Hsu Test of Attention (SHTA) for blind employees.

Methods: The study participants were 30 blind employees aged 20–64 without hearing impairments. Every participant was assessed twice with an interval of three weeks.

Results: The results showed that the SHTA had good test-retest reliability (ICC=0.768) for employees with blindness.

Conclusion: We found that the SHTA which is the auditory-based attention assessment tool, has good test-retest reliability. Therefore, we suggest using the SHTA as an attention assessment tool for persons with blindness in the future.

INTRODUCTION

Work performance is an important issue when discussing life reconstruction of blind people (Steverson, 2023), while attention has always been one of the most important factors of life reconstruction for many people with disabilities (Shih, 2015, 2022; Van Der Lubbe, 2017). But how to measure the attention performance of blind people is a difficult task, because almost all attention tests are based on visual stimuli such as picture cards and symbols (Cinciute, 2018; Hoonakker, 2017), which cannot be used in persons with blindness. With the evolution of the times, touch-screen tablet computers (such as iPads) have become a daily life tool commonly adopted by modern people and may become increasingly popular in the future, affecting people's habits (Shih, 2020). However, current common clinical attention test methods are not adapted for the use of tablets and touch screens for information processing and expression. An attention test with a tablet and a touch screen would be more in line with the habits of modern people than traditional attention test and would also enable immediate scoring. The development and construction of reliable and valid assessment tools are nec-

essary to the continued development. The attention performance is a worthy issue for employees with blindness (Shih, 2020, 2022).

Occupational therapy plays an important role for persons with blindness. The iPad-based attention assessment tool --“Shih-Hsu Test of Attention” (SHTA) has been developed by occupational therapists in recent years. A previous study indicated that the test-retest reliability (ICC = 0.67) and satisfactory criterion-related validity (γ = 0.29) of the SHTA has satisfactory for people with schizophrenia, and the test-retest reliability (ICC = 0.90) and satisfactory criterion-related validity (γ = 0.25) of SHTA has satisfactory for healthy adults aged 20–64 years (Shih, 2022). Another study indicated that the SHTA has high satisfactory criterion-related validity (γ = 0.400) and satisfactory test-retest reliability (ICC = 0.920) for healthy people aged 65–85 years (Shih, 2020). In addition, the SHTA has satisfactory inter-rater reliability between experienced occupational therapists and occupational therapy students (ICC=0.65). The SHTA is a newly invented attention assessment tool with auditory stimulation (Shih, 2022). As a result of previous attention tests focused on visual stimulation, and used the pen-

and-paper as the medium, this newly attention assessment tool (SHTA) uses an iPad computer. The software app of the SHTA randomly plays several auditory stimulations, including piano, violin, drum, zither, trumpet and Chinese flute in 10 minutes. All auditory stimulation has the same pitch and volume but different in timbre. Auditory stimulations are shown at intervals of 0.5, 1.0, and 1.5 seconds randomly, and the participants are asked to press the button matching to the answer (correct or incorrect) of whether the auditory stimulation corresponds to the displayed instrument name on the iPad touchscreen, as shown in Figure 1. The full score is 100 points, and the minimum score is 0 points, the test score is based on the rate of correct answers during the 10 minutes, and reaction time and number of correct responses are not included in the score. These regulations have been illustrated until the participants understand before formal testing (Shih, 2020, 2022).

Test-retest reliability is a measure administering the same test twice in a period of time to a group of individuals. In other words, test-retest is an important evaluation tool, because it ensures the stability of clinical tests (Leppink, 2017; Tang, 2017). If the SHTA can be used to persons with blindness, then it will be helpful for the reconstruction of their lives and work training. In this study, we intended to examine the newly invented attention assessment tool for employees with blindness. We also intended to do the test-retest reliability of the iPad-based attention assessment tool (SHTA) administered for persons with blindness aged 20–64 years.

METHODS

Research structure

Every participant was tested twice with an interval of three weeks. In this study, we intended to study the test-retest reliability of the newly attention assessment tool (SHTA) and to analyze the intra-class correlation coefficient (ICC) between two scores.

Ethical issues

The study was approved by the institutional review board at Fu Jen University (IRB protocol number = C110076, and date of approval = May 04, 2022) with the need to obtain signed consent forms from the study participants. All the study data were collected anonymously. In addition, participants could withdraw from the study of their own will any time during the study.

Research tool

The Shih-Hsu Test of Attention (SHTA) is a newly iPad-based assessment tool developed to test response time and sustained attention with musical stimuli (Shih, 2020, 2022). The official test of this newly invented attention assessment tool takes 10 minutes and focus on the performance of auditory attention. The score of the SHTA is only based on the percentage of correct answers, and reaction time and number of correct responses are not included in the score.

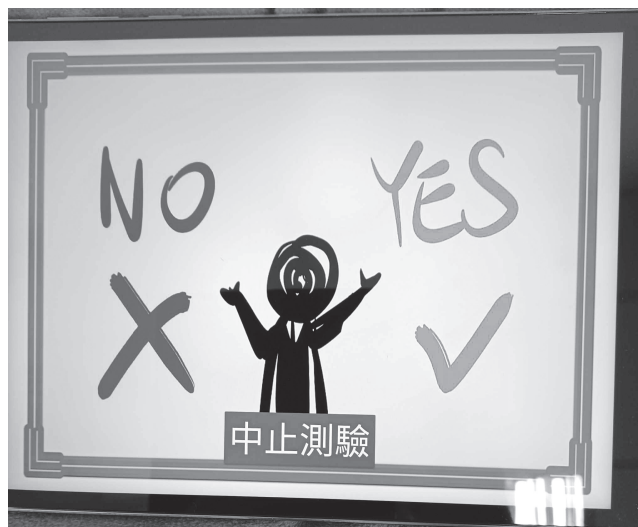


Figure 1. The test screen of the SHTA

Study participants

The persons with blindness were recruited from an employment counseling institute for the blind, while participants with blindness were recruited in New Taipei City. We excluded participants with hearing impairments. Finally, we recruited 30 voluntary participants who gave informed consents with the ages of 20–64 years.

Procedures

1. The SHTA was run to test the 30 voluntary participants with blindness by an experienced occupational therapist. Every voluntary participant has practiced first to ensure that they remember the relative positions of yes and no on the iPad touch screen of the SHTA.
2. The SHTA was run again after three weeks to test the same 30 voluntary participants by the same occupational therapist.
3. The two test scores were compared using the intra-class correlation coefficient (ICC) for exploring the test-retest reliability.

Data analysis

The intra-class correlation coefficient (ICC) was adopted to explore the test-retest reliability through comparing the test scores from the two tests. The intra-class correlation coefficient (ICC) was adopted to study the test-retest reliability of the SHTA. The $ICC \geq 0.90$ indicates excellent reliability; $0.75 \leq ICC < 0.90$ indicates good reliability, $0.5 \leq ICC \leq 0.74$ indicates moderate reliability, and $ICC < 0.49$ indicates poor reliability (Mcgraw, 1996; Shrout, 1979; Tang, 2017).

The statistical analyses of this study were done using Statistical Package for Social Science software version 20.0 for Windows (SPSS Japan, Tokyo, Japan). The differences between groups were considered significant if p -values were smaller than 0.05.

RESULTS

The scatter plot of the raw data from 30 participants was as shown in Figure 2. The intraclass correlation coefficient (ICC) was used to compare the scores from the two tests of the SHTA between three

weeks. As shown in Table 1, The ICC of the two tests was 0.768 ($p < 0.001$).

DISCUSSION

In this study, we found that the intraclass correlation coefficient of the SHTA was 0.768. This number was significantly correlated ($p < 0.001$) for two test data done by study participants with blindness, indicating its satisfactory reliability (Mcgraw, 1996; Shrout, 1979; Tang, 2017). Thus, we suggest that the SHTA may be a stable assessment tool for repeated testing for people with blindness.

Development of attention assessment tool is an important topic for employees with blindness, because attention performance remarkably influences their work performance and life. But many attention assessment tools are visual tests and thus cannot be applied to people with blindness. The SHTA is a recently invented auditory attention test, whose applicability to people with blindness is thus worth exploring. This pilot study for the test-retest reliability was done on 30 participants with blindness.

Table 1. Use intraclass correlation coefficient (ICC) to compare test scores from the two Shih-Hsu Test of Attention (SHTA) (N = 30)

	Mean	SD	intraclass correlation coefficient (ICC)
First time	68.533	24.472	0.768***
Second time	72.100	22.157	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ significantly correlated

SD, standard deviation

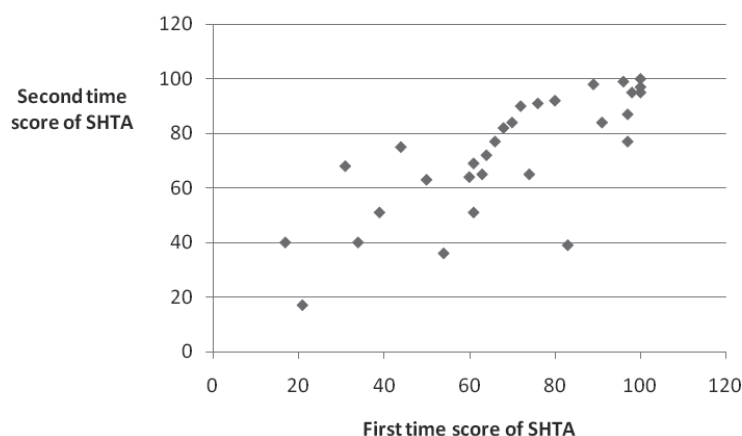


Figure 2. The scatter plot of the raw data from 30 participants

Study limitations

This pilot study still has its limitations.

- The sample size is too small. We recruited only 30 blind participants with blindness joined this study.
- This study used convenience sampling, which may not represent the actual persons with blindness. Therefore, the study findings may not be generalizable to populations of persons with blindness.
- Blindness has several types, such as congenital or non-congenital blindness. In this study, we did not consider factors such as blindness type, gender, and age for the persons with blindness.

Summary

How to assess the attention of employees with blindness is a major issue, and the assessment with auditory stimuli is an appropriate method. The Shih-Hsu Test of Attention (SHTA) is a newly auditory attention assessment tool with iPad-based. In this study, we conclude the following suggestions:

1. The Shih-Hsu Test of Attention (SHTA) has good test-retest reliability for adults with blindness.
2. To strengthen the credibility of the reliability analysis, we suggest that the SHTA test should be done with a much larger sample size in the future.
3. The test-retest reliability of the SHTA should be studied for different blindness type, age and gender in the future for persons with blindness.

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