

CAT (Comprehensive Assessment Tool) for Assessment of Functional Capacity of the Hand

Dr. Shilpshree Palsule¹, Dr. Jayashri Kale²

¹Assistant Professor, Department of Occupational Therapy, Seth GSMC and KEMH, Mumbai.

²Ex- Professor and HOD, Department of Occupational Therapy, Seth GSMC and KEMH, Mumbai.

Corresponding Author: Dr. Jayashri Kale

DOI: <https://doi.org/10.52403/ijshr.20240103>

ABSTRACT

Background: Hand function evaluations form an important element of extremity assessment, which helps to define the patient's problem. Many functional hand evaluations described in the literature. However, cultural differences, expenses incurred, non-availability of Indian normative data makes clinical application of these tests difficult in Indian scenario.

An attempt is made in the said study to construct an inexpensive, culture based, easy to administer, hand function test, which can be used for evaluation of the functioning of the upper extremity, for daily living tasks. Hence, the formulation of CAT (Comprehensive assessment tool) for evaluation of hand function.

Objectives: To construct a simple, but comprehensive test for assessment of hand function. (CAT for hand function evaluation)

2. To check the reliability of the CAT test.

Materials and methods: CAT test proforma was prepared based on available literature. The test that was constructed, consisted of 14 unilateral and 16 bilateral items. The study was conducted in the Occupational therapy department of a tertiary care hospital. Inclusion criteria were Normal, healthy individuals, between 20-60 years of age, with no known musculoskeletal upper extremity problems were recruited for the study. Total 30 people were evaluated on the newly constructed test and retested after a period of 3 weeks on the 30 test items after obtaining written informed consent. Standard method was employed while performance of the test. Scoring was done in time in seconds, and performance on CAT results noted.

Results: Cronbach's alpha values ranged from .798 to .976 suggesting excellent test-retest reliability for most test items. For bilateral test items, Cronbach's alpha ranged from .573 to .941 suggesting from fair for some items and excellent test-retest reliability for most test items.

Conclusion: The above findings suggest that the results of the CAT test are reproducible, hence CAT is a reliable test.

Keywords: CAT test, Comprehensive test, Functional hand evaluation, Hand function

INTRODUCTION:

Hand function evaluations form an important element of extremity assessment, which helps to define the patient's problem. A good evaluation procedure serves as a foundation for selecting and directing treatment. This is important, because, the hand, along with the entire upper extremity is involved in both unilateral and bilateral task. Hand function assessments, should hence, ideally use tasks representative of everyday functional activities. Static evaluation of hand function may not accurately predict functional recovery. Many functional hand evaluations described in the literature, namely Carroll hand function test, Jebsen hand function test, Smith hand function evaluation, The Sollerman test of Hand function, The Wolf test of motor function, Toronto research institute-hand function test, Southampton hand function evaluation test, to name a few. (1-6) One indigenously made tool described is an

Assessment of In hand manipulation tool, however it has been described for paediatric population, scoring has been described on an ordinal scale only and not in time. (7)

Published literature states that there is a difference in body dimensions related to Age, Sex, Geographic locations. Cultural variations in dimensions occur Dimensions of Indian women smaller than those of American, British and West Indian women. (8) Significant differences in hand dimensions may exist even within a nation and within genders, as well as between different countries (9) (10)

This raises a main concern of applying foreign norms to Indian conditions, for comparing performances on patients. Indian norms can be formulated, however, this does not account for the cultural variations that may affect hand functioning, for example, Indians use their hand for eating as compared to their western counterparts. Meaning of hand gestures and functions may also differ across cultures(11). This has also been stated in an article by Mokashi which mentions that one of the widely used Jebsen hand function test may not be suitable to the Indian scenario (12).

In addition to this, most of the commercially available tests are expensive, so procurement in all centers remains a challenge. Narrative review was conducted by us, in this regards, and published, which stressed on need of construction of an indigenous hand function evaluation measure(13) Based on this, an attempt was made to construct an inexpensive, culture based, easy to administer, hand function test, which can be used for evaluation of the functioning of the upper extremity, for daily living tasks. His was named as CAT (Comprehensive assessment tool) for evaluation of hand function. Study objectives were to construct the CAT tool and to check the test retest reliability of the tool. This study is part of a larger, more extensive study, wherein in the later stages of the study, the investigators planned to evaluate the validity of the said test, and

calculate normative data for the test, if found reliable.

METHODOLOGY

CAT test proforma and item list was prepared based on available literature.

Proforma reviewed by experts (Occupational Therapists) working in the field of hand, changes made in the proforma based on input provided. After revisions, the test that was constructed, consisted of 14 unilateral and 16 bilateral items All test items were procured from local shops. The entire cost of the entire kit was lesser than 2000 rupees. Maintenance and recurring cost for perishable items (box-board paper, clay, etc.), was estimated to be negligible. The subtests are given in the appendix.

The study was conducted in the Occupational therapy department of a tertiary care hospital. Inclusion criteria were Normal, healthy individuals, between 20-60 years of age, with no known musculoskeletal upper extremity problems were recruited for the study Ethical permission was obtained from the institutional ethics committee. In the current study, newly constructed CAT for hand function evaluation was administered to a sample of 30 normal participants. The same population was retested on the test after a period of 3 weeks, to establish the test-retest reliability of the test.

- Brief history was obtained to rule out any known/diagnosed musculoskeletal problems of upper extremity. Informed consent document was signed.

Test procedure:

- Standard table and chair height was used (table 30" and chair 18"). Participant was seated throughout the test. Participants were explained each item of the test. A box board paper measuring 32*21 inches (commercially available in local stationery shops) was placed on the table, to ensure the same surface, irrespective of the surface of the table used for the assessment purpose. A line was marked on the paper, at a distance

of 5” and then at a distance of 12 inches, based on average forearm length of Indians(14) and based on previous study carried out by Smith et al(1) Further, a centre point was marked on the 5” line and markings were made at a distance of 5” on both sides of the centre. These were references to place the items required for the various subtests. Small circles of 2” radius was drawn over each of these 5 points, to ensure standard procedure of administration.

Details of the template can be seen in figure 1. The entire test kit can be seen in figure 2.

Figure 1: Template paper of the CAT (Comprehensive Assessment tool)

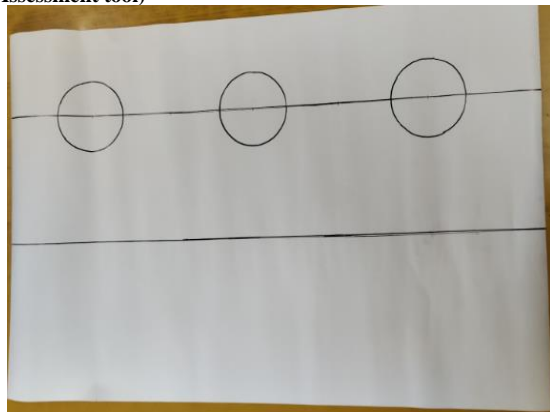


Fig2: All test items used for the CAT(Comprehensive Assessment Tool)



Materials used

Unilateral test items:

- Table, approximately 3* 2 feet, (30” height)
- Chair (18” height)
- Mobile based stopwatch, with an accuracy of 1/100th of a sec.
- Box board paper
- 5 shirt buttons, dark colored

- 5 five-rupee coins
- 5 office clips
- 1 small basket.
- 5 rubber balls
- 10 round sunpet bottles of ½ kg capacity (5 empty and 5 filled with ½ kg fillings)
- Standard bucket, princeware, 3 lit
- 5 plastic coated playing cards
- 1 teaspoon
- 1 soup bowl
- 1 melamine coffee mug
- Newspaper (English)
- 1 A4 sheet of paper
- 1 ballpoint pen
- 1 writing pad
- 1 ruler (1 feet, wooden)
- 1 mobile phone (touch screen weight of approximately 170 gms)
- 1 small pate 6” diameter, and with border
- 1 pack of funskool clay 25 gms
- Sphygmomanometer

Bilateral test items

- Godrej freedom lock with key, 7 levers
- Kangaroo stapler no.10
- 1 sheet of newspaper English, (Times of India, non-glazed newspaper sheet (Thickness 0.07-0.08 mm)
- Regular large size shirt with standard shirt buttons
- 1 size 4 canvas shoe (Bata brand used)
- 1 1000 ml round sunpet jar
- 1 Tupperware container
- 1 hand towel
- 1 cutlery knife, steel
- 1 25 gm funskool dough
- 1 scissor (munix kangaroo brand SI-1150 C, with cover with blade of 128 mm/ 5”
- 1 ream of paper neatly packed to weigh 1 kg

For unilateral items, non-dominant hand was scored before the dominant, and for bilateral items, each item was performed with both hands. The sequence of performance was maintained throughout the test. Scoring was done in time in seconds.

And performance on CAT results noted. Total time taken was approximately 30 -45 minutes per participant. The results of the same were analyzed for test-retest reliability.

- Quality of movement scale was proposed, (0-5, where 0 is no attempt to perform and 5 is normal performance)
- Also proposed is a record of performance is affected because of grasp/ grip, reach or prehension /precision G/R/M). Interrater reliability of this scoring is planned at a further stage of the study. This study, was a part of a more extensive study, which aims to

establish validity, reliability, as well as establish normative data of CAT.

RESULTS

Table no.1 shows the Cronbach's alpha values obtained for both the unilateral and bilateral items, after retesting after 3 weeks approximately. For unilateral test items, Cronbach's alpha ranged from .798 to .976 suggesting excellent test-retest reliability for most test items. For bilateral test items, Cronbach's alpha ranged from .573 to .941 suggesting from fair for some items and excellent test-retest reliability for most test items. Normative data is planned at a further stage of the study.

Table 1: Results of test-retest reliability of CAT

Sr. No	Test item	Cronbach's Alpha
1	UT1DR1-R2	.874
	UT1NDR1R2	
2	UT2DR1R2	.899
	UT2NDR1R2	
3	UT3DR1R2	.855
	UT3NDR1R2	
4	UT4DR1R2	.917
	UT4NDR1R2	
5	UT5DR1R2	.904
	UT5NDR1R2	
6	UT6DR1R2	.798
	UT6NDR1R2	
7	UT7DR1R2	.934
	UT7NDR1R2	
8	UT8DR1R2	.941
	UT8NDR1R2	
9.	UT9DR1R2	.894
	UT9NDR1R2	
10.	UT10DR1R2	.816
	UT10NDR1R2	
11	UT11DR1R2	.917
	UT11NDR1R2	
12	UT12DR1R2	.901
	UT12NDR1R2	
13	UT13DR1R2	.830
	UT13NDR1R2	
14	UT14DR1R2	.976
	UT14NDR1R2	
1	BT1R1R2	.710
2	BT2R1R2	.686
3	BT3R1R2	.788
4	BT4R1R2	.702
5	BT5R1R2	.661
6	BT6R1R2	.659
7	BT7R1R2	.697
8	BT8R1R2	.851
9	BT9R1R2	.573
10	BT10R1R2	.854
11	BT11R1R2	.954
12	BT12R1R2	.794
13	BT13R1R2	.681
14	BT14R1R2	.835
15	BT15R1R2	.822
16	BT16R1R2	.918

U= Unilateral; B= Bilateral; T= Test; D= Dominant hand; ND= non-dominant hand R1= Reading 1; R2= Reading 2

CONCLUSION

The above findings suggest that the results of the CAT test are reproducible, hence CAT is a reliable test.

Future implications for research:

Validity of the scale is planned, construct and criterion, with an existing measure of hand function, namely the Jebsen Hand function test

Normative data for Indian population planned.

Sensitivity and specificity of the new measure (CAT) to be established.

Declaration by Authors

Ethical Approval: Approved

Acknowledgements: We thank Dean, Seth GSMC and KEMH, and HOD, Occupational Therapy for allowing us to conduct the study. We thank the statistician Mr. Jadhav for helping us with the statistical analysis for the study

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Smith HB. Smith hand function evaluation. Am J Occup Ther. 1973 Jul-Aug;27(5):244-51. PMID: 4716362.
2. Carroll D. A quantitative test of upper extremity function. J Chronic Dis. 1965 May 1;18(5):479-91.
3. Jebsen RH, Taylor N, Trieschmann RB, Trotter MJ, Howard LA. An Objective and Standardized Test of Hand Function. Arch Phys Med Rehabil. 1969;50(6):311-9.
4. Burgerhof JGM, Vasluian E, Dijkstra PU, Bongers RM, van der Sluis CK. The Southampton Hand Assessment Procedure revisited: A transparent linear scoring system, applied to data of experienced prosthetic users. J Hand Ther. 2017;30(1):49-57.
5. Kapadia N, Zivanovic V, Verrier M, Popovic M. Toronto rehabilitation institute-hand function test: Assessment of gross motor function in individuals with spinal cord injury. Top Spinal Cord Inj Rehabil. 2012;18(2):167-86.
6. Establishing a standardized clinical assessment tool of pathologic and prosthetic hand function: Normative data, reliability, and validity - ScienceDirect [Internet]. [cited 2023 Dec 12]. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0003999302095795>
7. Raja K, Katyal P, Gupta S. Assessment of in-hand manipulation: Tool development. Int J Health Allied Sci. 2016;5(4):235.
8. Nag A, Nag PK, Desai H. Hand anthropometry of Indian women. INDIAN J MED RES. 2003;
9. Dewangan KN, Patel T, Vidhu KP, Khumukcham BS, Lusang I, Sumpi N, et al. An investigation of the hand anthropometric database of agricultural workers and integration of the database into tools and protective gear designs. Work Read Mass. 2023;74(4):1461-80.
10. Mandahawi N, Imrhan S, Al-Shobaki S, Sarder B. Hand anthropometry survey for the Jordanian population. Int J Ind Ergon. 2008 Nov;38(11-12):966-76.
11. Black RM. Cultural considerations of hand use. J Hand Ther. 2011 Apr;24(2):104-11.
12. Mokashi S. Jebsen Hand Function Test—How Useful It is for Indian Population? J Hand Ther. 2010;23(4):e8-9.
13. Functional Hand assessments: A review from the Indian perspective - IJAR - Indian Journal of Applied Research [Internet]. [cited 2023 Dec 13]. Available from: [https://www.worldwidejournals.com/indian-journal-of-applied-research-\(IJAR\)/fileview/functional-hand-assessments-a-review-from-the-indian-perspective_June_2020_1591007959_5106307.pdf](https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/fileview/functional-hand-assessments-a-review-from-the-indian-perspective_June_2020_1591007959_5106307.pdf)
14. Mohanty B, Agrawal D, Baisakh P, Samantsinghar P, Kumar S, Chinara P. A study of different parameters of human extremities and its relationship with human height in residents of eastern India. Vol. 43, Tanta Medical Journal. Wolters Kluwer Medknow Publications; 2015. p. 1-8.

How to cite this article: Shilpshree Palsule, Jayashri Kale. CAT (comprehensive assessment tool) for assessment of functional capacity of the hand. *International Journal of Science & Healthcare Research*. 2024; 9(1): 10-14. DOI: <https://doi.org/10.52403/ijshr.20240103>
