



dxdt Engineering and Research
and the Joseph Albert Hekimian Legacy Fund

Cognitive Acuity Tracking System (CATS) User Manual

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Thank you for your interest in the
dxdt Engineering and Research
Cognitive Acuity and Tracking System (CATS)

Please Review this Manual to Learn how to use dxdt's
Cognitive Acuity Tracking System

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What is the CATS?

The CATS tests and tracks a person's cognitive acuity over time so changes in brain health as indicated by trends in short term memory, multi-sensory cognition, and pattern recognition can be identified and monitored.

The CATS is instantiated on its own stand-alone workstation (See Figure 1). The workstation is intended to reinforce the clinical nature of the CATS process and minimize distractions during data collection. The CATS is a self-contained software system and does not require network support or connectivity.

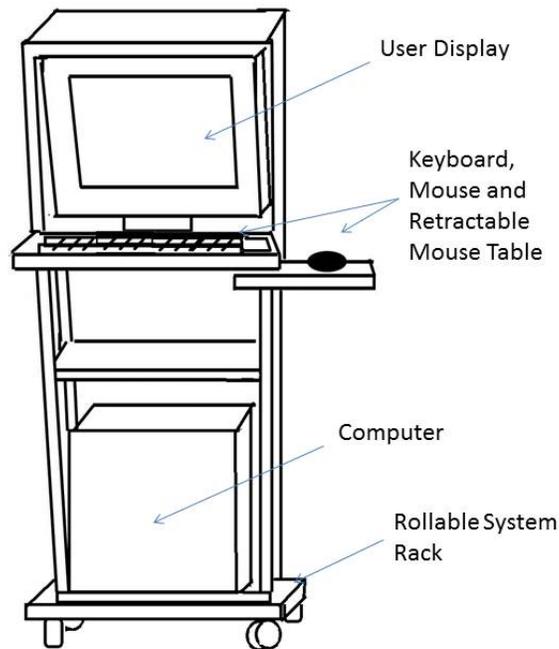


Figure 1 Cognitive Acuity Tracking System (CATS) Workstation

Each CATS User has their own password protected account through which they access the CATS games, exercises and progress report page.

CATS Administrators (i.e., Clinic Admins and Researchers) are provided with a separate utility program that will allow for CATS User profiles to be accessed and managed. The CATS can also be deployed on office computers and laptops running Windows operating systems.

Purpose of CATS

The system has many potential uses in support of health care monitoring of neurology patients and victims of traumatic brain injury as a result of stroke or other injury. The system also has applications towards Alzheimer's and dementia patients and those at risk of developing those diseases. In particular, the system is capable of tracking cognitive health for any number of

patients, securely and with privacy so clinicians can track progress and observe the effects of different protocols, interventions and changes in habits.

However, CATS was developed for the substance abuse recovery community in primary focus. In this role the system is intended to serve as an indicator to patients in recovery of any positive gains in neurological health (as indicated through cognitive testing) as they pursue sobriety and adhere to their prescribed substance abuse recovery regimen. The system provides recovery clinicians an objective tool that returns quantitative data related to each patient's progress at the most fundamental level, the brain. The data can be used to make the case that progress is occurring to Patients that may improve program retention and reduce the likelihood of relapse. The data could be used to test for the efficacy of interventions or to compare the merit of different treatment protocols.

The CATS is intended to encourage patients while simultaneously enable clinicians to learn about and optimize their recovery regimens and protocols.

The CATS is easy and fun to use. This manual provides the Clinician the information that they need to begin using the CATS. Any questions, comments or issues regarding the CATS should be directed to Dr. Christopher Hekimian, (301) 520-1575 or preferably by e-mail at dxdthelp@dxdteengineering.com.

Using CATS in your Clinic

Dxdt recommends that the each user begin using the CATS with a practice profile until they feel comfortable with using the system. This may involve 3 or 4 complete sessions, possibly more depending on the frequency with which the system is used (recommended at least one use per week).

The CATS is intended to be used by clinic clients on a regular basis such as once a week. This frequency fits in with most individual's schedules with only a small commitment of time. It is important to note that there is an unavoidable orientation period for each client introduced to CATS where the individuals are getting used to the system. This means that for research purposes, the first few sessions 3 or 4 sessions using CATS should be discarded as the data will be descriptive of how a person is learning to use the tool as much as it would be measuring the person's cognitive acuity. The training/practice/orientation sessions can be done in one day or done over the course of several visits as long as each individual has time to become familiar with the system. The CATS is capable of supporting any number of profiles. Each clinic client can request a practice profile during the orientation stage of CATS use.

CATS Profiles

The privacy of all CATS Users is of paramount importance. While the CATS is inherently more secure than most health clinic information systems due to its lack of reliance on a network or the internet, CATS Users should be directed to choose a username that can be easily remembered but

not directly identifiable to them. Usernames should not include last names or dates of birth. Passwords should be easy to remember.

Each username is associated with a data file or “Profile” that is automatically generated by the CATS. The profile will contain the aggregated scores of the different games and exercises which comprise the CATS cognitive acuity assessment methodology. When a CATS game or exercise is completed the User will have the opportunity to save the score to their profile.

The CATS Administrators program will allow usernames to be viewed and lost passwords to be recovered. It will also allow profiles to be accessed and deleted. Each CATS Administration program is associated with a unique username and password (provided separately from this document).

Starting the CATS

The CATS workstation computer has a password feature to protect the system from unauthorized use. The default password is “dxdt”. Once the workstation is opened through its password screen, the JAH Legacy CATS folder will be in view. Double click on the folder to see its contents, the CATS Admin program and the JAH Legacy Fund CATS Shortcut. See Figures 2 and 3.



Figure 2 JAH Legacy CATS Folder

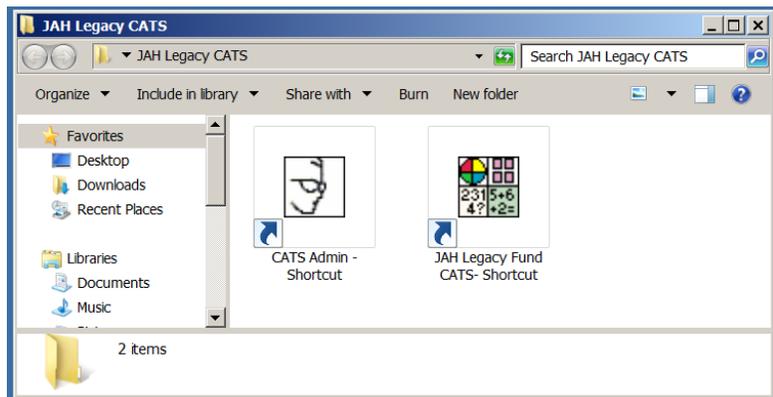


Figure 3 JAH Legacy CATS Folder Contents including Admin and CATS Programs

Setting up a CATS Profile

To set up a new CATS User profile, double-click on the JAH Legacy Fund CATS- Shortcut icon. The log in screen will appear after a short animation is complete. The animation is a depiction of Joseph Albert Hekimian, the inspiration behind the Joseph Albert Hekimian Legacy Fund and its activities. The log-in screen is depicted in Figure 4. The *Create New Profile* link is clicked and the CATS New Profile Form is displayed as shown in Figure 5.

Figure 4 CATS Login Form

Figure 5 CATS New Profile Form

The New User selects a profile name and enters an e-mail address and a password and password verification. When the required information is entered, the *Create New Profile* button will enable. Clicking that button will establish the new profile. The New User should be encouraged to use a username that is not clearly linked to them by last name. The New User should be encouraged to store their username and password on their smartphone or on a piece of paper kept in their wallet. Changes to usernames and passwords will need to take place through the Admin utility program.

Accessing the CATS Games and Exercises

After a User successfully logs into the CATS they are provided with the CATS Main Screen (Shown in Figure 6).

The Main Screen contains large activity launch buttons. The activities include two games:

- Audio-Visual (AV) Pattern Recall and,
- Concentration;

And two exercises:

- Short Term Recall and,
- Audio-Visual Addition.

The Progress button also appears. This is where a User can access their scores for the activities that have been collected over time. The Main Screen also contains a menu bar along its top edge where the User can get instructions, change their password, exit the program and where Researchers can access special information.

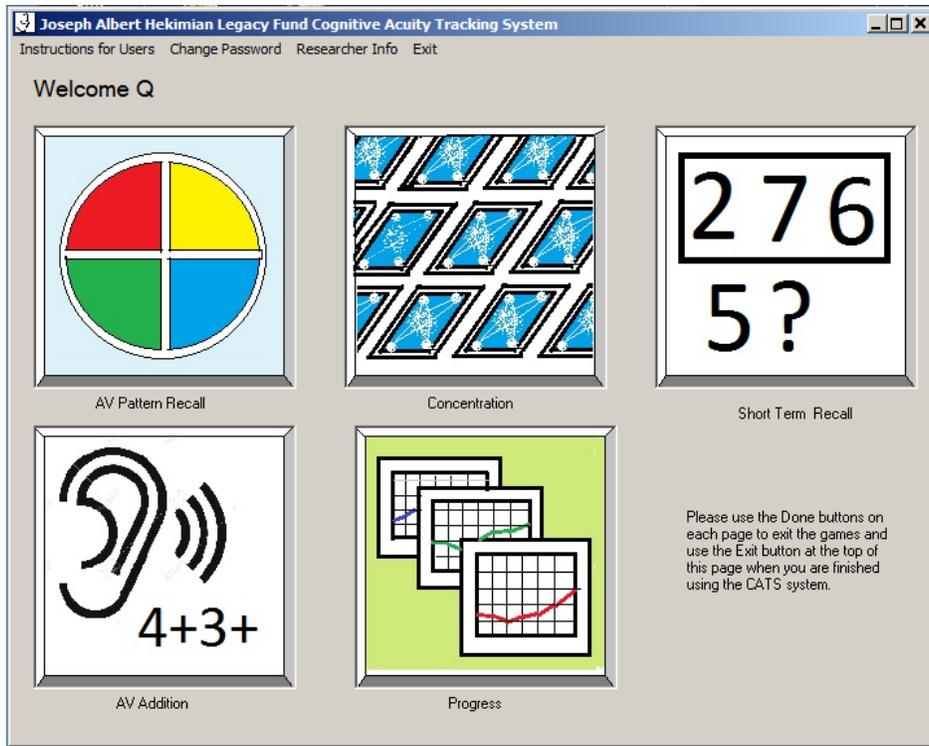


Figure 6 CATS Main Screen

Each CATS activity has a means to start the activity, stop the activity, and to get instructions. The games provide timely prompts and always give users the opportunity of committing their final scores to their personal data file that is accessed by the Progress page. All four CATS activities can be completed in approximately 15 minutes.

The CATS activities are discussed briefly in the following subsections.



AV Pattern Recall

(approx. 4 min.)

The AV pattern recall game is ideal for measuring short term recall ability in a multi-sensory context. The score is based on how long the User can continue to reproduce the random patterns of position, color and sound presented by the game. Figure 7 shows the game display. The game interface is a circle divided into 4 quadrants. Each quadrant is associated with its own tone and color. When the user clicks the START button the game will give a three beep warning. Then a single quadrant will identify itself by changing color and emitting a tone. When the color goes away the game will wait for the user to click on the same quadrant that the game produced. When that is done that level (the first level) will be complete. The game will advance to the next levels, each time adding an additional quadrant, creating a random pattern for the user to duplicate. With each new level the length of the random pattern will increase by one. The game continues until the user fails to duplicate the pattern exactly. The score is equal to the highest level of the game completed successfully.

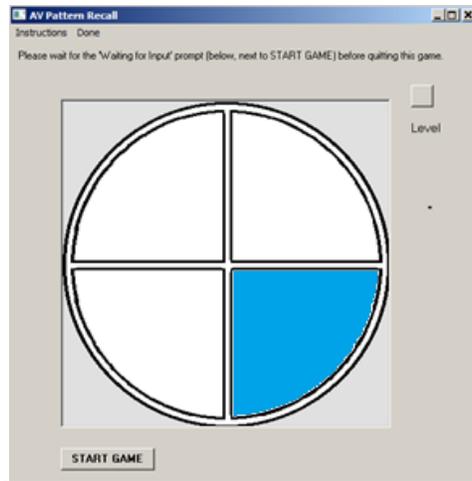


Figure 7 User Display for the AV Pattern Recall Game



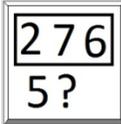
Concentration

(approx. 3 min.)

This game is ideal for measuring the ability to recall multiple factors at a time in a visual context over a longer interval. This game is based on a deck of 36 cards. The 36 cards each contain one of nine possible images. The user starts by clicking one of the cards. This card will turn over to reveal the image. The user attempts to remember what image is under each card that is turned over. The user then chooses another card, hoping to match the images of the two cards. If there is a match the cards will be marked as a match. If there is not a match the cards will turn over and wait to be selected again. The game progresses until all cards are matched based upon the users memory of which cards were where (and perhaps some luck). The score is the number of moves that it took to complete the game. The user tries to complete the game in the least number of moves. Both the AV Recall and Concentration games are fun to play and are based on once popular family games.



Figure 8 User Display for Concentration



Short Term Recall

(approx. 4 min.)

This exercise will show a random sequence of numbers for a few seconds. The user should try to remember the numbers. When the sequence of numbers disappears the program will ask whether some number was in the sequence. The user answers yes or no based on their recollection of the number sequence. There are 20 trials in this exercise. The length of the number sequence will increase as the game progresses. Also, the length of time that the number sequence is displayed decreases in the later trials. The final score is the number of trials of the twenty, which were answered correctly.

Short term recall is a cognitive ability that is closely correlated with the use of some commonly abused drugs and is dynamic in terms of the rate in which the ability can improve in the absence of the aggravating drug.

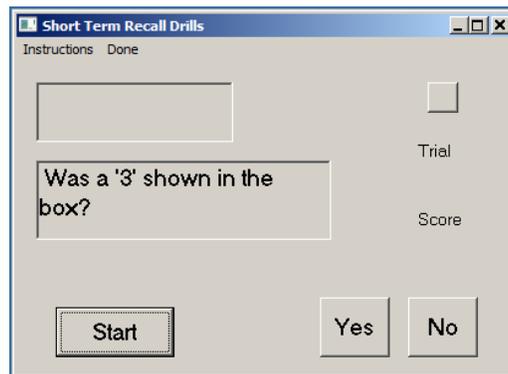


Figure 9 Short Term Recall Exercise Display



AV Addition

(approx. 4 min.)

This exercise will read and show a random sequence of numbers. The user is to add the numbers together (in their head). Shortly after the last number is read, the number keypad will become active. The user enters the sum that they calculated. The program will score the answer for correctness. There are 10 trials in this exercise. The length of the sequence of numbers will increase in two steps. Also, the length of time between each read number will decrease as the exercise continues.



Figure 10 User Display for AV Addition Exercise

The Progress Reporting Page

The purpose of the CATS is twofold. For individuals recovering from substance abuse addiction the purpose is to provide ongoing metrics on brain health as a source of continuous encouragement and reassurance during the recovery process. It is believed that such feedback will contribute to extended sobriety, recovery program retention and the ultimate success of the recovery effort. For clinicians, the CATS offers a means of collecting quantitative metrics that can provide a basis for evaluating overall recovery program effectiveness, the efficacy of interventions, and a means for comparing recovery protocols.

Dxdt recommends that the each user begin using the CATS with a practice profile until they feel comfortable with using the system. This may involve 3 or 4 complete sessions, possibly more depending on the frequency with which the system is used (recommended at least one use per week).

The CATS Progress Reporting Page enables all of these functions through easy to understand graphs and tabulated data. The Progress Reporting Page shows the CATS scores in graphical plot form. The tables below each plot allow for more details of every data point to be viewed. The plots can be printed out using the computers default printer using the Print Page menu bar button. The complete data tables can be printed in flat file form or exported in comma delimited format using the Print Data and Export Data menu bar selections, respectively. The data will be displayed using the notepad.exe text editor program and can be printed using that program or saved for import into another program such as Microsoft Excel. Dxdt can provide useful analytical tools that Researchers can use for analyzing the data trends. Figure 11 shows an example of the CATS Progress Page.

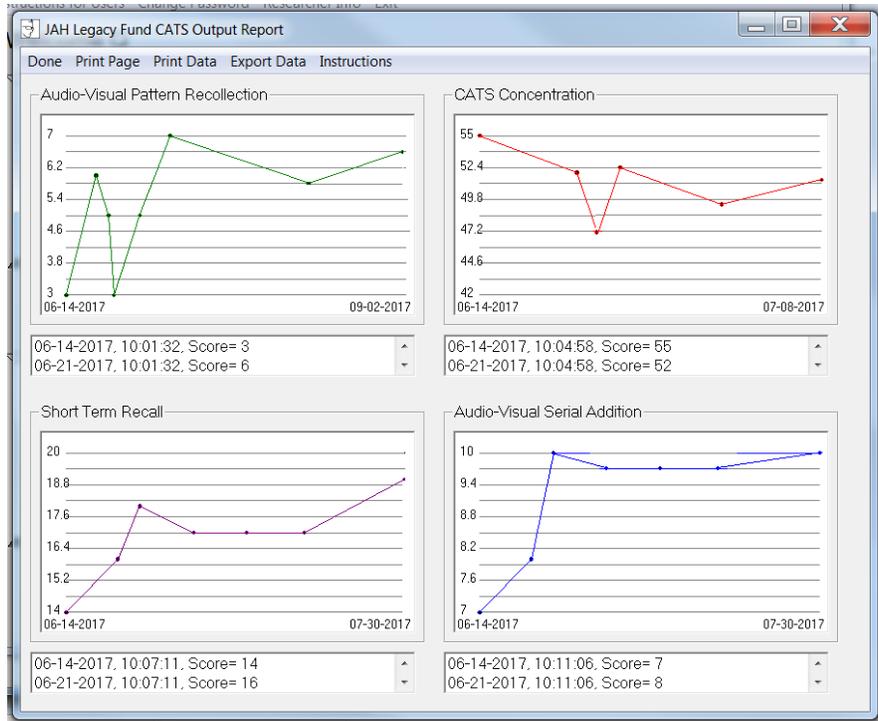


Figure 11 CATS Progress Reporting Page

Generally, one wants to see all of the scores except for the CATS Concentration scores increase over time. The CATS Concentration score is based on the number of turns it takes to complete the puzzle and therefore a lower score is better.

The menu bar at the top of the page provides a means for exiting the page; printing the page; printing the data tables; exporting the data; and accessing the instructions for the page.

The Administration Program

Clinicians can also be “CATS Super Users”. CATS Super Users can access the CATS Admin Program through a shared Administrators username and password. This information is provided separately from this document. The CATS Admin program is accessed by double clicking on the icon circled in Figure 12. The CATS Admin program log-in dialog box will display (See Figure 13). If a CATS Super User loses their username or password, they can contact dxdt at dxdt@dxdtengineering.com for the information.

Once the CATS Super User logs in they will see the CATS Admin main screen as shown in Figure 14. The Admin screen shows two fields. The top field lists all of the profile usernames stored in that particular CATS workstation. By double clicking on one of the profile usernames, the progress reporting screen for that user will appear. The CATS Super User will have full access to all of the data functions on that progress reporting page. This is a good way for the CATS Super User to export data associated with CATS Users.

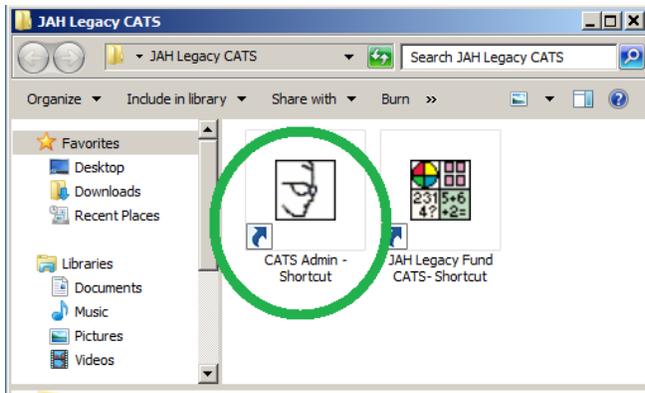


Figure 12 CATS Admin Program Launch Icon (circled in green)



Figure 13 CATS Admin Program Log-in Dialog Box

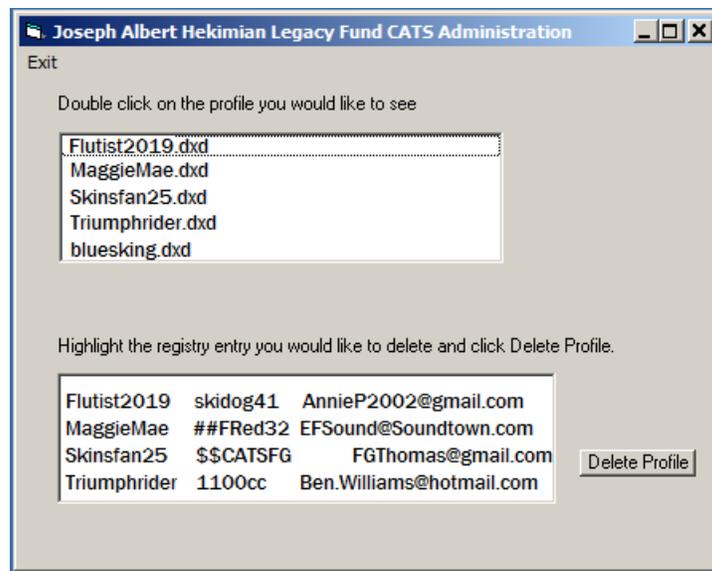


Figure 14 Sample Admin Program Main Screen

The lower field lists all of the profiles stored in that particular CATS workstation along with the associated password and e-mail address. A user profile is selected by clicking on it. Then, the CATS Super User will have the option of removing the profile from the system. This is a good way of facilitating the practice sessions for the CATS Users. A practice profile is created from the CATS program and when a user is sufficiently practiced in the use of the CATS activities, the CATS Super User deletes the practice profile. The CATS User initiates a new profile in CATS and all successive game scores are considered valid (I.e., not biased due to unfamiliarity with the use of the CATS program).

Questions, comments requests, and requests for assistance can be directed to:
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