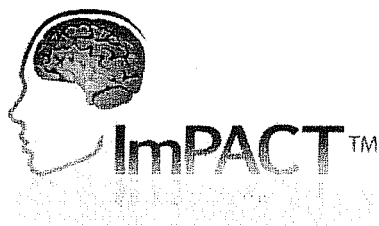# ImPACT 2007 (6.0)

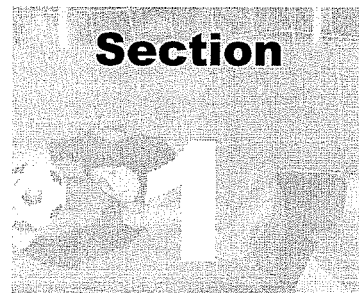# Software User's Manual

Fall 2007

ImPACT™

The Best Approach to Concussion Management

IMPACT APPLICATIONS, INC.
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(877) 646-7991
WWW.IMPACTTEST.COM / d load

2007 Software User's Manual

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www.impacttest.com

Rationale for Using ImPACT:

The management of sports-related concussion, regardless of participation level, is currently one of the most intensely debated topics in sport medicine.

M uch of this debate centers on the safe determination of return to participation once concussion has been diagnosed. Though long-term deficits in the form of post-concussion syndrome have been observed from a single concussive event, it is typically assumed that proper management of concussion should lead to good prognosis and no long-term harmful effects. Conversely, returning an athlete to participation prior to complete recovery may greatly increase the risk of lingering, long-term, or catastrophic neurologic sequelae. As such, acute assessment of injury and determination of existing symptoms that may indicate incomplete recovery proves critical to the safe management of the concussed athlete. In short, no athlete should return to participation until all signs and symptoms of concussive injury have completely resolved.

The determination of lingering difficulties associated with concussion has traditionally proven problematic for a variety of reasons. These may include:

- Mainstream neurodiagnostic techniques, such as CT scan and MRI, though invaluable in discerning more serious intracranial pathology (e.g., skull fracture, hematoma, parenchymal lesion), are generally insensitive in measuring the subtle effects of concussion.

- Athletes who have experienced a concussion present with a wide variety of symptoms. Although the classic symptoms of loss of consciousness, confusion, memory loss, and/or balance problems may be present in some athletes with mild concussion, there may or may not be obvious signs that a concussion has occurred. Symptoms indicative of brain impairment can be quite subtle and may go unnoticed by the athlete, team medical staff, or coaches.

- Many coaches and other team personnel may have limited training in recognizing signs and symptoms of concussion and therefore may not accurately diagnose the injury when it has occurred. Additionally, many players may be reluctant to report concussive symptoms to the athletic trainer or team physician due to the fear that they will be removed from the game, thus jeopardizing their status on the team or their careers.

- Many sports medicine practitioners are not satisfied with the current concussion return-to-play and management guidelines (at least 14 current versions) that are not based on data-driven or scientific principles.

Given these outlined issues, more sensitive neurodiagnostic assessment strategies have proven critical to the safe management of the concussed athlete. Further, such techniques have provided a valuable research paradigm for which to gain a better understanding of this elusive injury. At the forefront of these approaches is the advent of computerized neuropsychological testing. The UPMC Department of Orthopaedic Surgery and Center for Sports Medicine has recently developed a computerized battery of neuropsychological tests called ImPACT (Immediate Post-Concussion Assessment and Cognitive Testing) that is becoming widely used both nationally and internationally to better diagnose and manage sports-related concussion.
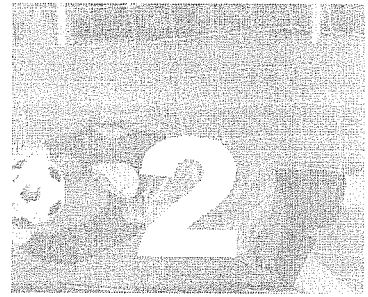
INSTALLATION & SET-UP

The ImPACT software must be installed on the local hard drive of the client workstation. If interested in networking the software, reference the networking instructions on Page 5 in this section. A network setup still requires the software be installed to each workstation.

ImPACT workstation requirements:

> Operating Systems – Windows 98, ME, 2000 with SP 3 or later, XP with SP 1 or later, VISTA
> Internet Explorer 4.01 with service pack 2 or later
> 32 MB of RAM, 64 recommended
> Pentium class processor with speed of 200 Mhz or faster
> 20 MB hard drive space for the software and 4 KB per saved test

CD Installation

1. Insert CD-ROM into drive. On most computers the installation program will start automatically. If installation doesn't start automatically:
   a. Click the START button and choose run...
   b. Type D:\SETUP.EXE in the space next to Open: (This assumes that your CD-rom is the D drive).
   c. Click OK
2. Follow the on-screen prompts to install the program. In general, you will not have to change any of the defaults.
3. Start ImPACT using the icon on the desktop. If no icon appears, then click the START button, choose PROGRAMS, and then ImPACT.
4. Registration. The first time you run ImPACT a registration screen will appear, use the online registration code provided in the download email, or call 1.800.942.8632 to register the software. Have the computer on at the registration screen when you call.

Download Instructions

1. An email message will be sent to you. Included will be the download password.
2. Visit the ImPACT download site at: http://www.impacttest.com/dload
3. Click the SAVE or RUN button.
4. A download dialog box will open with the option to SAVE or OPEN. SAVE the program to disk if you have multiple computers to update or install. Choose OPEN to run the executable from the website.
5. Enter the install password, this should be included in the email.
6. Follow the on-screen prompts to install the program. In general, you will not have to change any of the defaults.
7. Start ImPACT using the icon on the desktop. If no icon appears then click the START button, choose PROGRAMS, and then ImPACT.
8. Registration. The first time you run ImPACT a registration screen will appear, use the online registration code provided in the download email, or call 1.800.942.8632 to register the software. This will not apply for updates.

Networking Instructions (initial workstation) – Please consult with your Information Technology Department.

The user will need full access to the database on the shared server and privileges to the installation folder on the C drive (default is "c:\program files\ImPACT").

1. Decide a location on the server for the database.
   a. This can be done though a mapped drive or UNC.
   b. The server location must have full privileges for all users that will be accessing the database.
   c. Make sure that the location of the database is scheduled for backup every night.
2. Install the software to the workstation. Restart the computer if prompted and then start ImPACT using the desktop icon.
3. The program will ask, "The database doesn't exist, do you want to create it?" Click "NO".
4. A browse window will appear. Browse to the folder location you want to save the database on the server.
5. The program will ask, "The database doesn't exist, do you want to create it?" Click "YES".
6. Then it will ask if you want to make this your default location, choose "YES"
7. Choose one of the registration options to register the ImPACT® software. To register online please use the registration code included in your download email. To register by phone you need to have the computer on to the registration screen when you call. The process should take less then 5 minutes.
8. Quit out of ImPACT.
9. Restart the program to verify all changes have registered.

Networking Instructions (additional workstation)

On each subsequent computer you will follow steps #2 and #3 above. When you reach step #4, you browse to the folder that contains the database, the program will ask you "do you want to make this the default database?" Choose "YES" and the setup is complete for this machine.

Setting up

On each subsequent computer you will follow steps #2 and #3 above. When you reach step #4, you browse to the folder that contains the database, the program will ask you "do you want to make this the default database?" Choose "YES" and the setup is complete for this machine.

Software License

You have purchased a yearly ImPACT site license. Each purchased license permits the licensee to install the software on one or multiple stand-alone PCs at a single site (e.g. laptop or desktop computer), on an institution-wide network system at one site location (e.g. mainframe computer), or on a combination of stand-alone and network applications. Here is a copy of the ImPACT software license agreement:

1. As ImPACT is protected by copyright and is being provided to you only for use for your organization, you will not copy, alter or distribute this software without written permission from ImPACT Applications, Inc. This agreement allows the administrator to install the ImPACT software on the computer network of your organization. This agreement also allows the administrator to install the software on multiple personal computers within your organization. Use of the ImPACT software outside of your organization is strictly prohibited. Site licenses for additional software may be purchased directly through ImPACT Applications, Inc.

2. You understand that the software and all information gathered during this evaluation are to be absolutely confidential, and distributed only in accord with the terms of this agreement, or with the specific written permission of ImPACT Applications, Inc.

3. You understand that the license to use ImPACT includes the software and software support for the most recently published version of the software, at the time of licensure. Yearly updates will be provided at no additional cost as long as the yearly subscription fee has been paid for that year. Clinical consultation regarding ImPACT data will be individually contracted.

4. You understand that ImPACT Applications, Inc. or representatives of ImPACT Applications, Inc. make no claim as to the current diagnostic accuracy of ImPACT. Under the terms of this agreement, ImPACT is to be used as a clinical/research instrument in conjunction with standard medical care.

5. The licensor (ImPACT Applications, Inc.) disclaims any and all promises, representations, and warranties, except as expressly set forth in this Agreement, with respect to any data, information, software, or other material furnished to you for the evaluation consult hereunder, including their condition; conformity to any representation or description; the existence of any latent or patent defects; and, merchantability, or fitness for a particular purpose or use.

It should be noted that your institution owns and controls any ImPACT data collected by your institution. As you may be aware, however, one mission of our program is to research pertinent areas of concussion management and evolve standards of care in this area. Data derived from ImPACT is essential in this regard. As such, we ask that you be a voluntary participant in our multi-

center research program and submit both baseline and post-concussion data to add to our growing database. As discussed before, the identification information of all data submissions are removed for confidentiality.

Software Registration

To activate your ImPACT software, you will need to register online with the password sent to you in your purchase email or call the ImPACT Technical Support line at 1.800.942.8632. To register by phone have the software installed and the computer on to the registration screen. Please allow approximately 2 minutes to complete the registration process. NOTE: You will have to go through this procedure when you renew also.

Yearly Subscription License

Network based databases. – Call ImPACT Technical Support or use the online registration system to register the first computer. All the remaining computers will be licensed correctly when connected to the network database.

Stand alone machines. - You will have to register each stand-alone machine.

Per Save License

For per save testing you will have to register each computer that is using ImPACT.
Network based computers. - You will need to register the first computer and then connect to the database with each subsequent computer. Each subsequent computer will need to be registered.

Stand alone machines. - You will have to register each stand-alone machine.

Program Security

The ImPACT program contains its own internal security. To access the security features of this program, go to the TOOLS drop down menu and select OPTIONS, then the USER ACCOUNTS tab.

Click the REQUIREMENTS button to set up the password and account requirements.

The account that appears in bold is the default user at start up.

To set up a new user account, select the ADD button. Assign a user name and password. Type in the full name of the individual and select the level of privileges for that account. You do this by clicking the PERMISSIONS tab and putting checks in the boxes. You also have the choice of selecting which account will be the default and appear when the program is started up.

If you do not want to use the security features of the program then put a check in the box AUTOMATICALLY LOG ON AS THIS USER on the default user account.
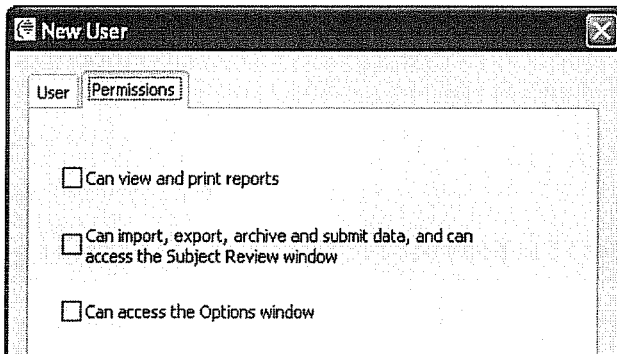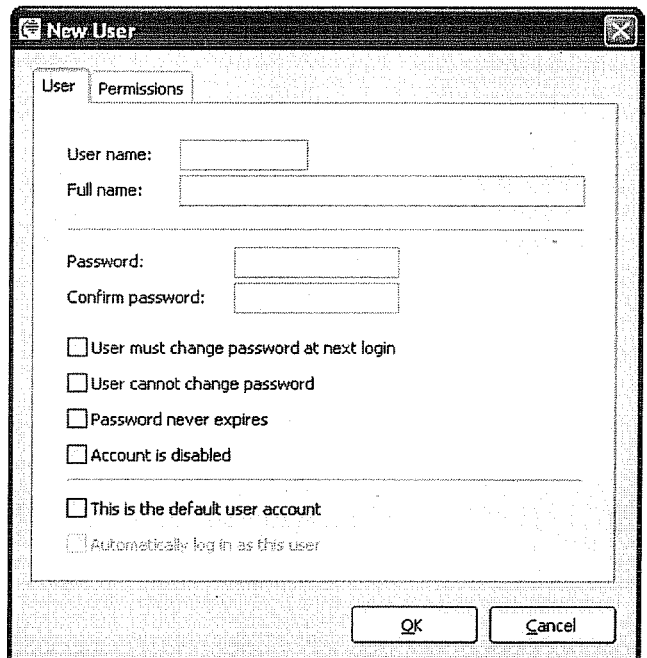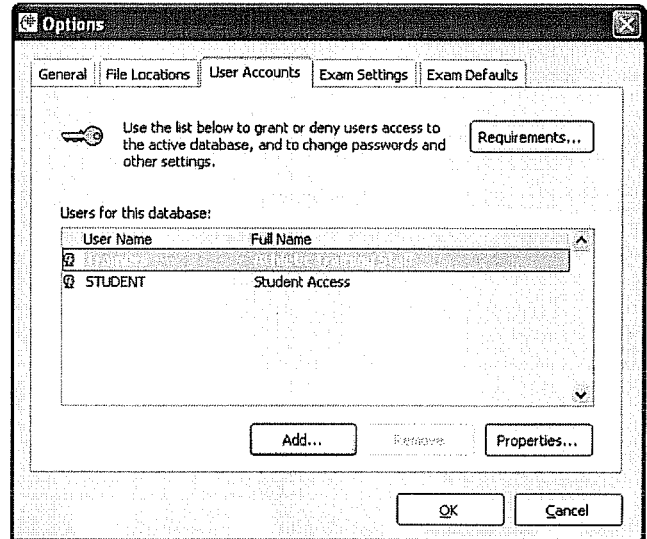
Additional Security

All database files stored on your computer are encrypted at a level that exceeds current HIPAA standards. Export files have a password protection option and encryption. When data is submitted to the data registry, the names, date of birth and identification numbers are removed, and the files are encryption protected.

Setting Additional Parameters:

Switching to the Metric System:

If you go to the TOOL, OPTIONS, GENERAL tab, and check "Use metric units of measurement," the program will display all measurement field in Metric.
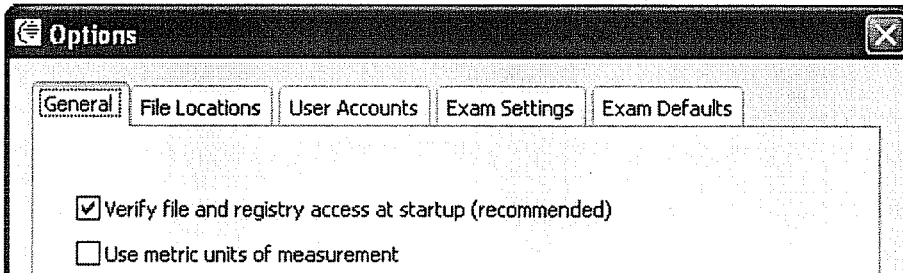
Changing the default database and alternate database:

The defau
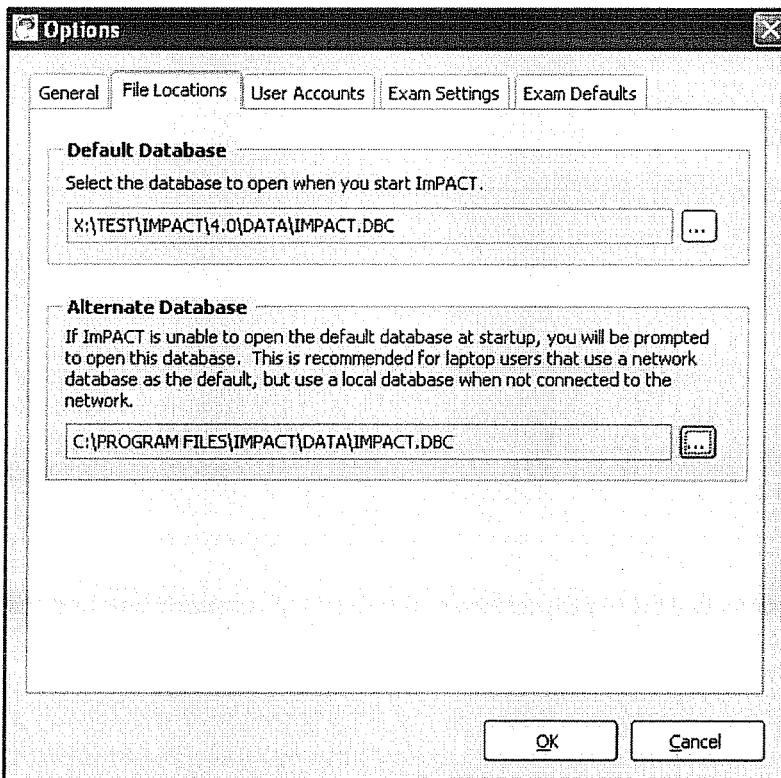
Changing the default exam settings:

If you go to the TOOL, OPTIONS, EXAM SETTINGS tab, you will have the option to change the default language, ID input mask and Supervisor Password.
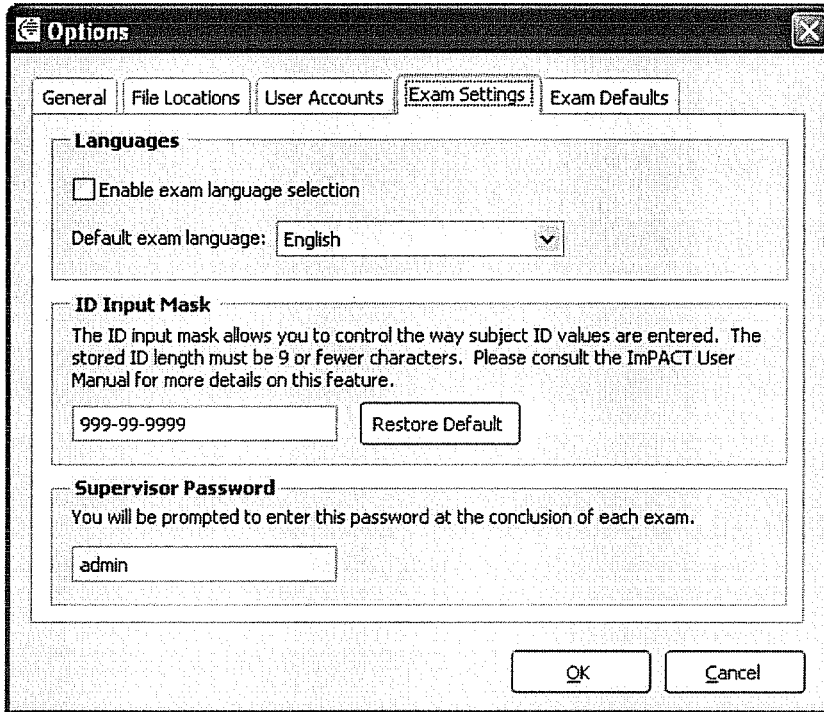
Changing the default exam defaults:

If you go to the TOOL, OPTIONS, EXAM DEFAULTS tab, you will have the option to set defaults for all users when they start the test. Changing these settings will save time during baseline testing.

Supervisor Password

No test data can be saved to the system without the test supervisor entering the administrative password. The default administrative password is **admin**. If you need to change the supervisor password for any reason, open the options under the tools menu and under the exam settings tab choose the supervisor password that you would like to use.

Program Updates:

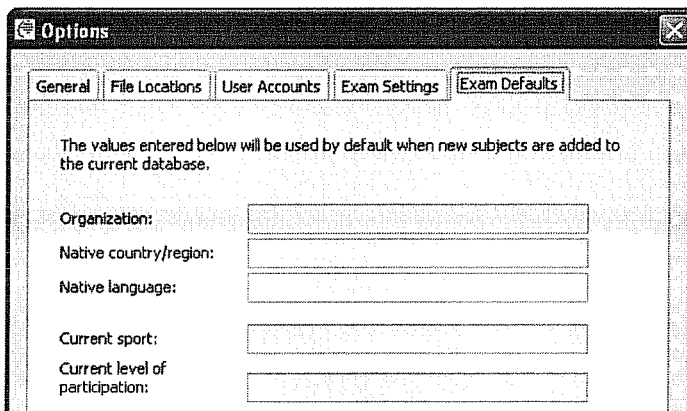The field of concussion management is new and ever changing. The ImPACT Application team is constantly striving to improve the ImPACT software. You may periodically receive an email questionnaire asking how you are utilizing ImPACT and what changes you would like to see in future updates. Many of ImPACT's current features have their roots in customer feedback and we would like to hear from you.

ImPACT Yearly Subscription Program:

With your yearly subscription you will receive free program updates, unlimited technical support, one free post concussion follow-up with our specialists, access to the current database, the quarterly newsletter, and much more. The month before your yearly subscription will expire; you will be contacted for renewal. You can choose to renew for 1, 2, or 3 years at a time if more convenient.

You will be contacted by email as updates become available. These can be downloaded from our website or a disk can be sent when requested. Please be sure to let us know if your email changes so we can get all the updates to you

Per Use License:

You will receive email notification of any version updates. If you begin to run low on tests then call the ImPACT sales department to arrange the purchase of more saves.
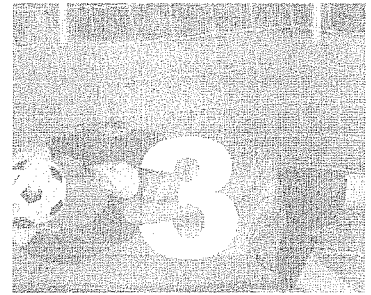
TEST COMPONENTS

You have successfully installed the software and it is time for the administrator to start testing individuals. Here are some general testing protocols you should know before you start testing.

Test Supervisor

ImPACT testing should always be done under the supervision of a neuropsychologist, physician, or athletic trainer. The data cannot be saved without an administrative password. This password should not be divulged to the athlete.

Baseline Administration

For optimal utility, ImPACT should be administered prior to athletic competition. Typically this can be done at the beginning of preseason training or even a few months prior to season training. It is important to have the athlete complete ImPACT before they start any type of practicing that might induce a concussion (e.g., hitting drills, scrimmages, etc.).

Post-Concussion Testing

ImPACT should be re-administered if an athlete is suspected of having sustained a concussion, even if it is considered to be mild without loss of consciousness. ImPACT post-concussion follow-up evaluations can be conducted within 24 - 72 hours of injury (to help determine severity of injury) and subsequently as needed (e.g. days 5 and 10 post-injury). Please note that while these testing intervals are optimal, the athlete's situation (e.g., other injuries requiring more immediate attention) may make it difficult to follow the testing protocol.
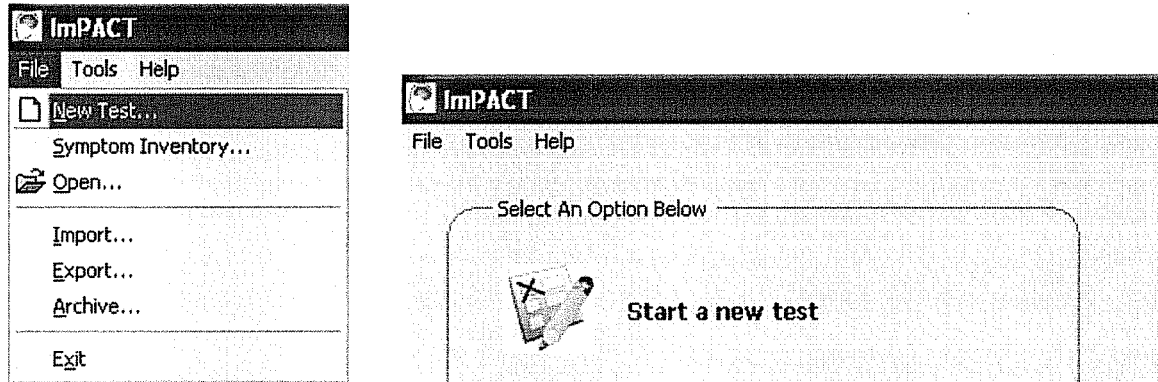
Test Environment

ImPACT will operate using both desktop PCs and laptops or notebooks with a color monitor/screen. However, if using a laptop it must be plugged into an electrical outlet. Do not run the laptop off of the battery as this may cause a general failure of the software with some laptops. Also, an external mouse should always be utilized to help avoid variability in the some aspects of the data profile. ImPACT can be administered individually or as a group in a computer lab. The environment should be relatively free of noise and distractions. We have also found that athletes should be separated by at least one seat when doing group administration so as not to distract each other. Administration is relatively self-explanatory. Baseline testing takes approximately 25 minutes. Post-concussion testing takes approximately 20 minutes. Please note that testing an athlete on the same machine, network system, or a system with access to the baseline data will reduce the amount of time it takes to administer a post-concussion session. At the beginning of the post-concussion session, the computer will search for the baseline data and extract the demographic data, thus by-passing the re-entry of this information. In order to do this appropriately, the specific 9-digit ID # (Social Security or other administrator assigned number) and date of birth both need to be entered.

Starting a New Test

You can start a new test by clicking the "Start a new test" button from the main ImPACT page, or proceed to the FILE drop down menu and select NEW TEST. This will take you through all three sections of the test including the 6 test modules.

ImPACT

File Tools Help

New Test...
Symptom Inventory...
Open...
Import...
Export...
Archive...
Exit

ImPACT

File Tools Help

— Select An Option Below —

Start a new test

SYMPTOM INVENTORY ONLY: If you are interested in taking just recording the athletes current symptom scores, choose SYMPTOM INVENTORY from the drop down menu or click the "Symptom inventory" icon from the main ImPACT window. The symptom inventory will allow the physician to track an athlete's symptoms with taking the entire test.

ImPACT

File Tools Help

— Select An Option Below —

Start a new test

Clinical reports

Symptom inventory

ImPACT

File Tools Help

New Test...
Symptom Inventory...
Open...
Import...
Export...
Archive...
Exit
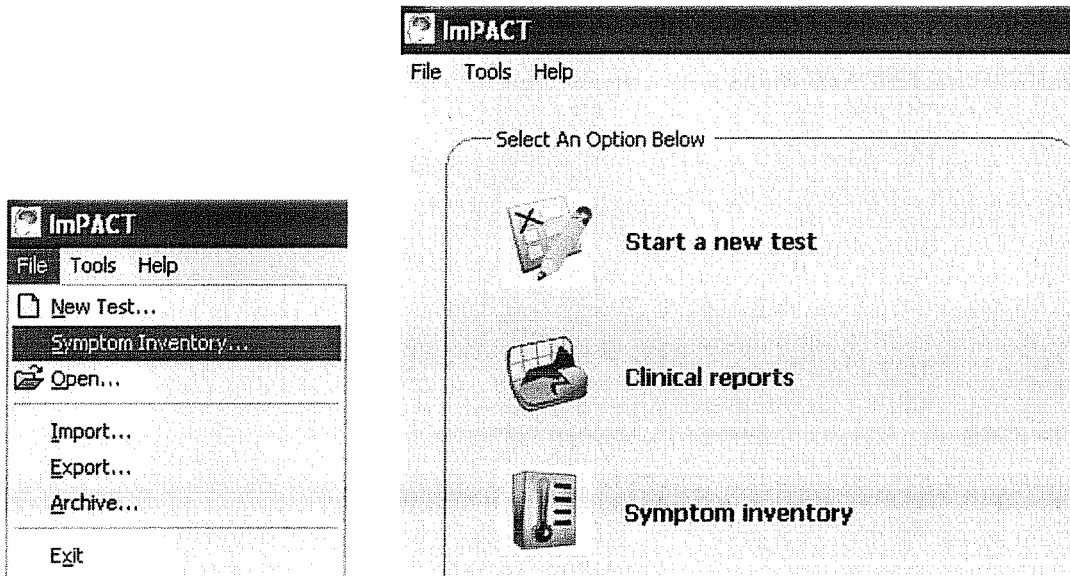
Once you have started a new test you will need to enter the demographic information. ImPACT uses a combination of ID# and date of birth to keep its records. If you enter a unique combination a new record will be added. If the ID# and date of birth already exists, the program will bring up the existing information associated with that combination. From this screen you select the language for the test.

Sport and Health History

| Step 1: Identification | ⌄ |

Enter the subject's identification number and date of birth below. If available, use the social security or social insurance number as the identification number. Otherwise, assign a unique identification number to the subject.

SSN/Identification #: [▓▓]

Date of Birth: [/ /]   (MM/DD/YYYY)

[Cancel]   << Previous   [Next >>]   Finish

Test Section 1: Subject Profile and Health History Questionnaire

ImPACT requires the subject to input basic demographic and descriptive information through a series of easy to follow instructional screens. The subject inputs this information via a keyboard and utilizes an external mouse to navigate/select responses on the screen. Many of the questions can be answered using "pull down" menus in the window. Use the CANCEL, PREVIOUS, NEXT, and FINISH buttons at the bottom of each screen to complete the section.

```
General Information

First Name:    [                    ]
Last Name:     [                    ]

Organization:  [                         ]

Height:        [ 0' ▼ ][ 0" ▼ ]
Weight:        [    0 lbs ▼ ]

Gender:        ○ Male  ○ Female
Handedness:    ○ Right  ○ Left  ○ Both

          Cancel    << Previous   Next >>    Finish
```

Test Section 2: Current symptoms and conditions

This section of ImPACT asks questions about the test subject's most recent concussion date, hours slept last night, and current medications. NOTE: If you want the athlete to just take the symptom inventory, choose FILE, SYMPTOM INVENTORY instead of start a new test.

```
Current Symptoms and Conditions

Step 1: Current Conditions    ▼

Date of last concussion:  [ / / ▼ ] (MM/DD/YYYY)
(approximate if uncertain)

Hours of sleep last night:  [    ▼ ]

Current medication:     [                         ▲
                                                  ▼ ]

                                          AutoFill

          Cancel    << Previous   Next >>    Finish
```

The subject must answer yes or no if a symptom exists. For all yes answers, the subject is to rate the current severity of 22 symptoms, via a 7-point Likert scale. This scale is currently utilized by the NFL, NHL and has been endorsed by the Vienna Concussion in Sports (CIS) group. This is accomplished via the use of the external mouse and keyboard. The symptom scores are displayed in the report along with the symptom total score. Use the CANCEL, PREVIOUS, NEXT, and FINISH buttons at the bottom of each screen to complete the section

---

Current Symptoms and Conditions

Step 2: Symptoms (1 of 22)

Click the box or button below that indicates the degree to which you are currently experiencing the following symptom:

Headache

⌐ Not experiencing this symptom

Minor ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 Severe

Cancel | << Previous | Next >> | Finish

Test Section 3:

Neuropsychological Tests (Baseline and Post-Concussion)

The subject will now be asked to choose Baseline or Post-concussion test. If the post concussion option is selected, you will be asked to select one or four word/design groups to be administered (Forms 2-5). Each of these forms has different word and design lists, as well as other randomized stimuli. This feature was incorporated into ImPACT to help reduce the practice or learning effects often associated with neuropsychological measures. Given this issue, it is recommended that different forms be utilized for each post-injury testing session (e.g. Form 2 for the first post-concussion test, Form 3 for the second, etc.) Follow the on screen instructions to complete each test module. It is recommended that the administrator be familiar with the test to answer any questions the subject may have. ImPACT is now ready to begin testing. Here is a brief description each module in the test.

Module 1 (Word Discrimination)

Word Memory

Was **Small**
one of the words displayed?
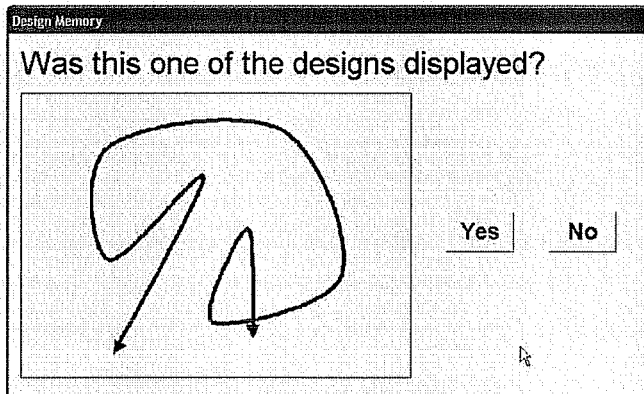
Yes   No
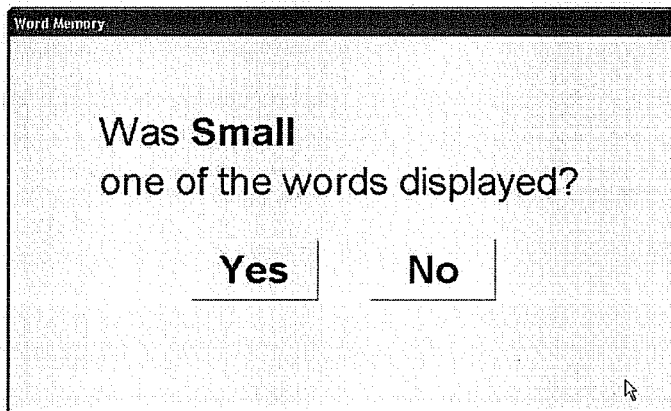
- Evaluates attentional processes/verbal recognition memory
- Utilizes a word discrimination paradigm.
- Twelve target words are presented for 750 milliseconds (twice to facilitate learning of the list)
- The subject is then tested for recall via the presentation of the 24-word list that is comprised of 12 target words and 12 non-target words

  ✓ Words chosen from the same semantic category as the target word.
  ✓ EX: the word "ice" is a target word, while the word "snow" represents the non-target word.
  ✓ The subject responds by mouse-clicking the "yes" or "no" buttons
  ✓ Individual scores are provided both for correct "yes" and "no" responses -In addition, a total percent correct score is provided.

- There are five different forms of the word list.

Delay Condition: Following the administration of all other test modules (approximately 20 minutes), the subject is again tested for recall via the same method described above. The same scores that are described above are provided for the delay condition.
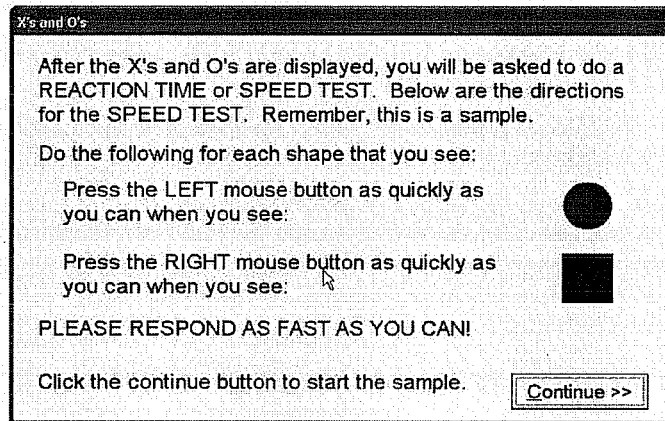
Module 2 (Design Memory)

- Evaluates attentional processes and visual recognition memory
- Utilizes a design discrimination paradigm.
- Twelve target designs are presented for 750 milliseconds (twice to facilitate learning)
- The subject is then tested for recall via the presentation of the 24-designs

  ✓ *Comprised of 12 target designs and 12 non-target designs*
  ✓ *EX: target designs that have been rotated in space*
  ✓ *The subject responds by mouse-clicking the "yes" or "no" buttons*
  ✓ *Individual scores are provided both for correct "yes" and "no" responses*
  ✓ *In addition, a total percent correct score is provided*

- There are five different forms of this task

Delay Condition: Following the administration of all other test modules (approximately 20 minutes), the subject is again tested for recall via the same method described above. The same scores that are described above are provided for the delay condition.

18

Module 3 (X's and O's)

X's and O's

After the X's and O's are displayed, you will be asked to do a REACTION TIME or SPEED TEST. Below are the directions for the SPEED TEST. Remember, this is a sample.

Do the following for each shape that you see:

   Press the LEFT mouse button as quickly as you can when you see:

   Press the RIGHT mouse button as quickly as you can when you see:

PLEASE RESPOND AS FAST AS YOU CAN!

Click the continue button to start the sample.   Continue >>

- Measures visual working memory, visual processing speed, and visual memory paradigm
- Incorporates a distractor task.
- The subject can practice the distractor task prior to presentation of the memory task
- The distractor is a choice reaction time test: the subject is asked to click the left mouse button if a blue square is presented and the right mouse button if a red circle is presented.
- Once the subject has completed this task, the memory task is presented.

   ✓   *Memory task: a random assortment of X's and O's is displayed for 1.5 seconds*
   ✓   *For each trial: three of the X's or O's are illuminated in YELLOW (the subject has to remember the location of the illuminated objects).*
   ✓   *Immediately after the presentation of the 3 X's or O's, the distractor task re-appears on the screen.*
   ✓   *Following the distractor task, the memory screen (X's and O's) re-appears and the subject is asked to click on the previously illuminated X's and O's.*
   ✓   *Scores are provided for correct identification of the X's and O's (memory), reaction time for the distractor task, and number of errors on the distractor task.*

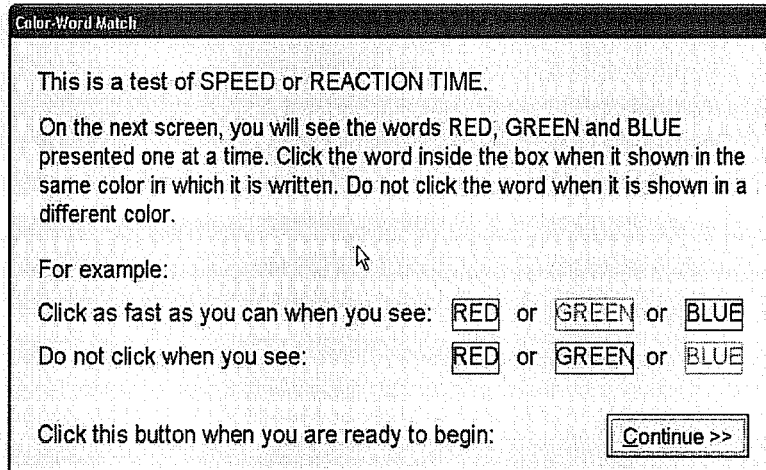- For each administration of ImPACT, the subject completes 4 trials.

Module 4 (Symbol Matching)

Click on the number that corresponds to the following symbol:
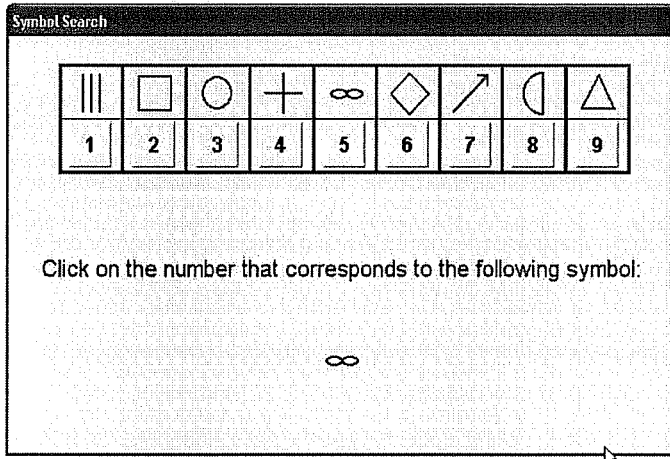
- Evaluates visual processing speed, learning and memory
- Initially, the subject is presented with a screen that displays 9 common symbols (triangle, square, arrow, etc).
- Directly under each symbol is a number button from 1 to 9
- Below this grid, a symbol is presented.

  ✓ *The subject is required to click the matching number as quickly as possible and to remember the symbol/number pairings*
  ✓ *Correct performance is reinforced through the illumination of a correctly clicked number in GREEN. Incorrect performance illuminates the number button in RED.*
  ✓ *Following the completion of 27 trials, the symbols disappear from the top grid.*
  ✓ *The symbols again appear below the grid and the subject is asked to recall the correct symbol/number pairing by clicking the appropriate number button.*

- This module provides an average reaction time score and a score for the memory condition.

Module 5 (Color Match)

Color-Word Match

This is a test of SPEED or REACTION TIME.

On the next screen, you will see the words RED, GREEN and BLUE presented one at a time. Click the word inside the box when it shown in the same color in which it is written. Do not click the word when it is shown in a different color.

For example:

Click as fast as you can when you see: RED or GREEN or BLUE

Do not click when you see: RED or GREEN or BLUE

Click this button when you are ready to begin: [Continue >>]

- Represents a choice reaction time task and measures impulse control/response inhibition
- First, the subject is required to respond by clicking a red, blue or green button as they are presented on the screen. This procedure is completed to assure that subsequent trials would not be affected by color blindness
- Next, a word is displayed on the screen in the same colored ink as the word   (e.g. RED), or in a different colored ink (GREEN or BLUE)

  ✓ *The subject is instructed to click in the box as quickly as possible only if the word is presented in the matching ink.*

- In addition to providing a reaction time score, this task also provides an error score.

Module 6 (Three letters)

Three Letters (Pass 1 of 5)					
Click each of these buttons in BACKWARD ORDER. Start with 25 and count down to 1 AS FAST AS YOU CAN.	**3**	**19**	**14**	**22**	**17**
	23	**13**	**8**	**4**	**5**
	16	**20**	**2**	**7**	**10**
	21	**11**	**18**	**12**	**9**
	1	**15**	**25**	**24**	**6**

If you make a mistake, use the "Go back" button to clear the buttons you have already clicked, one at a time.

<< Go back

- Measures working memory and visual-motor response speed
- First, the subject is allowed to practice a distractor task

  ✓ Consists of 25 numbered buttons (5 x 5 grid).
  ✓ The subject is instructed to click as quickly as possible on the numbered buttons in backward order starting with "25." (has an initial practice task)
  ✓ Then they are presented with three consonant letters displayed on the screen.
  ✓ Immediately following display of the 3 letters, the numbered grid re-appears and the subject is instructed to click the numbered buttons in backward order, again
  ✓ After a period of 18 seconds, the numbered grid disappears and the subject is asked to recall the three letters by typing them from the keyboard.
  ✓ Both the number placement on the grid and letters displayed are randomized for each trial.

- Yields a memory score (total number of correctly identified letters) and a score for the average number of correctly clicked numbers per trial from the distractor test.
- Five trials of this task are presented for each administration of the test.

Graphic Display of Data

In addition to the individual scores for each module described above, ImPACT 3.0 and 4.0 also yield summary composite scores for Verbal Memory, Visual Memory, Reaction Time, Processing Speed and Impulse Control. These scores were also provided for ImPACT 2.0. A previous version of ImPACT 1.0 yielded the following composite scores: Memory, Reaction Time, Processing Speed, and Impulse Control.

Following is a summary of the composition of the ImPACT 3.0 and 4.0 composite scores.

The Verbal Memory Composite is comprised of the average of the following scores:
     1) Total memory percent correct
     2) Symbol Match-Total correct hidden symbols
     3) Three-letters total percent of total letters correct.
A higher score indicates better performance on the Verbal Memory Composite.

The Visual Memory Composite score is comprised of the average of the following scores:
     1.) Design memory –total percent correct score and
     2.) The X's and O's-total correct-memory score.
A higher score indicates better performance on the Visual Memory Composite.

The Processing Speed Composite is comprised of the average of the following scores:
     1) X's and O's-total correct (interference)/4;
     2) Three-letters-Average counted correctly*3.
A higher score indicates better performance on the Processing Speed Composite.

The Reaction Time Composite is comprised of the average of the following scores:
     1) X's and O's-Avg. correct RT (interference);
     2) Symbol Match-Avg correct RT/3 and;
     3) Color Match-Avg. correct RT.
A lower score indicates better performance on the Reaction Time Composite.

The Impulse Control Composite score is comprised of the total of the following scores:
     1) X's and O's-total incorrect-interference and
     2) Color Match-total commissions.
A lower score indicates better performance on the Impulse control composite.

A large number on this composite index (>20) typically indicates errors in the approach to the test, such as misinterpreted directions or a careless response style. A close perusal of the individual raw data is indicated when this scale is elevated.

A Total Symptom Composite Score is also displayed graphically. This score represents the total for all 22-symptom descriptors. *A lower score indicates fewer endorsed symptoms by the athlete.*

This series of graphs allows direct comparison of test performance in these core areas across multiple testing sessions. The composite scores were constructed to provide summary information regarding different broad cognitive domains. Thus far, our studies have indicated that the verbal memory, visual memory, processing speed, reaction time and symptom scores accurately discriminate concussed from non-injured subjects.

ImPACT 3.0 and 4.0 have been designed to integrate data from previous versions into the new report format. This allows 1.0 and 2.0 user's to keep baseline testing data that was acquired using earlier versions of the software. ImPACT 3.0 and 4.0 software can therefore be installed in the same folder as ImPACT 1.0 and 2.0 and automatically "read" the previous data. In other words, when ImPACT 3.0 or 4.0 are installed on a computer that contains ImPACT 1.0 and 2.0 data, the newer program transfers the ImPACT 1.0 and 2.0 data into the new composite score format.

Saving the Test

When the test subject is finished, the supervisor password box will appear. This password should be entered by the test supervisor. The supervisor password is distributed with the initial software and is located inside the CD sleeve. If you need to change this password for any reason go to the TOOLS, OPTIONS, EXAM SETTINGS tab to make the change. The test cannot be saved without this password.
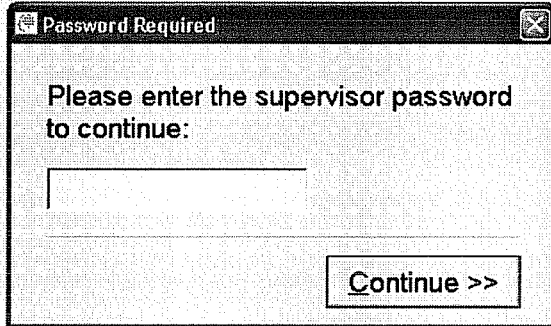
Concussion Details Screens

Following the evaluation of the athlete post-concussion, the professional who is conducting the evaluation is asked to describe the characteristics of the injury and treatment undertaken, if any. From the drop down list select the concussion that this test is associated with. If this is a second post concussion test the program will ask you to review the previously entered information. The report now displays follow-up tests grouped by the date you select in the screen below.
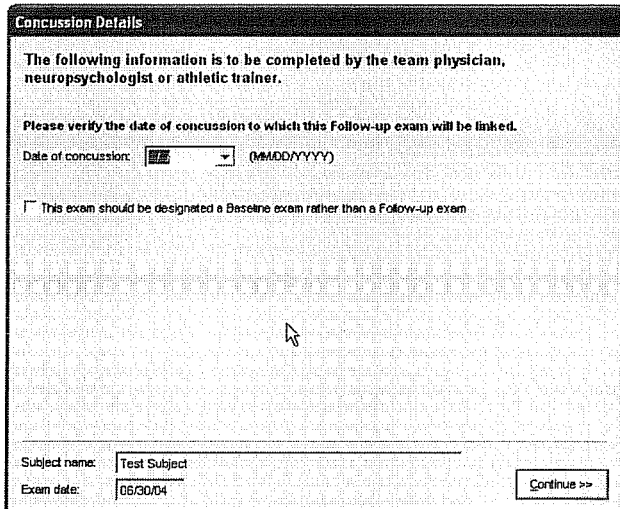
Concussion Details

PAGE 1:The external mouse is used to identify appropriate descriptors of the injury (e.g. duration of loss of consciousness, retrograde amnesia, on-field symptoms) as well as a description of evaluation and treatment, if any (e.g. CT, MRI, emergency room visit, etc.).

Concussion Details

The following information is to be completed by the team physician, neuropsychologist or athletic trainer.

Loss of consciousness
- None
- 1-2 minutes
- 1-20 seconds
- 3-5 minutes
- 21-59 seconds
- more than 5 minutes

Confusion/Disorientation
- None
- 6-15 minutes
- 1-59 seconds
- 16-30 minutes
- 1-5 minutes
- more than 30 minutes

Retrograde amnesia
- None
- 1-5 minutes
- 1-10 seconds
- 6-15 minutes
- 11-59 seconds
- more than 15 minutes

Returned to play
- after 0-15 minutes
- after 31-45 minutes
- after 16-30 minutes
- did not return to play
- Taken to hospital

Anterograde amnesia
- None
- 16-30 minutes
- 1-5 minutes
- 31 minutes to 3 hours
- 6-15 minutes
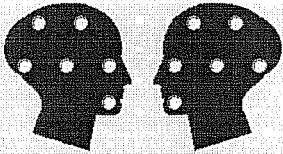- more than 3 hours

CT/MRI scan of head
- None
- Negative
- Positive

Subject name: ImPACT 3.0
Exam date: n/a   Date of concussion: 02/02/2002   Continue >>

PAGE 2: Check boxes for current symptoms are provided. A point of impact diagram is provided. Fill in the appropriate contact point. Mid-line contact should be denoted by checking both sides of the head at the same point.

Concussion Details

The following information is to be completed by the team physician, neuropsychologist or athletic trainer.

Symptoms (as evaluated on sideline)
- Fatigue
- Headache
- Dizziness or balance problems
- Visual changes
- Nausea
- Vomiting
- Personality change
- Numbness or tingling

Point of Impact

Mark the diagram at the point that best corresponds with the point at which the impact occurred. Impacts along the mid-line of the head should have the location marked on both profiles.

Subject name: ImPACT 3.0
Exam date: n/a   Date of concussion: 02/02/2002   Continue >>

PAGE 3: Mouth guard and helmet information is recorded when applicable. There is a free text field where additional descriptors of injury may be delineated by the medical staff for future reference (e.g. description and location of blow, sideline neurological examination results, etc.).

Concussion Details

The following information is to be completed by the team physician, neuropsychologist or athletic trainer.

Mouthguard

Type:
- None
- Boil and bite
- Multi-laminant
- Vacuum form

Condition:
- Poor
- Average
- Good

Manufacturer: _____

Helmet

☐ Not applicable / Not worn

Manufacturer: _____
Model: _____
Size: _____

Description of injury and additional information:

Subject name: ImPACT 3.0
Exam date: n/a   Date of concussion: 02/02/2002   Finish

You can also change this information through the TOOLS, Subject Review screen. Right click on the concussion date listed in concussion details and choose CONCUSSION DETAILS. The same three screens above will now be available for editing. Also use this procedure to delete incorrect entries from the concussion history list. NOTE: You will not be able to delete any concussions that have a post-concussion exam linked to them.

Subject Review

Select a subject: Find name: [   ]

Last Name	First Name	SSN / ID#	Date of Birth
Palm	Just	22 - -	07/21/2004
person	test	111-11-1111	11/11/1980

(right-click a name for options; double-click heading to sort)

Summary for Just Palm

Concussion history: Exam history:

07/...
    Concussion Details...
        Delete

Done

ACCESSING DATA

To see a list of all ImPACT test subjects go to the select subject review screen. Use the TOOLS drop down menu and SUBJECT REVIEW. This will give a composite list of test subjects, concussion history, and ImPACT testing history. Use the FIND NAME box to quickly jump to the athlete record you need. If running on a stand-alone machine this list will only contain the exam records for subjects tested on this workstation, while a network database will show records for every test taken on all the network computers.
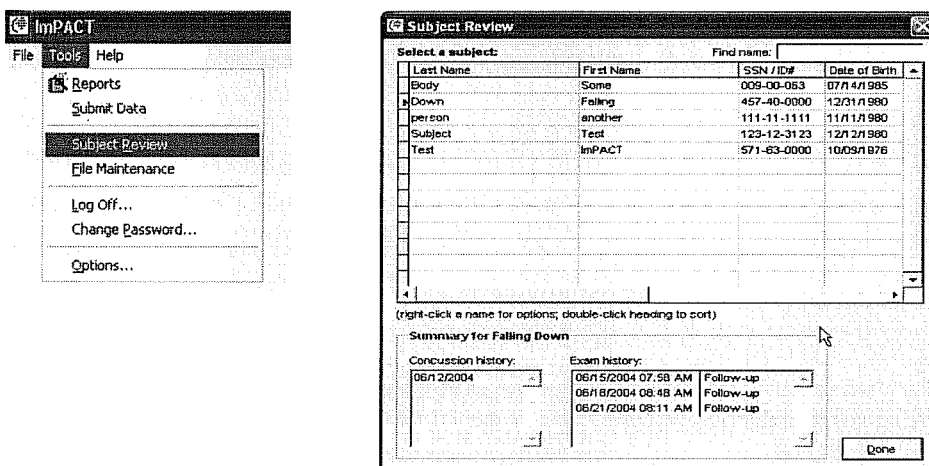

If any of the information on this page is incorrect, right click on the individuals name and select EDIT. You use this same procedure to delete people from the database. If an individual is listed twice you can merge the two records by editing the incorrect one to match the correct one. ImPACT will then ask you if you would like to merge the records.
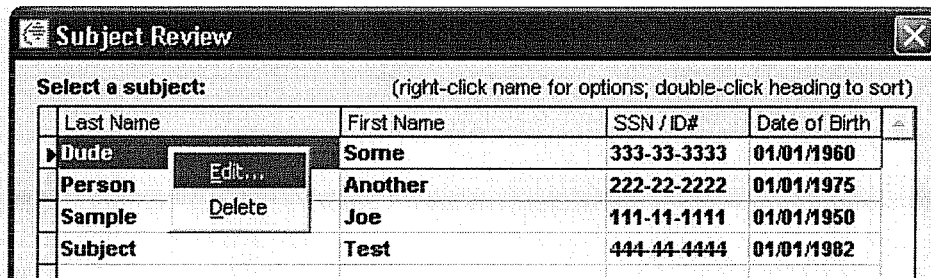
To review or change the details for a concussion listed in the concussion history, right click the date and choose from the menu items. You can also right click on a test under EXAM HISTORY to change the exam type. If you are running in a per-save mode, you must have a save available to make the change.

Clinical Report

The procedures for generating a report are as follows: Select the TOOLS menu bar, REPORTS, CLINICAL REPORT or select CLINICAL REPORTS from the main ImPACT window.
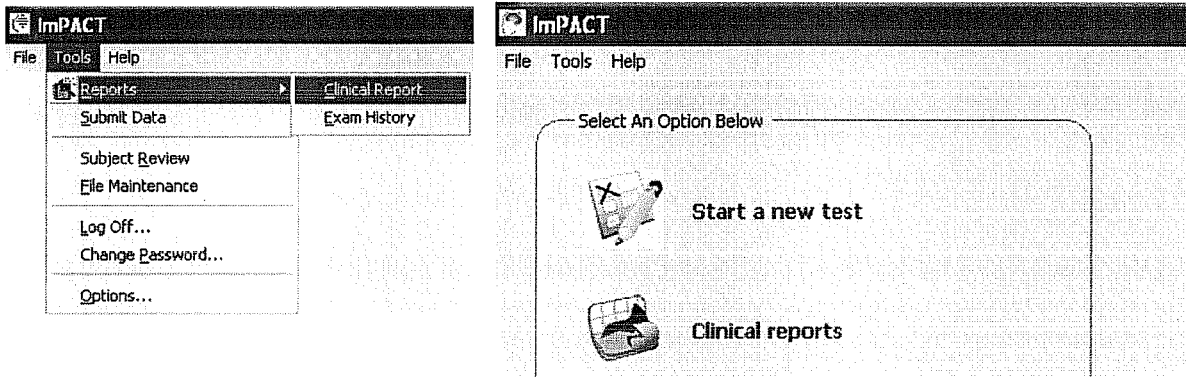

You must put a check next to the name of the subject(s) you want to view. You can generate multiple reports at one time. The report will display the baseline that precedes the concussion and all post-concussion tests associated with that concussion. If you would like the composite test scores graphically displayed, you must click on the "print composite graphs" box in the Report Generation Section. Select VIEW REPORT to generate a print preview on your monitor, and select PRINT REPORT to print a hard copy.
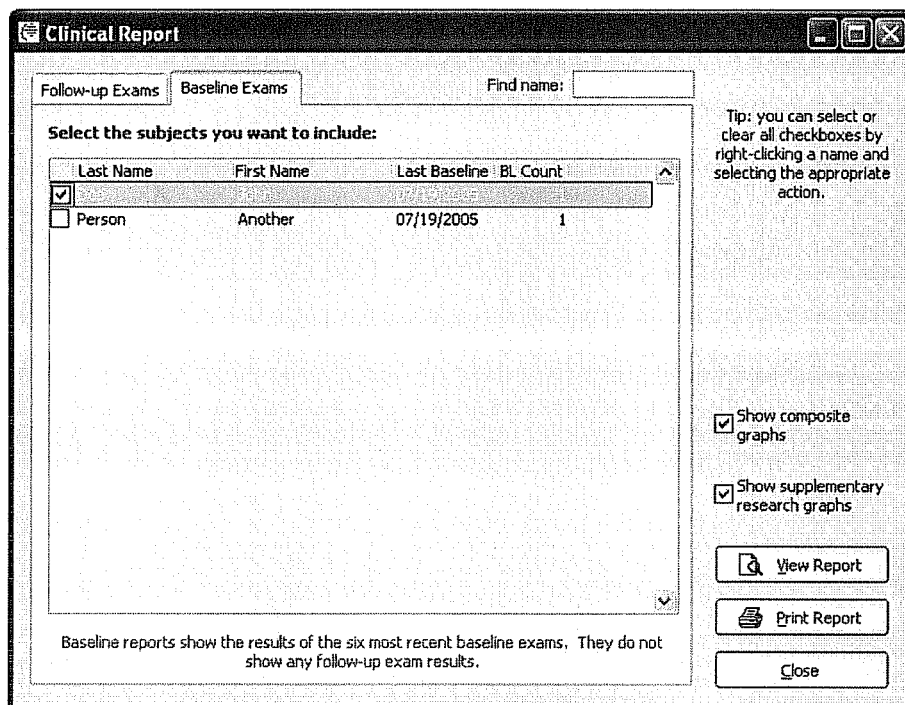
Click on the BASELINE tab to view baseline tests, and the FOLLOW UP tab to view concussion tests. To have the FOLLOW UP reports page only show the most recent concussion for all athletes, put a check in the box "Only show each subject's most recent concussion."
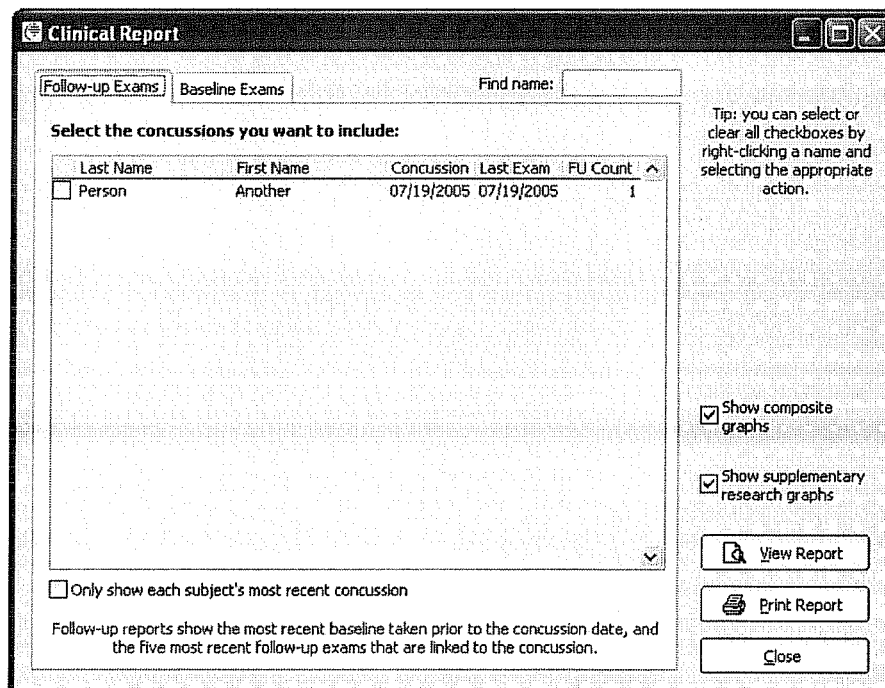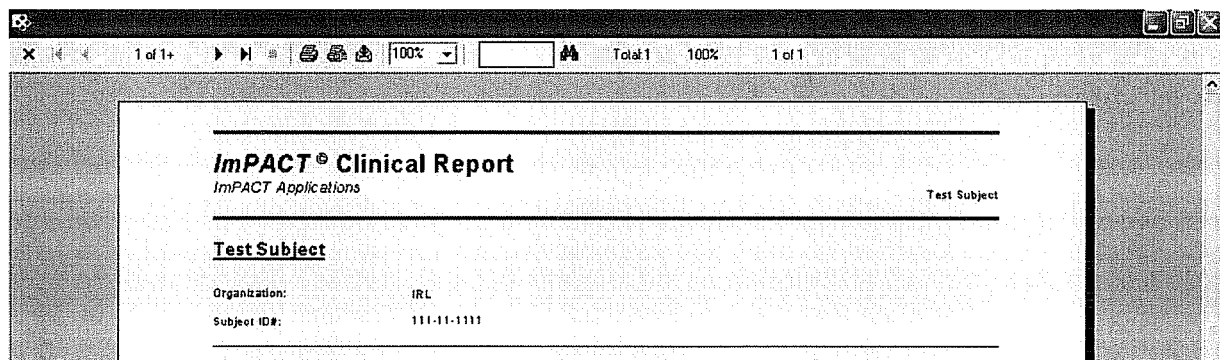
To view the composite graphs, put a check in the "Show Composite Graphs." This will add an additional page to the report with a graphical representation of the composite scores. Once "show composite graphs" is checked you may also choose "Show supplementary research scores" which will add an addition page of research graphs to the report. For a complete analysis of what the supplementary research scores represent, consult the ImPACT Clinical User's Manual.
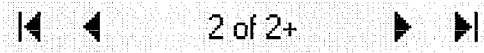
If you have a large data set and would like to quickly move to a specific person, type the first few letters in the Find name: [   ] box to scroll quickly to the target.

Reading & Printing Your Clinical Reports

Once you have selected the "View Report" button, a print preview window will appear. At the top of this window is a tool bar.


```
ImPACT® Clinical Report
ImPACT Applications                                              Test Subject

Test Subject

Organization:          IRL
Subject ID#:           111-11-1111
```

The ✕ closes the preview window. The |◀ ◀ 2 of 2+ ▶ ▶| tells the current page number and the black arrows scroll through the pages.

The 🖨 will create a hard copy of the report. The 🖨 will take you to the printer select screen.

The 📤 will take you to an export file screen. From this window you can select to save the report to an Adobe PDF file. Select the pages you want and save the file to your computer. This file can be attached to an email. The export screen is shown below:


```
Export

Format:
Acrobat Format (PDF)        ▼           OK

Destination:                            Cancel
Disk file                   ▼
```
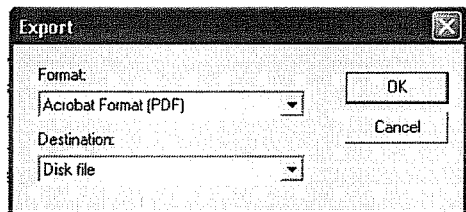
Normative Data on the Report

ImPACT 3.0 and 4.0 have incorporated normative data into the report. Consult the ImPACT 3.0 and 4.0 Clinical User Manuals for more details.

Percentile Rank

When looking at the composite scores, you will notice a smaller number to the right of the composite score. This is the percentile rank of the athlete for their gender and age at the time of testing.

Reliable Change Index

Scores in bold type indicate scores that exceed the Reliable Change Index (RCI) score when compared to the baseline score. However, scores that do not exceed the RCI index may still be clinically significant.

Normative Comparison Group

This is the gender and age group that the athlete is being compared against. In the example below the athlete is compared against other Males age 16-18.

ImPACT™ **Clinical Report**   Test Subject

Exam Type	Baseline	Post-concussion	Post-concussion			
Date Tested	08/29/2005	08/30/2005	09/01/2005			
Last Concussion	05/20/2003	08/30/2005	08/30/2005			
Exam Language	English	English	English			
Test Version	4.5.729	4.5.729	4.5.729			
Normative Comparison Group	M 16-18	M 16-18	M 16-18			

| Composite Scores *						
Memory composite (verbal)	92 74%	**82** 29%	88 58%			
Memory composite (visual)†	93 86%	86 70%	**78** 45%			
Visual motor speed composite	45.75 85%	**54.80** 99%	**52.65** 99%			
Reaction time composite	0.47 87%	0.43 97%	0.43 97%			
Impulse control composite	11	5	3			
Total Symptom Score	0	3	0			

*Scores in **bold** type indicate scores that exceed the Reliable Change Index score (RCI) when compared to the baseline score. However, scores that do not exceed the RCI index may still be clinically significant. Percentile scores, if available, are listed in small type. Please consult your ImPACT User Manual for more details.

† Clinical composite score is available only for exams taken in ImPACT version 2.0 or later.

Exam History Report
ImPACT has added the ability to print an exam history. Go to TOOLS, REPORTS, and choose EXAM HISTORY.
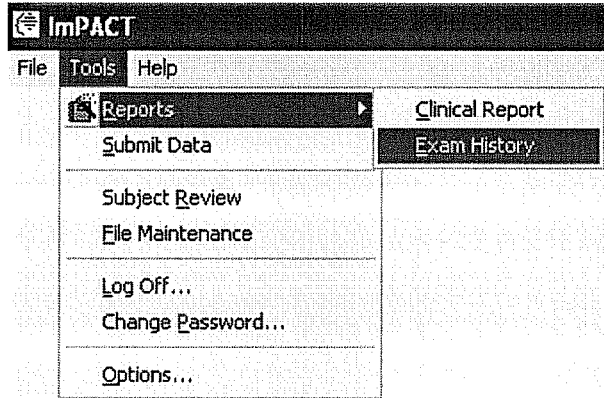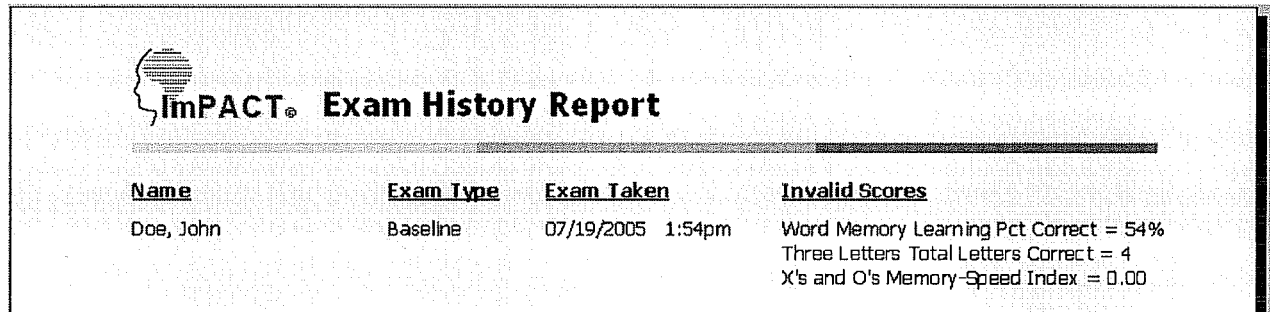
Enter the date range the report will be generated for. You may sort the report by sport or organization by checking the boxes under data grouping. You may choose baseline, follow-up tests, or both to view on the report. Select VIEW REPORT to generate a print preview on your monitor, and select PRINT REPORT to print a hard copy.
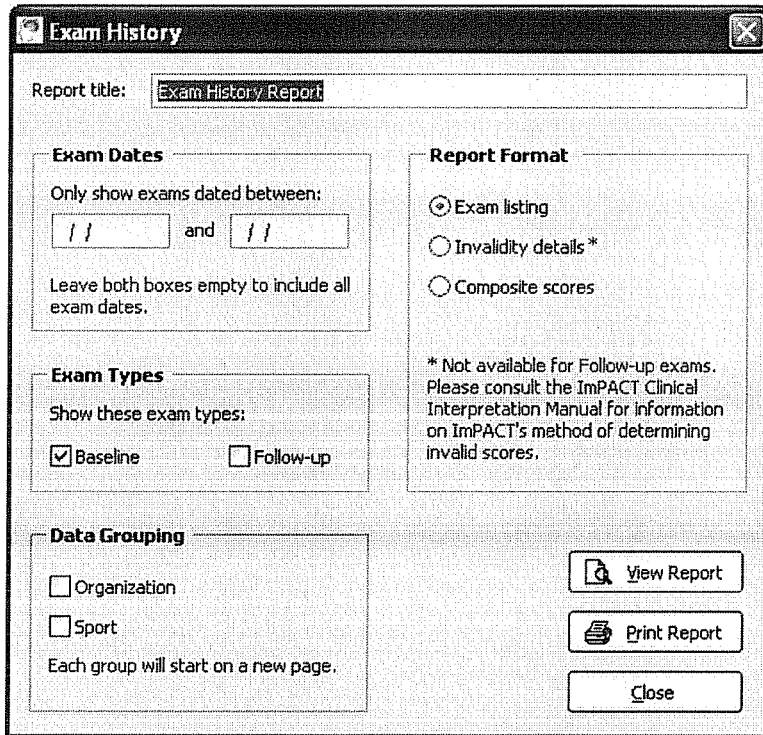
Viewing Invalid Baselines

ImPACT has been designed to screen for invalid baselines. Choose the Exam History Report and check baseline tests only. An option to "Only show exams that may have invalid scores" will become active. Select VIEW REPORT to generate a print preview on your monitor, and select PRINT REPORT to print a hard copy.

ImPACT® Exam History Report

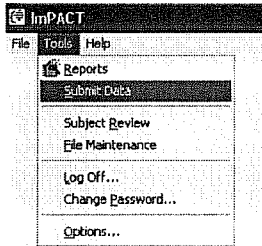| Name	Exam Type	Exam Taken	Invalid Scores
Doe, John	Baseline	07/19/2005 1:54pm	Word Memory Learning Pct Correct = 54% Three Letters Total Letters Correct = 4 X's and O's Memory-Speed Index = 0.00

For a complete analysis of how the invalid scores are calculated, please consult the ImPACT Clinical User's Manual.
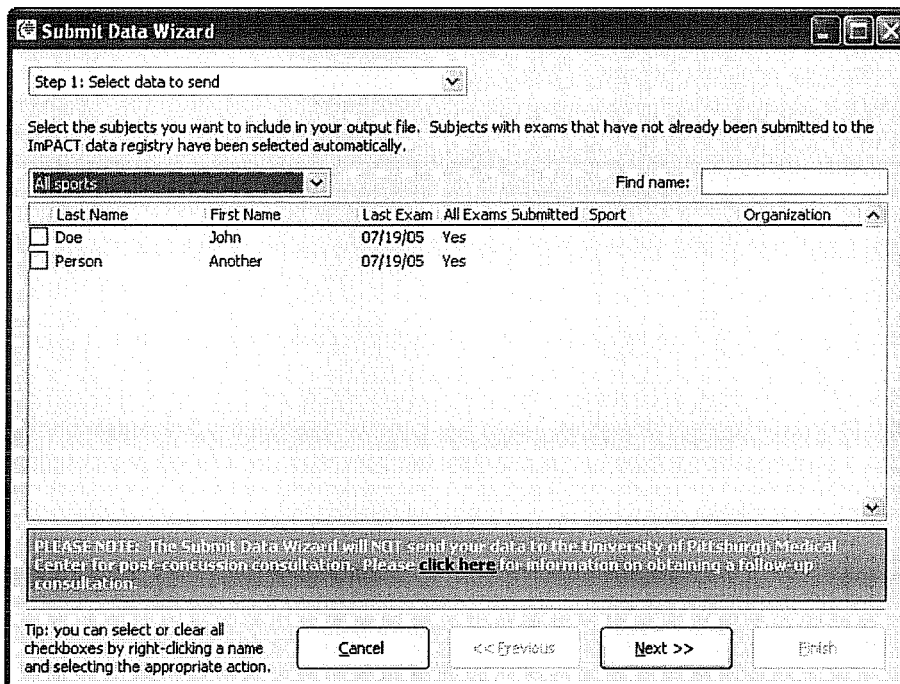
Submitting Data to the Data Registry

NOTE: This does not submit your data for post concussion analysis. This process anonymously submits your data to assist in research and creating normative data

You will submit your data using the Submit Data Wizard. Select the TOOLS drop down menu, then SUBMIT DATA..

```
ImPACT
File  Tools  Help
      Reports
      Submit Data
      Subject Review
      File Maintenance
      Log Off...
      Change Password...
      Options...
```

Place checkmarks next to each subject you want to submit. Previously submitted data will have a "YES" in the ALL EXAMS SUBMITTED column. Right click on a subject name and the CLEAR ALL and CHECK ALL options will appear.

```
Submit Data Wizard

Step 1: Select data to send

Select the subjects you want to include in your output file. Subjects with exams that have not already been submitted to the
ImPACT data registry have been selected automatically.

All sports                                              Find name:

  Last Name      First Name    Last Exam  All Exams Submitted  Sport      Organization
  Doe            John          07/19/05   Yes
  Person         Another       07/19/05   Yes

PLEASE NOTE: The Submit Data Wizard will NOT send your data to the University of Pittsburgh Medical
Center for post-concussion consultation. Please click here for information on obtaining a follow-up
consultation.

Tip: you can select or clear all
checkboxes by right-clicking a name      Cancel      << Previous      Next >>      Finish
and selecting the appropriate action.
```

You will have three options to send your data

Direct Upload: Select "Direct upload" and click FINISH. Your data will be compressed and automatically uploaded to our website. You must have an internet connection.

Using Email: Select "Send data using email" and click FINISH. Your data will be compressed and automatically inserted into an email message. Requires MAPI compliant email client.

Using a Diskette: Insert a blank diskette into your disk drive. Then select "Create a file". A Save As window will appear. Select your floppy drive and click SAVE. If you are transferring information between computers do not use the submit data wizard, instead use the import and export features discussed in the next section.
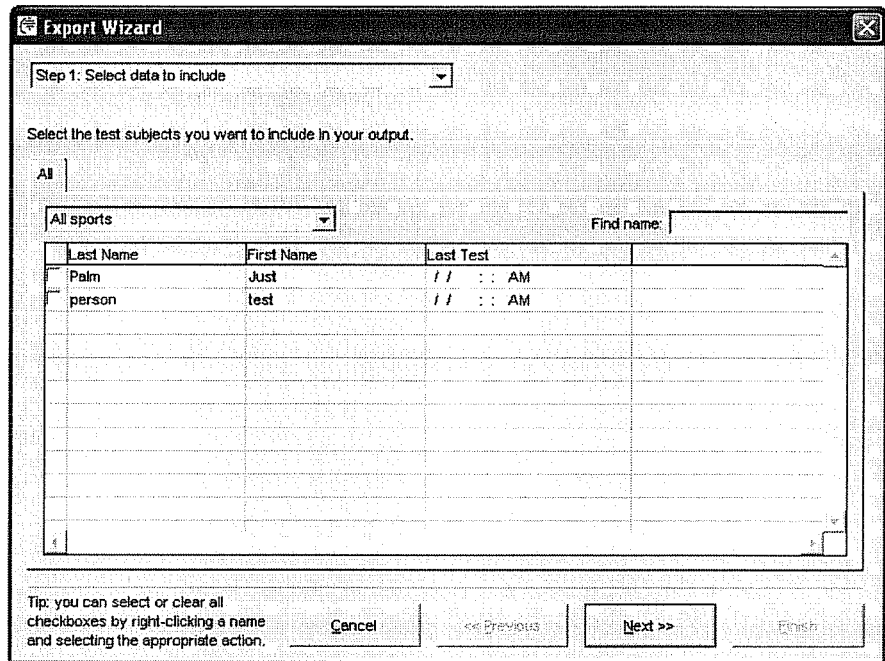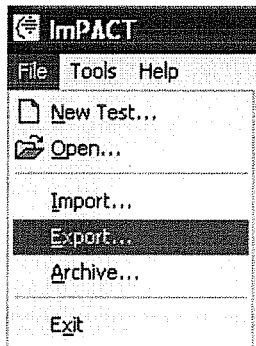
The names and ID#'s are excluded when you submit your data. If you need to include this information put a check in the INCLUDE SUBJECT IDENTIFIERS box. If you are using this feature to make an export file, stop and instead use the import / export tabs described in the next section.

Submit Data Wizard

Step 2: Send data

Select from the following output options:

◉ Direct upload

○ Send data as email attachment

○ Create a data file

By default, subject identifiers (i.e., name, identification number and date of birth) are not included in your data submission for reasons of confidentiality. However, you may include these identifiers by checking the box below. If you want to create a data file for importing onto another computer, please exit the Submit Data Wizard and choose "Export" from the File menu.

☐ Include subject identifiers

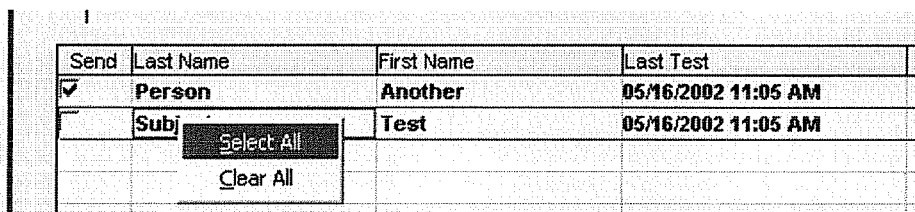[Cancel] [<< Previous] [Next >>] [Finish]

Exporting Data

The ImPACT program has an export system for extracting information. These exports can be input into another computer, put into a Microsoft Excel spreadsheet, or sent to an email recipient. First select EXPORT from the FILE drop down menu or choose EXPORT YOUR DATA from the main ImPACT window.

ImPACT

File Tools Help

New Test...
Open...

Import...
Export...
Archive...

Exit

Export Wizard

Step 1: Select data to include

Select the test subjects you want to include in your output.

All

All sports   Find name:

Last Name	First Name	Last Test	
Palm	Just	/ / : : AM	
person	test	/ / : : AM	

Tip: you can select or clear all checkboxes by right-clicking a name and selecting the appropriate action.

Cancel   << Previous   Next >>   Finish

You will need to check the names that you want included in your export file. Right click on a subject name to get the CLEAR ALL and SELECT ALL options. You can also export just one sport by utilizing the SPORTS drop down menu.

| Send	Last Name	First Name	Last Test
✓	Person	Another	05/16/2002 11:05 AM
	Subj Select All	Test	05/16/2002 11:05 AM
	Clear All		

Click the NEXT button. Now you choose your output file format. You may add a password for extra protection. NOTE: There is no way for ImPACT Applications to get into an export file you have password protected. Click FINISH to create the export file.

Archiving Old Data

ImPACT offers the ability to remove selected athletes from the active database. These files can then be archived and then restored for future analysis.

On step 1 of the wizard place a check make in the box of the athletes to be archived. On Step 2 of the export wizard, select the CREATE A FILE option. A window will appear asking for a location and file name. By clicking FINISH, you will be removing all checked athletes from your current roster list. Once this file is created, please burn it to a CD for safe keeping.
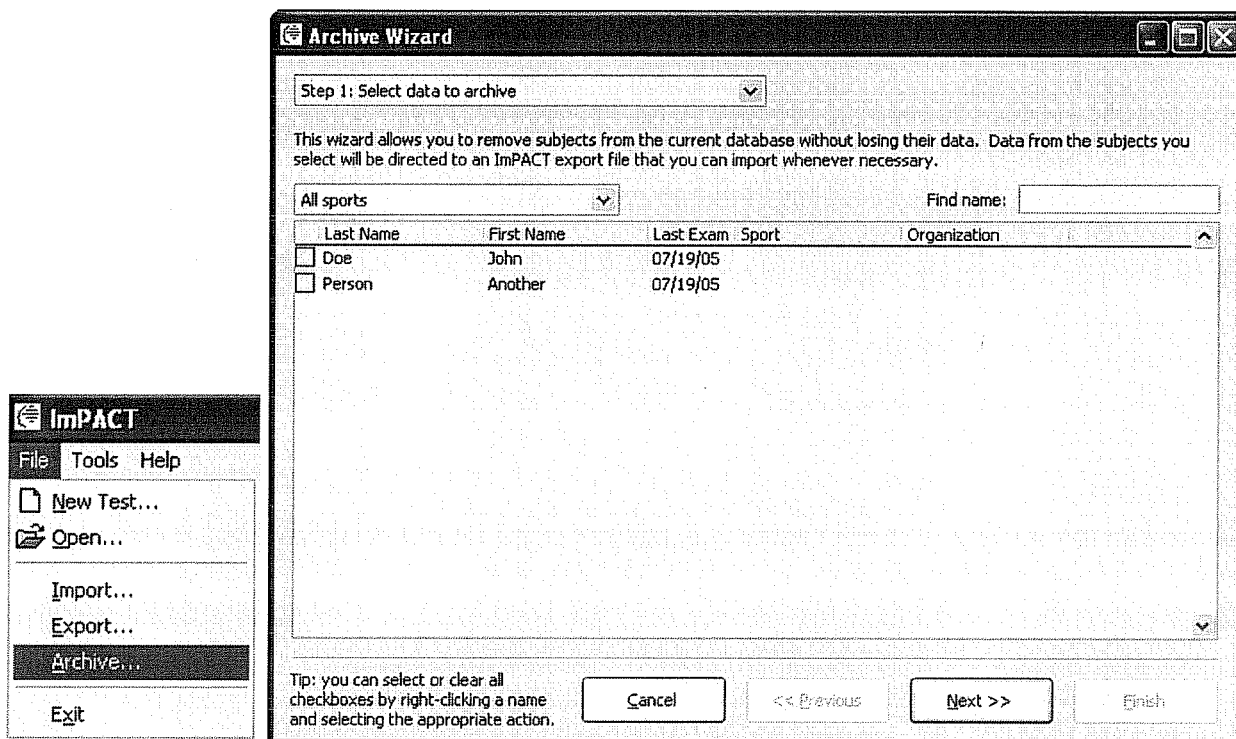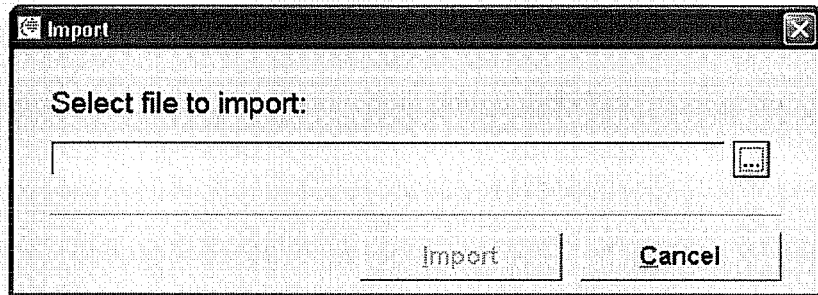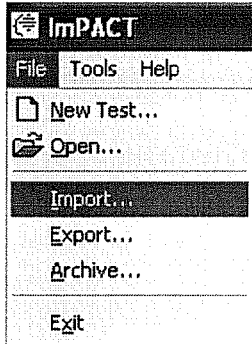
To restore these files, use the import wizard. The program will ask if you want to add the data back into the current database or create a temporary database. For complete details see the RESTORING AN ARCHIVE FILE section later in this manual.

Importing Data

Once you have created an export file on another computer, bring that file to the host computer on a floppy disk or CD. To import into the new computer, select IMPORT from the FILE drop down menu. This will bring up an import window. You can select the file you want to import by clicking the ⊞ button. In the select window you can choose multiple files by holding down the control key while clicking multiple selections.

ImPACT

File Tools Help

☐ New Test...
📂 Open...
Import...
Export...
Archive...
Exit

Import

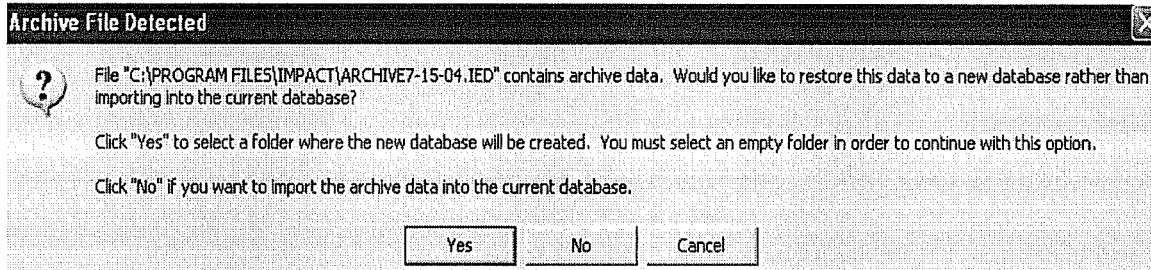Select file to import:

[_____] [...]

Import   Cancel

Note: The ImPACT program will import files created in all previous versions, but previous versions will not be able to import files from the latest ImPACT version.

Restoring an Archive File

If you need to look at information stored in an archive file, use the importing data procedure listed above. When you select the archive file you will be asked if you would like to reinsert the data in your active database, or start a temporary database with just the archive information.

Archive File Detected

? File "C:\PROGRAM FILES\IMPACT\ARCHIVE7-15-04.IED" contains archive data. Would you like to restore this data to a new database rather than importing into the current database?

Click "Yes" to select a folder where the new database will be created. You must select an empty folder in order to continue with this option.

Click "No" if you want to import the archive data into the current database.

| Yes | No | Cancel |

Restore Archive

Select an empty folder:

- ⊞ 🗀 eFax Messenger Plus
- ⊞ 🗀 epson
- 🗀 Google
- ⊞ 🗀 HTML Help Workshop
- ⊟ 🗀 ImPACT
  - 🗀 DATA
  - 🗀 Documents
  - ⊞ 🗀 Graphics
 - ⊞ 🗀 Sideline

| Make New Folder | OK | Cancel |

If you select to save the data to a new database you must create a new folder to put the data. Click the MAKE NEW FOLDER button, and select OK. A new database containing the archived data will be created and automatically open. NOTE: When you exit ImPACT and start the program again you will be back to your active database.

Managing Lists

Over time you will build up a collection of misspelled sports and organization names. To correct an error on one of these fields, choose TOOLS, MANAGE LISTS. From the drop down menu choose SPORT or ORGANIZATION.
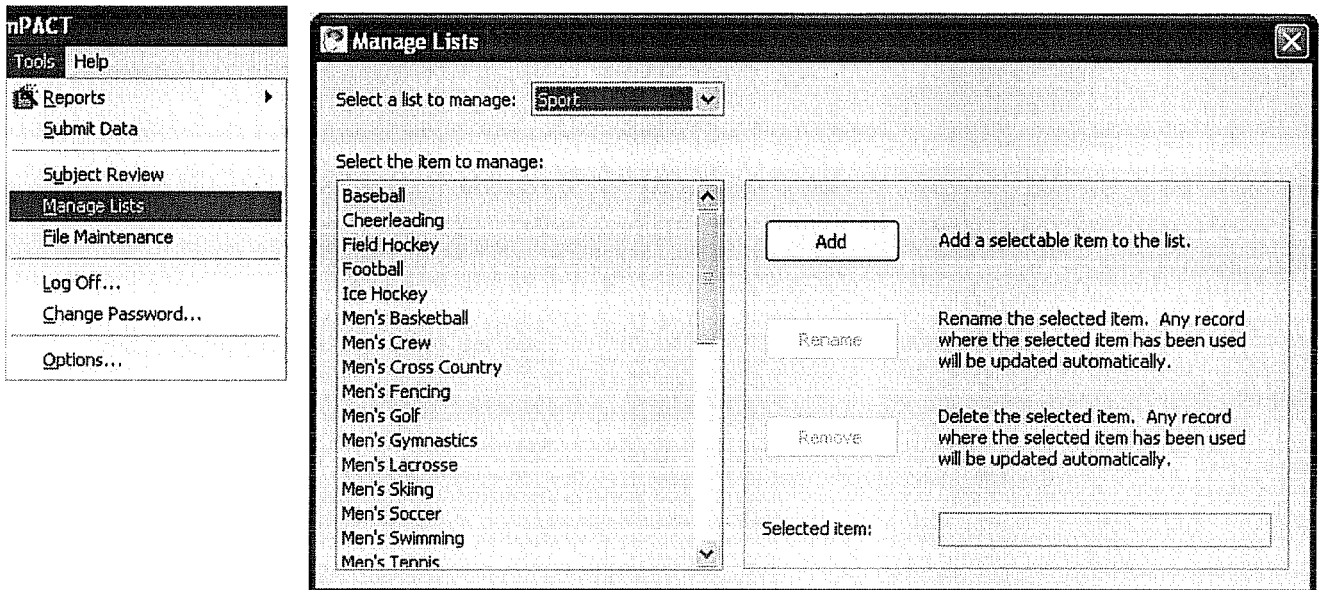

ADD – allows addition sports and organizations to be added.

RENAME - if you would like to combine two item lists into one, choose the incorrect item and rename it to match the correct one. The program will migrate all the players onto the same list. Use this option to modify existing list items.

REMOVE – takes the item off the list. This should only be used on items that have never been used.

Section 5
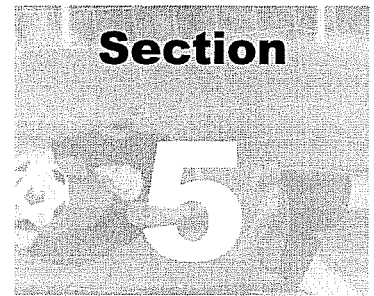
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