How to Construct a Relational Database

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Back-End – Relationship Concept

- Think of Access as a collection of spreadsheets that are relationally linked.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Glucose</th>
<th>Meds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient_ID</td>
<td>Glucose_ID</td>
<td>Med_ID</td>
</tr>
<tr>
<td>Fname</td>
<td>Patient_ID</td>
<td>DrugCombination</td>
</tr>
<tr>
<td>Lname</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Phone</td>
<td>Med_ID</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Glucose</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>Glucose</td>
<td></td>
</tr>
<tr>
<td>DOB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- STORE DATA ONE TIME / ONE PLACE
- DO NOT STORE CALCULATED DATA

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Front-End Example

<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th>Heart Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I: Baseline</td>
<td>160 / 70</td>
</tr>
<tr>
<td>30 sec</td>
<td>130 / 60</td>
</tr>
<tr>
<td>Phase II</td>
<td>140 / 60</td>
</tr>
<tr>
<td>Phase IV</td>
<td>140 / 60</td>
</tr>
</tbody>
</table>

**Medications:**

**Date:** Monday, May 01, 2009

**Patient:** [Redacted]

**Unit #:** 6830

**Gender:** [Redacted]

**Age:** [Redacted]

**Vitals:**

- **Blood Pressure:**
  - Supine: 184 / 110
  - Sitting: 149 / 80
  - Standing: 90 / 50

- **HR max/min:** 180 / 70
- **Heart Rate:** 93
- **Pressure reached:** 10 mmHg

**Valsalva Manoeuvres:**

- **Phase I:**
  - Baseline: J
  - Phase II: J

**Hyperventilation:**

- **Baseline:** 175 / 105
- **30 sec:** 130 / 75

**Handgrip:**

- **Baseline:** 156 / 110
- **1 min:** 144 / 100
- **3 min:** 142 / 110

**Cold Pressor Test:**

- **Baseline:** 170 / 100
- **1 min:** 180 / 110

**Notes:**

- **Valsalva ratio:** (HR II / HR IV, normal > 1.4)
- **Handgrip:** (30% of maximal voluntary contraction)
- **SBP should increase > 15 mmHg**
- **Cold Pressor Test:** (SBP should increase > 20 mmHg)

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Concept - Front / Back End

VB + Macros – Event Driven Automation, etc.

Forms (Active)

Reports (Static)

Front-End

Back-End

Demographics
Ethnicity
Labs
H & P

Queries

Tables

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GCRC Workshop – 30,000 feet

Use GCRC-sponsored VTC training resources
www.vtc.com/multiuser/
for detailed instruction: Access 2003 Course Main Topics:

- Introduction
- Using Access 2003 Databases
- Creating Database Objects - Tables
- Creating Database Objects - Forms
- Creating Database Objects - Queries
- Creating Database Objects - Reports
- Using the Properties Window
- Using the Expression Builder
- Relational Databases
- Advanced Forms Design
- Advanced Queries
- Advanced Reports
- Course Wrap up
- Credits

++ Separate Course - Microsoft Visual Basic for Access 2002 Training
GCRC Workshop – Day 2 Objective

Build on table and relationship training last week to consider a real GCRC application. We’ll focus on methods.

- Use MS-Wizards to automatically create forms.

- Use one form to describe event-driven programming methods.

- Discuss process of real-world database design and development.

- Demonstrate and discuss elements for this one real-world example.
GCRC Workshop – VB Overview

• Use Wizard to create form based on existing table in database (VB_Demo.mdb)

• Once designed, show form – update record – view in table.

• Edit Form – Create a button. Show action. Show VB procedure written by Wizard.

• Briefly explain VB event-driven programming using VB procedure and a few other examples (message box, close form, Form On-Load, etc)

• Take-Home Message – Everything is an Object. Every Object has properties (color, etc) and Events (onclick, etc)
Case Study – Chamber Timing Project

• Save time by doing design and planning work **BEFORE** touching the keyboard. Programming is the most expensive part of the process from a timing standpoint.

• The next slides give an overview of this project and the planning process involved before beginning to build the database application.
Chamber Timing Application

**Problem:** Several GCRC projects use the metabolic chamber for EE MSMTs during set activity profiles, e.g., 9:00-9:30 = Bike, 9:30-9:45 = Rest, 9:45-10:30 = Writing, etc.

- Chamber EE MSMT is continuous (10sec).
- Chamber is isolated with no 24-hour 'sitter'.
- Subjects are not always reliable with activity diaries.
- Without accurate diary, hard to correlate EE with activity.

**Proposed Solution:** Build a software application.

- To remind subjects about activity, subject interaction
- With application should provide 'time-stamp' log of activity & compliance. Subject comment could also be useful.

**Factors:**
- 2 users: subject & researcher.
- Subjects will break software if possible.
- Interface must be extremely intuitive.
- Multiple timing protocols.
- Easy export of timing data for EE matching.
- Timing resolution not in 1 minute (easy).

**Why Access?**
- Front-end programming is relatively easy.
- Table storage of events for display.
- Table storage of subject response data.
- Lock-down features are pretty good (protect app from).

**User Interface - One Form**

1. One variable known when study started.
2. This message changes based on relative time from start of study.
3. This button triggers procedure to save record of subject, response time to event in separate table.

**Tables**

- Time Stamp
- Protocol Id
- Label Start
- Label Stop
- Subject Id
- Event Id
- Timestamp
- Comments

**Diagram**

- User Interface with buttons and forms.
- Research interface with buttons and forms.
Chamber Timing Application

PROBLEM: SEVERAL GCRC PROJECTS USE METABOLIC CHAMBER FOR EE MSMTS DURING SET ACTIVITY PROFILES, EX 9:00 - 9:30 = BIKE 9:30 - 9:45 = REST; 9:45 - 10:30 = WRITING, etc.

- CHAMBER EE MSMT IS CONTINUOUS \( \frac{1 \text{msmt}}{10 \text{sec}} \)
- CHAMBER IS 'ISOLATED' WITH NO 24-HOUR 'SITTER'
- SUBJECTS ARE NOT ALWAYS RELIABLE WITH ACTIVITY DIARIES
- WITHOUT ACCURATE DIARY - HARD TO CORRELATE EE W/ ACTIVITY
Chamber Timing Application

- Subjects are not always reliable with activity diaries.
- Without accurate diary – hard to correlate EE w/activity.

Proposed solution: Build a software application.
- To remind subjects about activity. Subject interaction with application should provide time-stamp log of activity + compliance. Subject comment could also be useful.

Factors (2 users: subject + researcher)

- [(Trace: 6833)]
Chamber Timing Application

- Activity + Compliance: Subject comments could also be useful.
- Factors:
  - 2 users: Subject + Researcher
  - Subjects will break software if possible
  - Interface must be extremely intuitive
  - Multiple timing protocols
  - Easy export of timing data for EM matching
  - Timing resolution needed within 1 minute (Easy)
Chamber Timing Application

Why ACCESS?

- Front-end programming is rel. easy
- Timer resolution OK (1 microsecond)
- Table storage of events for display
- Table storage of subject response data
- Lock-down features are pretty good (protect app from subject)
- User interface - one form
- One variables known
Chamber Timing Application

1. One variable known when study started

2. This message changes based on relative time from start of study (pull from table)

3. This button triggers procedure to save record of subject response time and event in separate table

User interface - one form

Activity message

Launch

Researcher interface

Name entry

Export study

Start study

Excel
Chamber Timing Application

subject_id, f_name, l_name

protocol_description + event_order
Case Study – Table Relationships
## Case Study – Subject Form

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Mouse Wheel</td>
<td></td>
</tr>
<tr>
<td>On Key Down</td>
<td></td>
</tr>
<tr>
<td>On Key Up</td>
<td></td>
</tr>
<tr>
<td>On Key Press</td>
<td></td>
</tr>
<tr>
<td>Key Preview</td>
<td>No</td>
</tr>
<tr>
<td>On Error</td>
<td></td>
</tr>
<tr>
<td>On Filter</td>
<td></td>
</tr>
<tr>
<td>On Apply Filter</td>
<td></td>
</tr>
<tr>
<td>On Timer</td>
<td>[Event Procedure]</td>
</tr>
<tr>
<td>Timer Interval</td>
<td>1000</td>
</tr>
<tr>
<td>Before Screen Tip</td>
<td></td>
</tr>
<tr>
<td>On Cmd Enabled</td>
<td></td>
</tr>
<tr>
<td>On Cmd Checked</td>
<td></td>
</tr>
<tr>
<td>On Cmd Before Execute</td>
<td></td>
</tr>
<tr>
<td>On Cmd Execute</td>
<td></td>
</tr>
<tr>
<td>On Data Change</td>
<td></td>
</tr>
<tr>
<td>On Data Set Change</td>
<td></td>
</tr>
<tr>
<td>On PivotTable Change</td>
<td></td>
</tr>
<tr>
<td>On Selection Change</td>
<td></td>
</tr>
<tr>
<td>On View Change</td>
<td></td>
</tr>
<tr>
<td>On Connect</td>
<td></td>
</tr>
<tr>
<td>On Disconnect</td>
<td></td>
</tr>
<tr>
<td>Before Query</td>
<td></td>
</tr>
</tbody>
</table>