A Comparative Study of Elderly, Younger, and Chronically Ill Novice PDA Users

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Abstract. Some researchers in the UbiComp community create applications for diverse groups of people. However, before these applications can be developed, we must ensure the target user group can use the technology. Researchers are challenged to investigate new ways of helping older people and chronically ill people remain independent and preserve their quality of life. Some of these assistive solutions require elderly people and chronically ill people to use Personal Digital Assistants (PDAs). Critics question whether elderly and chronically ill people can use PDAs given their difficulties with computers. This paper presents two usability studies showing there are no major differences in performance between elderly, chronically ill, and younger people performing traditional (pressing buttons, viewing icons, recording messages) and non-traditional (scanning barcodes) PDA tasks.

1 Introduction

Researchers in the UbiComp community are creating applications for diverse populations of people. Some researchers chose to develop ubiquitous applications for elderly people or people with chronic illness to assist people live independent and productive lives. Personal Digital Assistants (PDAs) ([2][3]) and smart phones ([7]) are some of the devices researchers are using to create assistive technologies for elderly and chronically ill people. We are currently developing a PDA application to help elderly and younger people who suffer from illnesses requiring dietary restrictions (end-stage renal failure, diabetes, etc.) monitor their nutrition.

Since we started our nutrition monitoring project, we have been cautioned that elderly and chronically ill people may not be able to use PDAs, given the adverse effects age has on vision, dexterity, and coordination [4][5]. If elderly and chronically ill populations have difficulties using computers, how can they use PDAs with smaller screens and buttons?

In this paper, we present two of our initial studies investigating if elderly and chronically ill people can use PDAs. In our first study, we conducted a usability study on two groups of people: 25-30 years old and 75-85 years old. Participants were asked to completed three traditional PDA tasks (pushing buttons, viewing icons, and recording voice messages) and two non-traditional tasks (scanning barcodes with two kinds of scanners). The non-traditional tasks were added to aid in our research for a future method of inputting nutrition information. Participant performance in scanning can give insight into how participants may fair in other non-traditional PDA tasks such as taking digital pictures.

Our first study found elderly people can complete tasks just as well as people 25-30 years old. Elderly people needed a little more practice time to learn how to complete each task, but overall there is no difference in performance. In addition, the elderly tended to express slightly less frustration with the technology than our younger user group. Thus, while the elderly's performance may be somewhat degraded because of poorer vision, coordination, and dexterity, this does not translate to an inability or unwillingness to use the technology.

Our second study investigated if chronically ill people can use PDAs and compared the results with our first study. Similar to the first study, participants completed three traditional tasks (pushing buttons, viewing icons, and recording voice messages) and one non-traditional task (scanning barcodes with the favored scanner from the first study). We found that chronically ill people can complete tasks just as well as younger and elderly people.

This paper begins by briefly reviewing related work. The technology, applications, and evaluation techniques we used in our studies are discussed next. We end with a description of our user studies evaluation of our results, and ideas for future work.

2 Related Work

Usability studies have been conducted on many PDA applications. However the studies usually focus on the interface design and presentation of information, instead of the user's ability to use the PDA. In this section, we will briefly describe some research that has been done with respect to icon sizes and voice recording.

Stephen Brewster evaluated how multi-modal feedback can help improve data entry in PDA computers regardless of icon size. Multi-modal feedback involves the PDA device making sounds, tactile changes (i.e. vibration) or vision changes (button turns to inverse colors when touched) when PDA tasks are completed. He evaluated how college students performed inputting numbers into a PDA while sitting and walking. The experiments showed sound helped users input more numbers, however smaller buttons required more "workload" [1].

Using PDAs for voice recordings is becoming a popular way to get user feedback in situ. Stephen Intille et al. integrated voice recordings into their context-aware experience sampling tool to obtain feedback from participants [8]. In the future, we see researchers using the PDA audio recorder for voice diaries to allow users to quickly record problems or comments about applications for mobile usability testing.

To the best of our knowledge, there have not been any extensive studies comparing the abilities of different age groups and people with chronic illness using PDAs.

3 General Experiment Design

Before we began the usability study, we had to evaluate what PDAs and scanners to use in the study. Once we decided on the hardware, we looked into the abilities we wanted to test and how to create applications to test our users abilities. After we created our applications, we decided how to measure the usability of the PDA. In this section, we will discuss how we selected the Tungsten T3 as our PDA, Socket SDIO scanner and Baracoda pencil as our scanners, and a modified version of NASA's Task Load Index (TLX) as our metric for our usability testing applications.

3.1 Hardware

PDA Selection The PDA is the center of our study and the building block of many UbiComp applications, thus we had to evaluate current PDAs available. Most UbiComp PDA applications use off-the-shelf PDAs to make their application more widely accessible and less expensive. We conducted our study with an off-the-shelf PDA so the results would be useful to the UbiComp community.

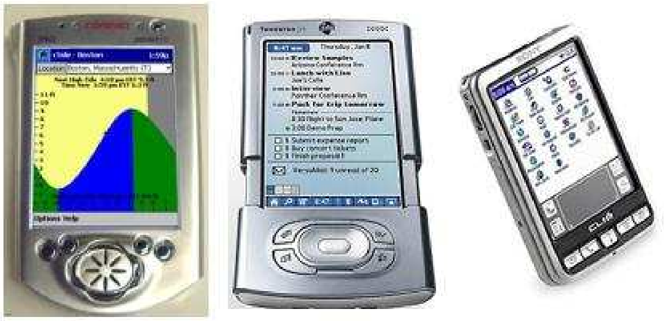


Fig. 1. Current popular PDAs. From left to right: Compaq Ipaq, Palm Tungsten T3, and Sony Clie

Most popular PDAs have similar physical designs as shown in Figure 1. They have screens of varying sizes, followed by an area that can be used for stylus input. Underneath the screen are five buttons. The middle button is usually larger than the other four. The use of 5-way controller buttons, as shown on the Compaq Ipaq and Palm Tungsten T3, are becoming more widespread allowing users to scroll through applications and documents with one hand. Some PDAs have buttons on the left hand side of the device for voice recording or quick jog dial menu selections.

Since the physical design of all PDAs are similar, we could choose any PDA for our study. We selected the Tungsten T3 because it had a 5-way controller button, four large application buttons, Bluetooth, an SDIO slot, and a voice recorder button on the side.

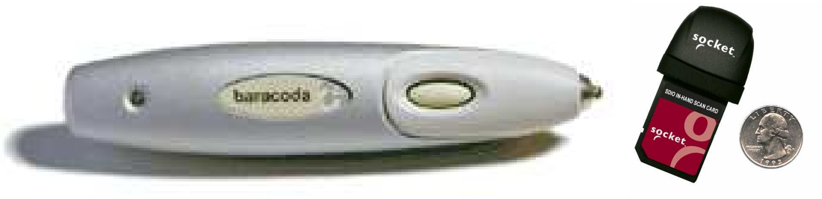


Fig. 2. Scanners used in testing

Scanner Selection Once we selected a PDA, we researched barcode scanners that could interoperate with the Tungsten T3. We found many large, unwieldy scanners, however these scanners would not do. We wanted to use scanners that were small, easy to use, and robust. We found two scanners that met our criteria - the Baracoda pencil and Socket SDIO card scanner shown in Figure 2.

To scan a barcode using the Baracoda pencil, the user presses the button on the side of the pencil and runs the pencil over the barcode as if drawing a line across the barcode. The pencil scans the barcode and sends the barcode numbers via Bluetooth to the PDA. In our study, we used the software that came with the Baracoda pencil. The Baracoda pencil application wrote all barcodes to a note pad application and did not provide any audio feedback (for instance beeping) when a barcode was scanned. The Baracoda pencil's documentation claimed the pencil's ergonomic design allows people with large and small hands to use the device as a scanner or stylus. Since the Baracoda pencil works similar to a regular pencil, we felt inexperienced PDA users would feel comfortable using the scanner.

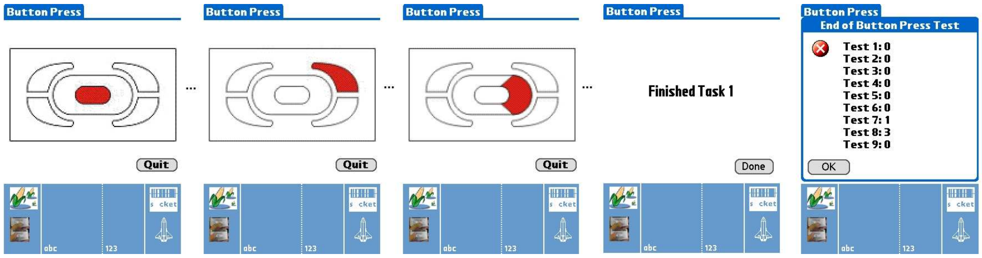
The Socket SDIO card scanner requires a user to press a button on the PDA and move the PDA or object being scanned until the scanning light covers all of the barcode. Once the scanning light reads the barcode, the Socket scanning application beeps and prints the barcode number on a note pad application. The Socket SDIO card scanner is similar to scanners at supermarkets, self check-out kiosks, and price check kiosks in stores, thus inexperienced PDA users could feel comfortable using the scanner.

The two scanners we chose tested the dexterity and coordination of our participants. The Baracoda pencil required users to press the pencil button while running the pencil over the barcode. In order to see if they were successful at scanning the barcode, the user had to look at the PDA screen for feedback. The Socket scanner required users to keep the PDA scanning button depressed, line up the scanning light with the barcode, and move the PDA and/or object to get the right distance to scan the barcode. The operation of the scanners were close enough to everyday events (writing with a pencil, scanning objects at a store) that inexperienced PDA users should not be intimidated by using the devices. The use of scanners allowed us to see if the users could hold the PDA steady or use two devices at once without overwhelming the user.

3.2 Designing the Applications

In order to use a PDA, a users must have decent dexterity, coordination, and vision. The most common tasks a user does on a PDA is select icons on the screen and use the buttons to navigate through applications. Stylus input is another common task, however we did not want to intimidate or insult participants who cannot read by asking them to write using graffiti.

Pushing the buttons on a PDA, recording a voice diary entry, and scanning UPCs on various items test a users dexterity. Coordination is required for users to record a voice diary entry and scan a barcode. Vision can be tested by asking users to view various sized icons and asking for their preference. These tasks allow us to evaluate (1) if people can use the buttons on the PDA to complete basic tasks; (2) how large icons have to be for people to see and select them with their finger, stylus, or Baracoda scanner pen; (3) if people can use PDA scanner technology; (4) what problems different age groups experience when completing our dexterity and vision tasks. Evaluating the differences in abilities of different age and illness groups should help developers when creating applications for a target population.



Finished Task 1

End of Button Press Test
Test 1: 0
Test 2: 0
Test 3: 0
Test 4: 0
Test 5: 0
Test 6: 0
Test 7: 1
Test 8: 3
Test 9: 0

Fig. 3. Button Press Application. The participant must press the corresponding PDA button before advancing to the next screen. At the end of the test, a screen shows how many incorrect buttons the participant pressed.

PDA Button Press Application PDA buttons allow users to access commonly used applications and scroll through applications or data with one hand. We tested if users could press buttons on the PDA because it is an essential way for users to quickly access information with a PDA. We created an event-driven test modeled after the 1980's Simon Says game as shown in Figure 3 to test a user's ability to press buttons. The picture on the PDA screen shows the same configuration of buttons as the buttons on the Tungsten T3. The buttons take turns "lighting up" by turning red until the participant selects the corresponding button on the PDA. The application tests if the user can press each of the nine Tungsten T3 buttons once (four application buttons and each of the 5-way navigator buttons). Errors are recorded (i.e. if a participant pushes the incorrect button) to assist with assessing dexterity problems as shown in the last screen in Figure 3. We also recorded how far away the participant held the PDA and what hands and or fingers the participant used to complete the task. The button press test shows if the user could use all of the buttons on the PDA (dexterity).

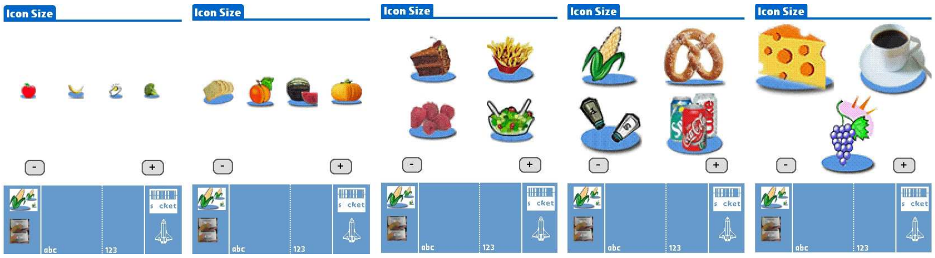


Fig. 4. Icon Size Application. From left to right: 5mm, 10mm, 15mm, 20mm, and 25mm screens. The icon size application was conducted similar to an eye exam.

Icon Size Application Icons allow users to select PDA applications from the main menu and navigate within applications. More over, icons allow us to convey information to users independent of user group literacy rates. We created an application similar to an eye exam chart to test what size icons participants prefer to use (vision). Icon sizes ranged from 5mm to 25mm. When the application was started, a screen with four 15mm icons was displayed. The participant was asked to read the pictures on the screen. We would increase or decrease the size of the icons based on the participants answers. The test concludes by recording what size icons the participant preferred, the smallest icon size the participant could read, how far the participant held the PDA from them, and if they had a preference between the realistic picture icons and the illustrated drawing icons. We decide what is the smallest size icons a participant can read if they can either successfully read all of the icons or successfully identify ambiguous icons to the best of their ability. For example, with smaller icons it is difficult to differentiate between strawberries and apples. Thus if the participant identifies all of the icons, but confuses an apple icon with a strawberry icon we would count this participant as successfully reading icons of the specified size. We noted preferred icon size and what sizes the participants could read to see if there were any noticeable differences between their preference and vision.

Recording a Voice Diary One way to get feedback from users about applications is to have the user record comments or questions using the voice recording application on PDAs. Recording a voice message requires users to push the record button on the side of the PDA, wait for the beep, and continue to hold the button while saying the entire message. We asked users to record three phrases - a short phrase (approximately 1 second), a medium length phrase (approximately 5 seconds), and a longer phrase (approximately 15-20 seconds) . After recording each phrase, the participant played back the phrase. If a participant did not record the message properly, they could try recording the phrase again. We recorded how many times a user took to successfully record each phrase, if the participant waited for the beep before saying each phrase (learning), how far the participant held the PDA away from them, and any difficulties the participant had finding the recording button. The test showed if a user could press the recording button (dexterity), hold the button and speak (coordination), and learn quickly (did the participant wait for the beep before speaking?).

Scanning Items Our nutritional monitoring application requires users to input everything they eat during the course of a day. Scanning UPCs (barcodes) on food is one way to decrease the amount of input a users must enter into the PDA. Users may have to tap on multiple screen icons before finding the item they ate, whereas scanning a UPC would only require one button press. Scanning requires a user to hold the scanner steady (dexterity) and work with two objects - the scanner and object being scanned (coordination). The Socket SDIO scanner requires a user to carefully hold the scanning laser across a barcode similar to taking a photograph. The Baracoda pencil requires participants to run the pencil over the barcode, similar to hand scanners. For our usability test, we had participants scan three items: a book, a small bag of pretzels, and can of soda. Each item had different properties (hard, mushy, curvy and reflective) requiring the user to hold the item differently. We recorded how many times it took the participant to successfully scan each item, if the participant moved the PDA or object being scanned, and how many times a participant practiced scanning an item after successfully scanning an item the first time. Scanning with each scanner tested users ability to hold two objects (coordination) and operate the device (dexterity).

3.3 Measuring the Usability

We designed all of our applications to have quantitative measurements such as the number of incorrect button presses, preferred icon size, or number of incorrect recordings/scannings before a successful recording/scanning. However, to complete our study we wanted to measure qualitative differences in the amount of workload participants experienced during each task. NASA's Task Load Index (TLX) has successfully measured workload in many studies ([11][1]) by measuring how much mental demand, physical demand, temporal demand, effort, performance, and frustration participants felt during tasks.

We used a modified TLX model for our qualitative measurement using only physical demand, effort, and frustration. Mental demand entails how much participants had to "decide, remember, [or] search..." Since none of our tasks required remembering, decision making, or searching, we did not include mental demand in our user evaluation. Temporal demand referred to how much time pressure a participant felt during each task [9]. We emphasized to our participants that we were not timing them. We were only interested in seeing if they could do the task, not how quickly they could do it. Our applications were largely event-driven, thus temporal demand was not needed in our user evaluation. We did not require participants to measure their performance because we discussed how they felt after each task. An open, personal conversation can yield more information than a rating on an evaluation.

We retained physical demand, effort, and frustration in our modified TLX model because they provided us with necessary information. The button press application, voice recording, and barcode scanning required some physical activity, thus we were interested in how much physical demand a user felt during the tasks. We kept effort in the TLX because we wanted to know how much work participants felt they had to do in order to complete each task. Frustration was an important metric to keep in because if participants were frustrated with the tasks, it is unlikely they would continue to do the activity for any extended period of time.

In Appendix L we have an example of our NASA TLX form the participants filled out. In the first part of the form, the participant circled one of the three feelings they felt most during the task. If the participant did not lean towards one feeling, they could write neither. In the second part of the form, participants put an "X" or check mark in the scale box indicating how much frustration, physical demand, and effort they felt during the task. Our younger and elderly user groups completed our modified TLX, however our dialysis user group did not use the modified TLX. We will discuss why our dialysis patients did not use the modified TLX in Section 5.

4 Study 1: Comparison of Younger and Eldery Users

Our first study focused on the usability of PDAs from a novice user's perspective in two age groups - 25-30 years old and 75-85 years old. Participants completed tasks testing their ability to use the PDA buttons, record a message, view icons, and scan items with two types of scanners. Younger participants were tested in an academic building's meeting room that had ample fluorescent lighting and space for the user, tester, and videographer. Elderly participants were tested in a community building's meeting room that had ample fluorescent lighting and space for the user, tester, and videographer. Information about our Institutional

Research Board (IRB) usability test application can be found in Appendices J and L.

4.1 Hypotheses

The main hypotheses for this study was all people, independent of age, can use a PDA. We can break down this hypothesis as follows:

- People of all ages can press buttons on the PDA. Pressing buttons on a PDA shows participants have enough dexterity to scroll through applications and make selections with buttons.
- People of all ages prefer medium size (10mm or 15mm) size icons. Icons slightly larger may be more appealing to users in various age groups.
- People can record voice messages of various lengths. Pressing the record button while holding the PDA to record a message shows participants have dexterity and coordination to complete the task.
- People can scan bar codes with some practice. Scanning barcodes show users have dexterity and coordination to hold the PDA with another object and interact with both.

4.2 Participants

Twenty participants were used in our study. We tested participants in two age groups: 25-30 and 75-85 years old. We had ten participants in our younger group (two female, eight male) and ten in our older group (five female, five male). One of our elderly participants was hearing impaired.

Sixteen of our participants reported using computers a lot showing us most our participants are comfortable with technology. All of our older participants and over half of our younger participants wore glasses when using a computer One younger participant reported problems reading a computer screen, but later specified that problems only occurred when the participant did not wear his/her glasses. Two elderly participants reported having difficulties reading computer screens, however later we found out one participant had recently had eye surgery and had not purchased new glasses yet and the other participant only had difficulties reading the computer screen when the font was too small. None of our participants owned a PDA, however three of our participants reported they had some experience with PDAs but rarely used them (i.e. occasionally played with a friends PDA by playing a game or drawing a picture). We decided to use novice PDA users because if someone without any experience using a PDA could successfully complete the tasks the results would imply that anyone could complete the tasks.

All of our participants have used television remote controls and did not have trouble using the remotes. Over three quarters of our younger participants and three of our elderly participants used cell phones without any difficulty. The use of television remote controls and cell phones by our participants shows our users can press small buttons on devices and implies they will not have problems pressing PDA buttons. More detailed information about our participants backgrounds can be found in Appendix A.

4.3 Design and Procedure

Ability Tested	**Type of Test**
Push PDA buttons	Dexterity
Selecting an icon	Vision
Recording a voice diary entry	Dexterity and Coordination
Scanning a UPC with SDIO scanner	Dexterity and Coordination
Scanning a UPC with pencil scanner	Dexterity and Coordination

Table 1. Usability tests and abilities we tested during our study.

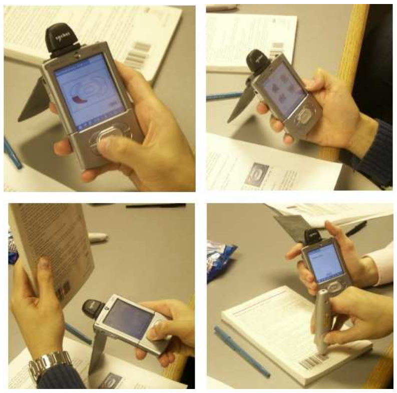


Fig. 5. Usability test tasks

Participants completed five tasks during our study summarized in Table 1. We let the participant hold the PDA for each test as shown in Figure 5 and recorded how they held the device. After each test, participants were asked to complete our modified TLX worksheet.

Participants were only allowed to complete the button press test once. The use of cell phones and television remotes gives participants enough practice in pushing small buttons. Allowing novice PDA users to complete the button task only once gave us insight into how intuitive it is to hold the PDA and use it with one or two hands.

For the icon size test, participants were allowed to hold the PDA and move it as necessary to view the icons. The test administrator changed the size of the icons by pressing buttons on the PDA while the participant held the PDA. We did not enforce any maximum amount of viewing time because we wanted the participant to feel comfortable reading the icons. We recorded how far away the participant held the PDA from them and how they viewed the screen (i.e. moving the PDA back and forth to avoid reflection).

During the scanning tests, participants scanned the barcodes on three items: a book, a small bag of pretzels, and a can of soda. Participants were allowed to scan each object as many times as they wanted. Participants were encouraged to start the task by scanning the book, then the bag of chips, and finally the soda can because each item was increasingly difficult to scan based on barcode material and object size. We recorded how many times the participant practiced scanning the objects before a successful scan and how many times the participant successfully scanned each object before scanning the next object. How the participant held the PDA and object was also recorded.

At the conclusion of the test, we discussed any comments the participant made during the study to clarify his or her feelings.

4.4 Results

In this section, we will discuss how our quantitative results reflect our qualitative NASA TLX results for each task. Our study provides some interesting insights into the usability of PDAs and gives us directions for more detailed studies.

Button Press Task Results The button press results were very promising in showing minimal performance differences between elderly and younger participants - 80% of the younger participants and 80% of the elderly participants did not make any mistakes during the task. Of those who did make mistakes, most only made one error (one younger participant made two errors). A majority of the errors were made when pressing the left or right 5-way navigator button. An interesting point is the test started by making participants press the middle of the 5-way navigator, thus participants knew the 5-way navigator button was different than the others. When participants saw the up or down part of the 5-way navigator light up they made comments about how the navigator is an “up and down” button. However, when the left and right part of the 5-way navigator lit up, participants voiced some confusion. Most participants followed their instincts and pressed the left or right part of the button, but others made a mistake and quickly learned from their mistake.

Our elderly male participants voiced concerns about how their “fat fingers” may cause problems when completing the test. They worried the size of their fingers would cause them to push multiple buttons at the same time. The “fat finger” problem was unfounded shown by the lack of errors recorded during the task. As previous stated, errors were caused by confusion of the 5-way navigator rather than pushing multiple buttons at once.

Most of our participants held the PDA in their non-dominant hand and selected buttons with their dominant hand as shown in Tables 17, 16. Only three younger participants completed the task by using one hand to hold the PDA and select buttons. One younger participant completed the task by holding the PDA with two hands and using his thumbs to select buttons. The elderly participant who was hearing impaired kept the PDA on the desk and selected buttons with one hand. This was the first task participants completed with the PDA, thus they were not as comfortable with holding the PDA. In the next few sections, we will mention how participants held the PDA and discuss how their comfort with the device affected how they held the PDA.

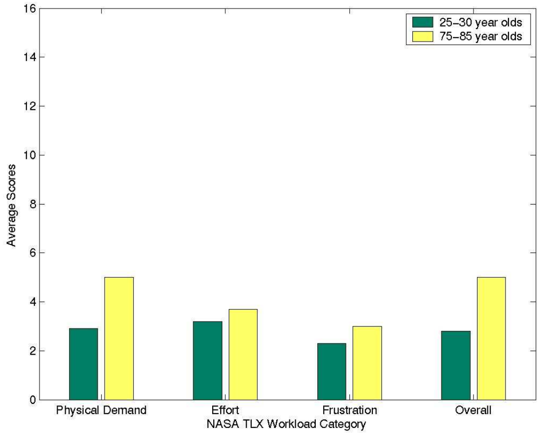


Fig. 6. NASA TLX results for the button press task

We see in Figure 6 the elderly participants felt the button press task was more physically demanding, frustrating, and required more effort. The larger gap in the amount of physical effort between the elderly and young groups required for the button press task can be attributed to the design of our event driven button press application. The application requires participants who made errors to do more physical work (pressing buttons) before moving to the next screen. Although elderly participants reported having slightly more effort and frustration, they commented that the task was "easy to follow" - the PDA told them exactly what to press and 90% of the elderly participants said the button press task was the easiest task they completed during our study. It is important to note the overall workload for each age group is relatively low (2.8 versus 3.9 overall) when considering the maximum score is 20. The button press task showed us that although elderly people felt more frustration, physical demand and effort younger participants, they did not think the task was overly difficult.

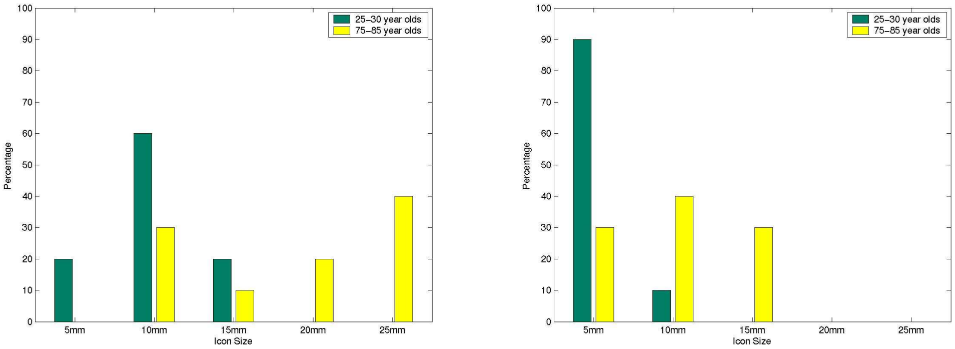


Fig. 7. Participant's preferred icon size and the icon sizes participants could read.

Icon Size Task Results Results from the icon size task were a little surprising. We originally thought people of all age groups would prefer medium size icons (10mm or 15mm). However, as Figure 7 shows our younger group preferred icons 10mm. A majority of our elderly group preferred icons 25mm. Despite our elderly participants preferring larger icons, we see that they could all read icons $\leq$ 15mm. One should keep in mind, current PDA icons are 7.76mm or 5.29mm square depending on the layout chosen [10]. If PDA applications are geared towards users in different age groups, icon size should be taken into account.

When we asked participants why they chose a specific size icon, the younger participants said they were interested in how many icons could fit on the screen. Older participants were primarily interested in larger icons so they could "clearly see details." This accounts for the preferences of size.

Our icon size application used scaled photographs and illustrations of food items as shown in Figure 8. We wanted to see if participants noticed the change in pictures and if they had a preference. Only two of our older participants noticed the use of photographs and illustrations. When asked if they had a preference (Table 22), a majority of the younger group did not have a preference, but the older group preferred the photographs because they were "clearer" and "more realistic."

During the icon size task participants were allowed to hold the PDA to view the icons. Both of our user groups held the PDA at about the same distance on average (14.5" for the younger group and 13.1" for the older group). The only noticeable difference in how our user groups held the PDA was the older group tilted the PDA in their hand trying to view the icons with less glare. The younger group did not have a problem with glare. Older people's sensitivity to glare was also recorded in a study by Kosnik et al.in 1988 [4].

Similar to the button press task, our older group reported more physical demand, effort, and frustration as shown in the TLX graph in Figure 7. This may be attributed to the glare problems our elderly group reported - they had

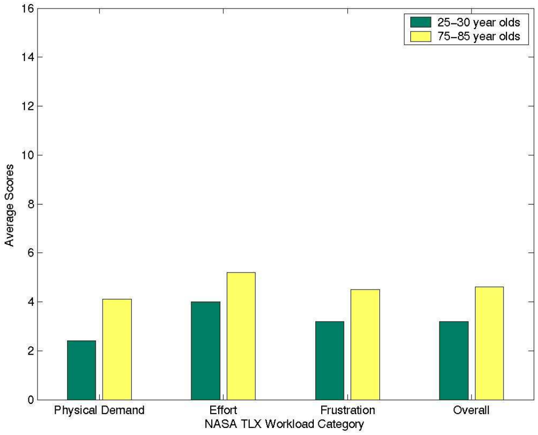


Fig. 8. NASA TLX results for the icon size task

to move the PDA more while trying to read the food icons. Despite having some problems with glare, our elderly group reported relatively low scores (below 6 on a 20 point scale).

The icon size task showed us a one-size-fits all approach to developing handheld applications for various age groups must account for various size icons. Current PDAs offer two different size icons, but both of these sizes are smaller than the preferences of our two user groups.

Recording a Voice Diary Entry Task Results Participants were asked to record three phrases during the recording voice diary entry task - a short phrase, a medium length phrase, and a longer length phrase. The voice diary recording task was an easy task for most of our participants - 70% of the younger participants and 70% of the elderly participants were able to record the short message correctly the first time as shown in Table 23. Participants who could not successfully record the short message during their first try, succeeded on their second try. All of our younger participants and all but one of our elderly participants successfully recorded the long messages on their first try.

The one elderly participant who did not successfully record the medium and longer length phrases had a hearing impairment. The participant could not hear the beep the PDA made when it was time to record the message, nor did the participant hear the recorded message when we played it back. The participant thought the message had been recorded because the person told us the PDA record button was kept pressed in and even pushed the play button on the PDA to play the message back to us. In the future, more research will be needed in the area of PDA usability and people with hearing impairments.

Most of the younger participants held the PDA in their left hand and used their thumb to press the button when recording the messages. A majority of the elderly participants used two hands when recording - the right hand stabilized the handheld while the left hand pressed the recording button (Table 24). Some elderly participants expressed a fear of breaking the PDA and held it with two hands to make sure they had a good grip on the device. The fear of breaking the PDA could attribute to why most people in our elderly group used two hands for some of the tasks. Both user groups held the PDA about nine inches away on average from themselves when recording their messages (Table 25).

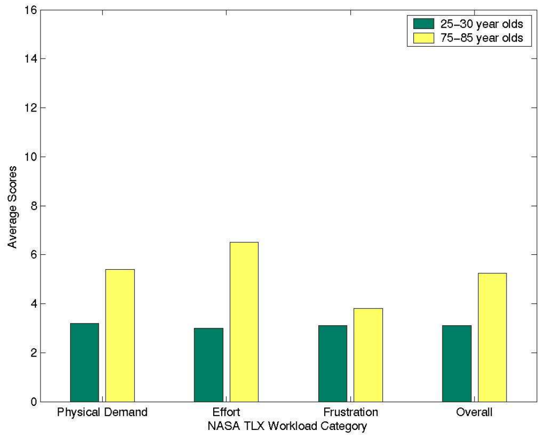


Fig. 9. NASA TLX results for the voice diary entry task

Our TLX results for the voice diary entry task is similar to the button press and icon size TLX results. Our elderly user group felt more physical demand, effort, and frustration. The hearing impaired participant did not change the results because the participant thought he had completed the task correctly and ranked the amount of effort, physical demand, and frustration low (2 out of 20). The overall workload score is low in both groups (3.1 for younger participants and 5.23 for older participants).

Socket SDIO Scanning Task Results During the socket scanning task, participants scanned three items - a book, a small bag of pretzels, and a can of soda. The elderly group was able to scan the book on the first try better than the younger group (50% versus 40% success rate). All but one younger participant who could not successfully scan the book on the first try, were able to scan the book on the second or third try. Younger participants were able to scan the bag of pretzels on the first try better than older participants (60% versus 50%

success rate). All of the participants were able to scan the the bag of pretzels eventually. The can of soda was the most difficult item to scan - only 40% of the younger participants and 20% of the elderly participants were able to scan the can within three tries. Two younger participants and five elderly participants could not scan the can at all.

	# of Unsuccessful Bag Scans	
Practice Scanning Book	**25-30 year olds**	**75-85 year olds**
1-2 Times	2.6	2
3 - 8 Times	1.6	2.6

Table 2. We measured learning by correlating how many times participants practiced successfully scanning the book and how many times on average it took them to successfully scan the bag of pretzels.

We can observe how learning affects scanning success with the bag of pretzels in Table 2. Younger participants who practiced successfully scanning the book 3-8 times were able to scan the bag of pretzels quicker than those who only practiced successfully scanning the book 1-2 times. Half our younger and elderly participants practiced scanning the book three or more times before trying to scan the bag. A majority of the elderly participants were able to scan the bag of pretzels after 1-2 times. The hearing impaired participant took 7 times before scanning the bag of pretzels. When the socket scanner successfully scanned the item, it would make a beep. The hearing impaired participant could not hear the beep - this may have effected her ability to scan the items. We did not find any relation between overall scanning practice and the ability to successfully scan the can of soda. The soda can was an especially challenging item to scan because of its curved edges and reflective material.

Most participants operated the scanner with one hand, using their thumb to press the scanning button on the PDA. The elderly participants liked the multimodal feedback the scanner provided. They used the scanner laser to indicate the distance needed for a successful scan and the beep as a way of ensuring they were successful scanning the barcode. All of the participants exhibited some confusion on what part of the barcode to scan (numbers or lines) and what direction to scan the barcode (sweeping vertically through or shine the laser across the barcode).

When scanning items, elderly people kept the scanner still and moved the item being scanned, whereas the younger people moved scanner and kept the item stationary. This behavior may be attributed to less frustration shown in Figure 10 by elderly participants because the visual beam does not move. They had a general idea of where to hold the object from their previous scan successes. The elderly group felt more physical demand and effort because they completed 66% more scans (successful and unsuccessful tries) than the younger group. Even though the elderly participants did more scans, they were not frustrated by the

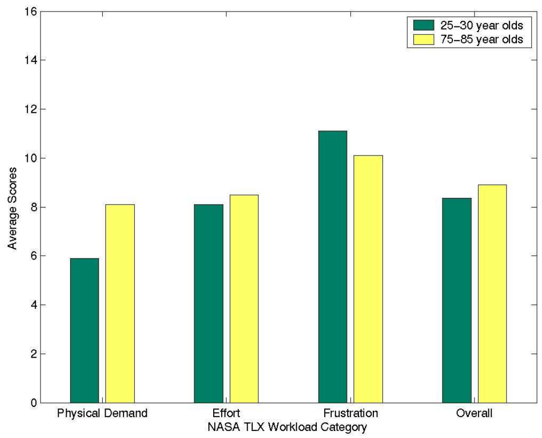


Fig. 10. NASA TLX results for the Socket SDIO scanner task

activity and felt they did the best they could. The overall workload for the two groups were similar showing the task had the same amount of difficulty for each group.

Baracoda Pencil Scanning Task Results The Baracoda pencil scanner task was the most difficult task of the usability study. Only two younger participants and one older participant was able to successfully scan the book on the first attempt. On average, younger participants took 4.2 times to successfully scan the book and elderly participants took 3.3 times. Only three participants were able to successfully scan the bag of chips. One elderly participant was not able to scan the book and did not try to scan the bag of pretzels or soda can. The inability to scan the bag of chips and soda can is not the fault of our participants, it is simply a limitation of the device.

Two female participants had difficulty scanning with the Baracoda pencil because the length of their nails (the length of nails ranged from an $\frac{1}{8}$” to $\frac{1}{4}$”) inhibited them from depressing the narrow button fully. To overcome this problem, female participants had to hold the pencil precariously and use the tip of their nail to press the button. Elderly participants usually pressed the scanner button, reflected the scanner laser on their hand, and then scanned. They did not like that they could not see the scanner light while scanning. One elderly participant remarked, “I don’t know if it is scanning because I don’t see the light when I put it on the book.”

Scanning with the Baracoda pencil scanner required the use of a pencil scanner and the PDA. The PDA did not give any audible feedback on successful scans, thus participants had to check the PDA screen to see if they had suc-

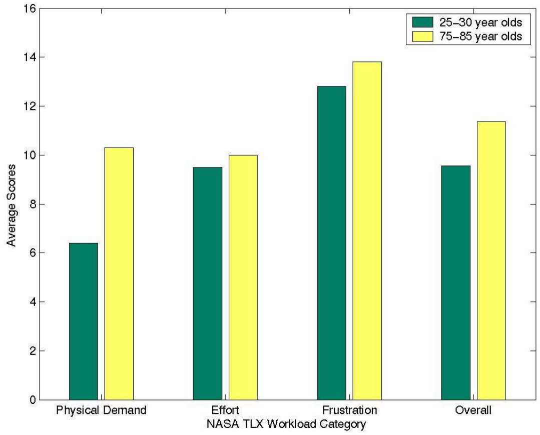


Fig. 11. NASA TLX results for the Baracoda pencil scanner task

cessfully scanned the object. Participants rested the PDA and item on the table when scanning. Obviously, this is not a mobile solution to scanning items.

The increased physical demand and frustration by elderly participants shown in Figure 11 can be linked to the increase in number of times to scan the book. Additionally, elderly participants attempted to scan the bag of pretzels more than the younger participants before giving up (15.4 times versus 8.8 times). Both groups of participants thought the workload was significantly more than all other tasks performed during the test.

4.5 Discussion

The results of our study are in-line with our hypotheses. We showed elderly and younger novice PDA users are capable of pressing PDA buttons and recording a voice diary. Participants are capable of scanning barcodes with some practice using the Socket SDIO scanner. Participants icon size preference was the only hypothesis disproved - younger participants prefer smaller icons (5mm or 10mm) and elderly participants prefer larger icons (20mm). Since this was the first time all of our participants used a PDA for an extended period of time, they did a great job completing all of the tasks. We surmise with more practice, the users would be able to easily scan the three items. Application developers can learn from our study (1) elderly people can complete traditional and non-traditional PDA tasks and (2) applications for a wide range of users need more icon sizes to select from to ensure universal usability.

When we selected scanners for our study, we based our selection on product documentation and reviews. Our study showed the Baracoda pencil's scanning (inability to scan a bag of pretzels and can of soda efficiently) and usability (small button makes it difficult to scan with longer nails) limitations. In future studies we will discontinue the use of the Baracoda pencil and add other tasks such as standing or walking when completing tasks.

Participants expressed some confusion when completing our modified NASA TLX questionnaire. They needed reminders about the difference between physical demand and effort. After looking at the TLX categories (mental demand, physical demand, temporal demand, effort, performance, and frustration), we wonder how participants in other studies differentiated the categories. This is a topic that needs further study. We found the scale we used in the second part of our modified TLX form flawed because the scale was out of 20 when we really only needed a scale of 5 or 10 for the same results. Providing our participants with a 20 point scale was somewhat confusing for our participants.

5 Study 2: Comparison of Younger, Elderly, and Dialysis Users

Our second study focused on the usability of PDAs from a chronically ill novice user's perspective. We coordinated with researchers at Indiana University-Purdue University to usability test patients with end-stage renal disease during their dialysis sessions at Indiana University Hospital's dialysis unit. Participants completed tasks testing their ability to use the PDA buttons, record a message, view icons, and scan items with the Socket SDIO scanner.

5.1 Hypotheses

The main hypotheses for this study was all people, independent of chronic illness, can use a PDA. We used our results from our first study to break our hypothesis down ad follows:

- People can press buttons on the PDA despite chronic illness. Pressing buttons on a PDA shows participants have enough dexterity to scroll through applications and make selections with buttons.
- People with chronic illness prefer medium to larger size (15mm - 20mm) size icons. Icons slightly larger may be more appealing to users who have varying visual acuity.
- People can record voice messages of various lengths. Pressing the record button while holding the PDA to record a message shows participants have dexterity and coordination to complete the task.
- People can scan bar codes with some practice. Scanning barcodes show users have dexterity and coordination to hold the PDA with another object and interact with both.

5.2 Participants

Ten participants with end-stage renal disease were used in our study. The participants ages ranged from 34 to 70 years old with an average age of 51 years old. Five female and five male participants volunteered for our study.

Three of our participants reported they rarely used a computer. Three of our participants had never used a computer before. Eight of our participants wore glasses when using a computer.None of our participants had owned or used a PDA.Similar to our first study, we used novice PDA users because if a novice could complete the tasks, then our results would imply any chronically ill person could complete the tasks.

All of our participants have used television remote controls and did not have any trouble using the remotes. Half our of participants reported using cell phones without any difficulty. The use of television remote controls and cell phones by our participants shows our users can press small buttons on devices and implies they will not have problems pressing PDA buttons. More detailed information about our participants backgrounds can be found in Appendix A.

5.3 Design and Procedure

After reviewing our results from our first study, we realized we were not going to use the Baracoda pencil scanner for our dialysis application and decided to not test the pencil scanner with our chronically ill participants. The participants completed four tasks - button press, icon size, voice diary entry, and Socket SDIO scanning.

We let each participant hold the PDA during the tasks. Unfortunately, the participant did not always have a choice in the hand they used to complete the task because the dialysis machine was sometime hooked up to their dominant hand making it impossible for them to use their dominant hand during the task and complete their dialysis treatment. Researchers at IUPUI told us literacy rates vary among dialysis patients. To ensure all participants felt comfortable, we read the task description to each participant and read any questions we wanted the participants to answer. Similar to our first study, none of the tasks required reading.

We attempted to have each participant complete a TLX worksheet, but our attempts were unsuccessful. Our first three participants either could not differentiate the three feelings we used in the modified metric or could not give us a clear scale measuring. When we attempted to ask our first participant a questions about scale (i.e. “On a scale of 1-10, how frustrating was this task?’), the participant asked us to have a break from the test until they felt better. The other two participants simply said they did not know. The dialysis ward is a very busy place and our participants are not in comfortable circumstances, so we decided to not use the TLX scales and burden our participants. Instead, we attempted to keep an open conversation going between the test giver and participant to collect important information about the usability of the PDA. More research is needed in usability testing in situ in hospital environments.

5.4 Results

In this section, we will compare our quantitative results with the quantitative results from our first study. This study provides some insights into how chronically ill participants can use a PDA just as well as younger and elderly participants.

Button Press Task Results Dialysis patients had slightly more difficulty pressing the buttons than our younger and older participants as shown by the tables in Appendix B. Only 40% of dialysis participants did not make a mistake, whereas 80% of younger and elderly participants did not make a mistake. However, this percentage is misleading because three of the dialysis participants were confused at the beginning of the task and thought they only had to press the middle button on the 5-way navigator button to continue onto the next screen. They quickly realized they had to press the button lit up. After the three participants learned they had to press the button that was lit on the screen, they did not make any mistakes. Thus, we could say 60% of our participants did not make any mistakes if we take into account the dialysis participants did not have a sheet of paper that listed instructions for each task they could read over and over again if need be like the younger and older participants had shown in Appendix L.

A majority of the errors were made when pressing the 5-way navigator button. The first screen had the middle of the 5-way navigator button lit up. Thus, most of our participants made a comment that the 5-way navigator was a big button. When the participants saw the up, down, left, and right part of the button light up during the task they were confused. Half of the participants attempted to press the PDA case above the button, but quickly learned the up, down, left, and right buttons were actually part of the 5-way navigator. One participant was not included in our mistake count because the participant did not completely understand the task. The participant pressed whatever button they felt like. Midway through the task, the tester reminded the participant to try to press the button that lights up. However, the participant did enjoy the task and completed the task.

Most of our participants held the PDA in their non-dominant hand and selected buttons with their dominant hand similar to the younger and older participants in our first study. Only three participants used one hand to hold the PDA and press the buttons, however these participants had their other arm hooked to dialysis. Whenever the participant attempted to use two hands, the dialysis machine would beep and the nurse would have to come over to fix the machine and warn the participant about not moving the other arm. Participants who used two hands either had shunts in their collar bone area or leaned to the side where their arm was hooked up to the dialysis machine in order to use the device.

Even though the dialysis participants had more overall errors (10 errors versus 3 errors for younger/older user group) they were all able to complete the task and felt it was easy. The increase in errors can be attributed to the uncomfortable testing environment (dialysis ward), cramping of the hands (a symptom that commonly occurs near the end of a participant's dialysis session as a lot of fluid is removed from their body), and tremors (three participants had slight tremors). Over half of our participants (80%) felt the button press task or all the tasks were easy to complete.

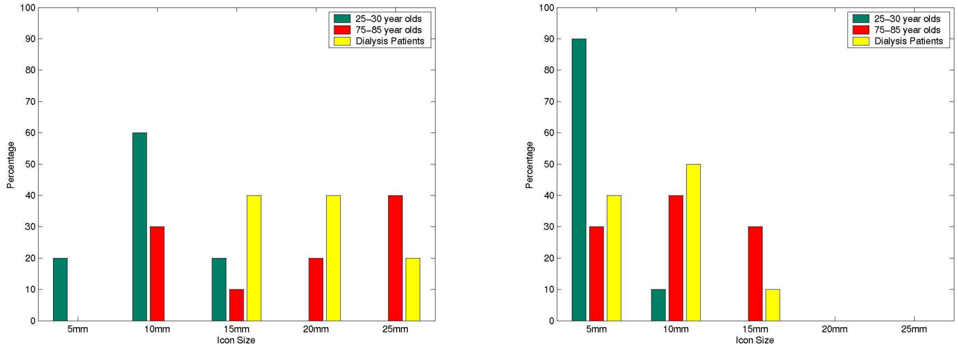


Fig. 12. Participant's preferred icon size and the icon sizes participants could read.

Icon Size Task Results The icon size results were not surprising. A clear majority of our participants preferred icons in the range of 15mm-20mm (40% preferred 15mm and 40% preferred 20mm). Similar to our older group, our participants preferred larger icons. However, as Figure 12 shows, a clear majority of our participants could read icons 10mm or smaller. The dialysis participants could read icons the same size as the older and younger group. Participants said that even though they could read the smaller icons, they preferred to view an icon that had noticeable details and were able to read without their glasses. Less than half of our participants could read 5mm icons, thus they could read current PDA icons, however the participants do not prefer this icon size. Similar to our younger and older group, applications should be geared towards user preferences and allow for icon size variations.

Our icon size application used scaled photographs and illustrations of food items as shown in Figure 8. We wanted to see if participants noticed the change in pictures and if they had a preference. None of our participants notice the use of photographs and illustrations. When asked if they had a preference (Table 22), 70% of our participants did not have a preference.

During the icon size task participants were allowed to hold the PDA to view the icons. Dialysis participants held the PDA at about the same distance on average as our elderly participants (13.2" for our dialysis group and 13.1" for our older group). As we discussed earlier, dialysis participants held the PDA so that it would not affect the dialysis machine.

Recording a Voice Diary Entry Task Results Similar to our first study, participants were asked to record three phrases during the recording voice diary task - a short phrase, a medium length phrase, and a longer length phrase. Unlike the first study, our dialysis participants could not read the task list and read the phrases we asked them to read. The medium length and longer phrases were too complicated for our participants to remember in the busy dialysis ward environment. So, we created a simpler medium length phrase - "I ate a banana" and allowed the participants to tell us about a recent meal they ate or a meal they wish they could eat for the longer phrase. The voice diary task was an easy task for most of our participants - 50% of the dialysis participants successfully recorded the shorter message, all of our participants recorded the medium length message, and 90% of our participants recorded the longer message. For participants who did not record the messages successfully on their first try, they were able to record the message on their second try. The dialysis participant results are very close to the younger and older participant results as shown in Table 23.

Half our the dialysis participants held the PDA with one hand when recording the messages and the other half of our participants used two hands.The participants who used one hand usually used their dominant hand. One participant used his non-dominant hand because his dominant hand was attached to the dialysis machine.

Dialysis patients held the PDA closest to them during the voice recording task than any of our other groups (6.3" as opposed to 8.6" for our older group and 9" for our younger group). This could be attributed to the louder environment. The first study was conducted in a quiet room with only the test giver and participant, whereas the dialysis participants were in the dialysis ward with lots of dialysis patients, nurses, and noisy machines. Similar to our first study, the dialysis participants were easily able to complete the voice diary entry task.

Socket SDIO Scanning Task Results Participants scanned three items during the socket scanning task - a book, a small bag of pretzels, and a can of soda. The dialysis group was able to scan the book on the first try 50% of the time - the same as our elderly group and better than our younger group.All but one of the dialysis participants who could not successfully scan the book on the first try were able to scan the book on the second or third try. Younger and older participants were able to scan the bag of pretzels on the first try better than the dialysis participants (60% and 50% versus 40% success rate). All of the dialysis participants were able to scan the bag of pretzels eventually. Similar to our first study, the can of soda was the most difficult item to scan. Only 50% of our dialysis participants were able to scan the can of soda. Dialysis participants who could not scan the can of soda attempted to scan the soda six or more times before stopping the task.

We can observe how learning affects scanning success with the bag of pretzels in Table 3. Dialysis participants who practiced successfully scanning the book 3-8 times were able to scan the bag of pretzels quicker than those who only practiced successfully scanning the book 1-2 times. Half of all our participants

	# of Unsuccessful Bag Scans		
Practice Scanning Book	**25-30 year olds**	**75-85 year olds**	**Dialysis**
1-2 Times	2.6	2	2.8
3 - 8 Times	1.6	2.6	1.8

Table 3. We measured learning by correlating how many times participants practiced successfully scanning the book and how many times on average it took them to successfully scan the bag of pretzels.

practiced scanning the book three or more times before trying to scan the bag. We did not find any relation between overall scanning practice and the ability to successfully scan the can of soda. As we discussed in our first study, the soda can was challenging to scan because of it shape and material.

5.5 Discussion

Our second study proved our hypothesis. We showed chronically ill novice PDA users are capable of pressing PDA buttons and recording voice diaries. Participants preferred 15-20mm sized icons - icons larger than current PDA icons. Participants are capable of scanning barcodes with some practice using the Socket SDIO scanner. Since this was the first time all of our participants used a PDA and the first time for some using a computer, the participants completed all the tasks to our satisfactory. With more practice, we believe our users would be able to easily scan the three times. Application developers can learn from our study (1) elderly people can complete traditional and non-traditional PDA tasks and (2) applications for a wide range of users need more icon sizes to select from to ensure universal usability.

The dialysis participants gave us some terrific ideas in regards to scanning items. One participant wished the PDA had a number pad so if it was too difficult to scan the item, the bar code number could be inputted into the PDA with the number pad on the screen. Another participant ask about what kind of items to scan. If the participant buys a 24 pack of soda, does the participant scan the soda box or the individual can? In this case, the participant would scan the soda can, however the participant brings up an interesting point that will have to be integrated into training dialysis participants when we teach them what items to scan.

6 Future Work

The next step in this research is to develop training exercises using our results for our chronically ill user group to become more comfortable with PDAs. We would also like to extend the study and have participants complete the tasks standing and walking. Testing users while standing and walking may affect icon size preference ([6]) and the ability to find and push correct buttons for the button press and voice recording applications. Scanning barcodes may also become more difficult when standing because users will not have anything to balance their arm or the item on when scanning the barcode. Scanning barcodes while standing is important for us to evaluate to ensure our future nutritional monitoring users can input data anywhere - standing while preparing food, buying a can of soda from a machine, etc. We will use this information in our nutritional-monitoring research.

7 Conclusion

The studies determined if there are any noticeable differences in performance of people 25-30 years old, 75-85 years old, and chronically ill people completing traditional and non-traditional PDA tasks. Researchers in the UbiComp community wonder if elderly and chronically ill people can use PDAs given their typical difficulties with vision, dexterity, and coordination. The results have shown that there are no major differences between performance of elderly, chronically ill, and younger novice participants using a PDA.

The results from our first study showed that elderly people occasionally needed a little more practice time to learn how to complete each task, but overall there is no difference in performance. Elderly participants showed more physical demand, but less frustration than younger participants leading us to believe that although they may have worked harder because of vision, dexterity, or coordination difficulties, they were undeterred in completing tasks.

Our second study showed that chronically ill people perform just as well as younger people in most tasks. More research needs to be done in regard to usability testing in situ, however our results can be used as a guideline for creating applications for diverse or elderly groups.

8 Acknowledgments

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A Participant Background

Participant Number	**Gender**	**Problem viewing computer or TV screen?**	**Wear glasses when using Computer or TV?**	**Color blind?**	**Easy to use TV Remote?**	**Easy to use Cell Phone?**	**How often use a computer?**	**How often use a PDA?**	**Predominant Hand**
1	Male	No	Yes	No	Easy	Easy	A lot	N/A	Right
2	Male	No	Yes	No	Easy	Easy	A lot	N/A	Right
3	Male	No	No	No	Easy	Easy	A lot	N/A	Right
4	Male	No	No	No	Easy	Easy	A lot	Rarely	Both
5	Female	No	Yes	No	Easy	Easy	A lot	Rarely	Right
6	Male	No	No	No	Easy	Easy	Sometimes	N/A	Right
7	Male	Yes[a]	Yes	No	Easy	N/A	A lot	Rarely	Right
8	Female	No	Yes	No	Easy	Easy	A lot	N/A	Right
9	Male	No	No	No	Easy	Easy	A lot	N/A	Right
10	Male	No	Yes	No	Easy	N/A	A lot	N/A	Left

Table 4. Background information for 25-30 year old participants.

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[a] Participant has difficulty reading a computer screen without his glasses.

Participant Number	**Gender**	**Problem viewing computer or TV screen?**	**Wear glasses when using Computer or TV?**	**Color blind?**	**Easy to use TV Remote?**	**Easy to use Cell Phone?**	**How often use a computer?**	**How often use a PDA?**	**Predominant Hand**
1	Male	Yes	Yes[a]	No	Easy	N/A	A lot	N/A	Right
2	Female	Yes[b]	Yes	No	Easy	N/A	A lot	N/A	Right
3	Male	No	Yes	No	Easy	Easy	Sometimes	N/A	Right
4	Female	No	Yes	No	Easy	N/A	A lot	N/A	Right
5	Male	No	Yes	Yes [c]	Easy	Easy	A lot	N/A	Right
6	Male	No	Yes	No	Easy	N/A	A lot	N/A	Right
7	Male	No	Yes	No	Easy	N/A	A lot	N/A	Right
8	Female	No	Yes	No	Difficult [d]	Easy	Sometimes	N/A	Right
9	Female	No	Yes	No	Easy	N/A	N/A	N/A	Right
10	Female	No	Yes	No	Easy	N/A	A lot	N/A	Right

Table 5. Background information for 75-85 year old participants.

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[a] Participant recently had eye surgery and had not received his new eye glass prescription yet.

[b] Participant only has difficulty reading a computer screen if the font is too small.

[c] Red/Green Color Blind

[d] Usually easy, but recently bought new remote control

Participant Number	**Age**	**Gender**	**Problem viewing computer or TV screen?**	**Wear glasses when using Computer or TV?**	**Color blind?**	**Easy to use TV Remote?**	**Easy to use Cell Phone?**	**How often use a computer?**	**How often use a PDA?**	**Predominant Hand**
1	58	M	No	Yes	No	Easy	Easy	Sometimes	N/A	Both
2	44	F	No	No	No	Easy	Easy	A lot	N/A	Right
3	38	M	No	Yes	No	Easy	Easy	Sometimes	N/A	Right
4	53	F	No	No	No	Easy	N/A	Rarely	N/A	Right
5	59	F	No	Yes	No	Easy	Somewhat[a]	Rarely	N/A	Right
6	47	M	No	Yes	No	Easy	Easy	Rarely	N/A	Both
7	57	F	Yes	Yes	No	Easy	Easy	N/A	N/A	Right
8	50	M	No	Yes	No	Easy	N/A	N/A	N/A	Right
9	34	M	No	Yes	No	Easy	N/A	Sometimes	N/A	Right
10	70	F	No	Yes	No	Easy	N/A	N/A	N/A	Left

Table 6. Background information for dialysis patient participants.

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[a] Participant was taught how to use it and then did not have any problems.

B Button Press Task Results

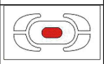
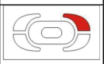
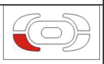
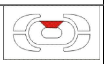
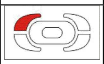
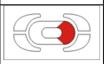
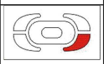
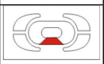
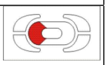
Screen #	1	2	3	4	5	6	7	8	9
User Group									
25-30			1			2			
75-85	1						1		1
Dialysis[3]		10[4]	2	1		1	1	2	3

Fig. 13. The number of incorrect button press per button.

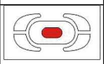
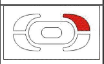
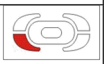
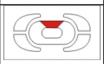
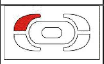
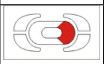
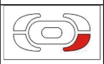
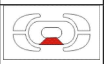
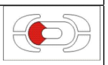
Screen #	1	2	3	4	5	6	7	8	9
									
Dialysis Participant	0	1	5	14	6	50	3	6	3

Fig. 14. The number of incorrect button press per button made by a dialysis participant who did not understand the task.

B.1 One dialysis patient not listed in Table 13

One dialysis patient is not listed in Table 13 because the participant did not quite understand the task. The participant pressed whatever button he or she felt like. Midway through the task I reminded the participant to try and press the button that lights up. However, the participant did enjoy the task (it was their favorite task) and completed the task. Results are shown in Table 14.

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[3] 9 out of 10 participants are counted. See B.1 for more information

[4] Three participants were confused. They thought they could continue to the next screen by pressing the middle button when the next button lit up. They quickly learned they had to press the correct button to continue with the task.

	No Mistakes (Perfect)
25-30	8 = 80%
75-85	8 = 80%
Dialysis	4 = 40%

Fig. 15. The percentage of participants who did not make any mistakes pressing buttons during the button press test.

User Group	**One Handed**	**Two Handed**	**Rested PDA on Table**
25-30	3	7	
75-85		9	1
Dialysis	3	7	

Fig. 16. How the participant held the PDA - Number of participants who held the PDA with one hand, two hands, or rested the PDA on the table.

	# Using Dominant Hand
25-30	
One Hand	3
Two Hand	7
75-85	
One Hand	
Two Hand	8
On Table	1
Dialysis	
One Hand	3
Two Hand	7

Fig. 17. The number of participants who selected buttons with their dominant hand.

User Group	**No Mistakes**	**1 Mistake**	**2-3 Mistakes**	**$>$ 3 Mistakes**
Dialysis	4	2	1	5

Fig. 18. A break down of the number of participants who made no mistakes, 1 mistake, 2-3 mistakes, and $>$ 3 mistakes during the button press task.

C Icon Size Task Results

		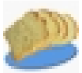	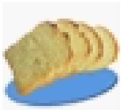	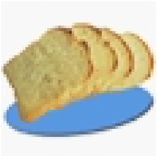	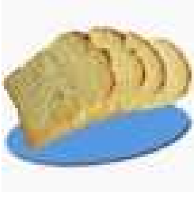
User Groups	**5mm**	**10mm**	**15mm**	**20mm**	**25mm**
25-30	2	6	2		
75-85		3	1	2	4
Dialysis			4	4	2

Fig. 19. The icon sizes participants prefer.

		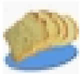	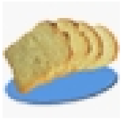	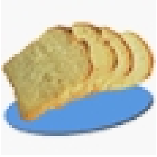	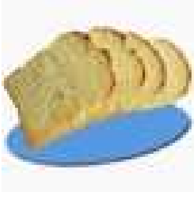
User Groups	**5mm**	**10mm**	**15mm**	**20mm**	**25mm**
25-30	9	1			
75-85	3	4	3		
Dialysis	4	5	1		

Fig. 20. The smallest size icons participants can read.

C.1 Comments about Icon Size

25-30

- Preferred Size/Actual Size - Comment
- 10mm/5mm - Depends on how much information is on the screen
- 10mm/5mm - Don't want it too large to fit enough information on the screen
- 10mm/5mm - If there are only pictures, prefers 10mm. But if mostly text to describe pictures, would prefer 5mm

75-85

- 15mm/5mm - Preferred because easier to see, but thinks with familiarity could use 10mm icons
- 20mm/15mm - Clear and easy to read...it's apparent (could read half of 5mm, 3/4 of 10mm, and all of 15mm)
- 25mm/10mm - Easer to tell
- 10mm/5mm - Could do smaller icons when I learned what they meant (retired scientist)
- 10mm/10mm - Allows me to have more on the screen (retired engineer)
- 25mm/15mm - Easier for me to see details.
- 25mm/10mm - The bigger the better. The clarity is more important than the number of options present.
- 25mm/10mm - Easer for me to distinguish them.

Dialysis

- 20mm/10mm - The bigger the better
- 20mm/5mm - The bigger the better
- 15mm/10mm - I can see it without my glasses
- 15mm/5mm - Easier to see
- 25mm/5mm - Easier to see
- 25mm/10mm - I just like the biggest (could read half of 5mm)
- 25mm/5mm - The detail is easier to see (could **easily** read 5mm)

User Group	Average Distance	Smallest Distance	Largest Distance	Mode	Median
25-30	14.5”	8”	24”	12”	12”
75-85	13.1”	7”	18”	18	13.5”
Dialysis	13.2”	6”	24”	8”,12”	12”

Fig. 21. The average distance participants held the PDA away from them during the icon size task.

User Group	Notice different images?	Illustrations	Pictures	No Preference
25-30		1	3	6
75-85	2	1	8	1
Dialysis			3	7

Fig. 22. Participants preference on illustrations or pictures as icons.

D Voice Diary Entry Task Results

User Group		Short Message	Medium Message	Long Message
25-30	**Perfect**	7	9	10
	Learning	2,2,2	2	
75-85	**Perfect**	7	8	9
	Learning	2,2,2	2,H	H
Dialysis	**Perfect**	5	10[5]	9[6]
	Learning	N/A[7], 2, 2, 2, 2		2[8]

Fig. 23. Participants success at recording short, medium, and long length messages.Perfect means the number of participants who successfully recorded the message the first time. Learning has the number of times a participant had to attempt the task before success (i.e. 2 - successful on second attempt).N/A means the participant did not complete the task.H means the participant thought they were recording, but could not complete the task because of hearing difficulties.

Examples of long messages for dialysis patients

- "I ate steak, fresh steamed vegetables, and a potato."
- "I had fried chicken, salad with dressing, corn with butter."
- "I had grits with butter...I love butter, eggs, and I would eat cheese burgers...I love cheese burger." (Participant had tremors and realized when her finger slipped off the button, it stopped recording (audible beep). So she kept recording this long phrase in three parts...starting where she left off).

User Group	One Handed	Two Handed	Rested PDA on Table
25-30	6	3	1
75-85	4	5	1
Dialysis	5	5	

Fig. 24. How the participant held the PDA - Number of participants who held the PDA with one hand, two hands, or rested the PDA on the table.

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[5] Medium Length phrase was, "I ate a banana."

[6] Long Message was a recent meal they ate or a meal they wish they could enjoy.

[7] Participant did not want to try recording the short message again, but successfully completed the other two phrases

[8] Long Message was a recent meal they ate or a meal they wish they could enjoy.

User Group	Average Distance	Smallest Distance	Largest Distance	Mode	Median
25-30	9”	5”	24”	12”	8”
75-85	8.6”	4”	12”	6”	7”
Dialysis	6.3”	4”	12”	6”	6”

Fig. 25. The average distance participants held the PDA away from them during the voice diary recording task.

E Socket SDIO Scanning Task Results

User Group		Book	Bag of Pretzels	Can
25-30	Perfect	4	6	2
	Learning	3,2,3,3,8,2	5,4,3,3	8,2,2,7,4,3
	Gave up after __ tries			8,5
75-85	Perfect	5	5	1
	Learning	3,2,3,2,3	5,2,7,2,2	7,20,3,5
	Gave up after __ tries			4, 23, 5,14, 25
Dialysis	Perfect	5	4	
	Learning	2,5,2,2,3	5,2,3,2,3,4	5,3,2,3,8
	Gave up after__ tries			>10, 8, >15, >10, 6

Fig. 26. Participants success at scanning a book, bag of pretzels, and can of soda with the socket scanner. Perfect means the number of participants who successfully scanned the item the first time. Learning has the number of times a participant had to attempt the task before success (i.e. 2 - successful on second attempt).Gave up after __ tries is the number of times the person attempted to scan the item before quitting the task.

Trouble Scanning Book	**25-30**					
# of tries to scan **book**	3	2	3	3	8	2
# of times **practice** with book after success	2	2	5	2	0	3
# of tires to scan **bag**	1	1	1	3	3	1
# of tires to scan **can**	N/A (8)	8	2	1	4	3

Fig. 27. A close look at how practicing scanning the book may help successful scanning of the can for participants in the 25-30 year old age group who had difficulty scanning the book on their first try.

No trouble Scanning Book	**25-30**			
# of tries to scan **book**	1	1	1	1
# of times **practice** with book after success	0	5	4	3
# of tires to scan **bag**	5	4	1	1
# of tires to scan **can**	2	7	N/A(5)	1

Fig. 28. A close look at how practicing scanning the book may help successful scanning of the can for participants in the 25-30 year old age group who did not have difficulty scanning the book on their first try. N/A(#) means the participant did not successfully complete the task and gave up after # times.

Trouble Scanning Book	**75-85**				
# of tries to scan **book**	3	3	2	3	2
# of times **practice** with book after success	2	0	4	1	3
# of tires to scan **bag**	1	5	7	1	1
# of tires to scan **can**	N/A (25)	7	N/A (4)	N/A (23)	N/A (14)

Fig. 29. A close look at how practicing scanning the book may help successful scanning of the can for participants in the 75-85 year old age group who had difficulty scanning the book on their first try.N/A(#) means the participant did not successfully complete the task and gave up after # times.

No trouble Scanning Book	**75-85**				
# of tries to scan **book**	1	1	1	1	1
# of times **practice** with book after success	3	4	9	1	2
# of tires to scan **bag**	2	1	2	2	1
# of tires to scan **can**	20	1	3	5	N/A (5)

Fig. 30. A close look at how practicing scanning the book may help successful scanning of the can for participants in the 75-85 year old age group who did not have difficulty scanning the book on their first try. N/A(#) means the participant did not successfully complete the task and gave up after # times.

Trouble Scanning Book	**Dialysis**			
# of tries to scan **book**	2	2	2	3
# of times **practice** with book after success	0	0	1	1
# of tires to scan **bag**	5	3	2	3
# of tires to scan **can**	N/A (>10)	N/A(>10)	2	3

Fig. 31. A close look at how practicing scanning the book may help successful scanning of the can for participants in the dialysis group who had difficulty scanning the book on their first try.N/A(#) means the participant did not successfully complete the task and gave up after # times.

No trouble Scanning Book	**Dialysis**					
# of tries to scan **book**	1	1	1	1	1	1
# of times **practice** with book after success	1	1	2	3	5	1
# of tires to scan **bag**	1	4	1	2	1	1
# of tires to scan **can**	5	8	3	N/A(8)	N/A (>15)	N/A (6)

Fig. 32. A close look at how practicing scanning the book may help successful scanning of the can for participants in the dialysis group who did not have difficulty scanning the book on their first try.N/A(#) means the participant did not successfully complete the task and gave up after # times.

F Baracoda Pencil Scanning Task Results

User Group		**Book**	**Bag of Pretzels**	**Can**
25-30	Perfect	2		
	Learning	4, 11, 7, 4, 3, 5, 3, 3	8,10	
	Gave up after __ tries		10, 14, 10, >10, 6, 10, 5, 5	9, 13, >20, 7, 7, 5, 3, 7, >10, 9
75-85	Perfect	1		
	Learning	5, 3, 2, 3, 2, 9, 4, 4	32	
	Gave up after __ tries	12	20, N/A, >15, >15, 10, >10, 25, 6, 21	11, 24, N/A, >10, >17, 10, >5, 31, 2, 11

Fig. 33. Participants success at scanning a book, bag of pretzels, and can of soda with the Baracoda pencil scanner. Perfect means the number of participants who successfully scanned the item the first time. Learning has the number of times a participant had to attempt the task before success (i.e. 2 - successful on second attempt).Gave up after __ tries is the number of times the person attempted to scan the item before quitting the task. N/A means the participant did not attempt to scan the bag of pretzels or can after giving up trying to scan the book.

G Younger (25-30 Year Old) Participant Datasheets

G.1 Participant 1

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - right index and thumb chose buttons.
3. **How far did the participant hold the PDA away from them?** 2'
4. **Other comments:** Not sure about top part of 5-way navigator.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm - Don't want it too large, want enough information on the screen.
2. **Smallest icon size participant can see:(5-25mm)** 10mm
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** No preference
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** No (didn't know had to hold button the whole time), got it second time.
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did they have difficulty finding/using the button?** Had to be reminded what button to use the first time, but had no problems thereafter.
5. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	1st try	8th try

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** Twice
4. **Other comments:** Participant used right thumb to scan. Didn't realize at first had to keep pressing the button to scan the barcode. Rested hand holding the item on the table.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	Unsuccessful after 5 tries	Unsuccessful after >9 tries

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**5 practices.
3. **Other comments:** Tried holding bag and resting it on the table.

Other comments

- **Easiest task? Why?** Button press because graphical display of buttons...it is easy to use.
- **Most difficult task? Why?** Scanning with the pencil because it did not work.
- **Would you use a cellphone...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes...everywhere except class
- **If you owned a PDA, would you use a PDA...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes
- **If you owned a PDA, where would you keep it?** backpack
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** May use it, but interested in nutrition ... not calories
- **Do you see yourself purchasing a PDA in the future?** No
- **Any comments or questions?**

G.2 Participant 2

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - but only selected with left thumb
3. **How far did the participant hold the PDA away from them?**1.5”
4. **Other comments:** The upper part of the 5-way navigator was confusing, but knew what was going on afterwards.Wanted to press above it, but knew there was no button there.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?** 24”

4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** No
6. **Other comments:** Helped guessing items because knew the context was food; not the best looking egg (drawing of egg had dots around the egg yolk showing it was fried.

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st time	1st time	1st time

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 12"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** Holding PDA is easy to do - Right hand held PDA, Right index finger pushed button

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd time	1st time	3rd time

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA moved
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 3 times
4. **Other comments:** no more difficult than any other scanner. Participant has worked as a librarian. Wants to enter the number by hand.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	4th try	N/A(10)	N/A(9)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No Practice
3. **Other comments:** Doubted immediately this would work on bag of chips because of uneven surface.

Other comments

- **Easiest task? Why?** Button press - like Simon Says. Plays video games like Simon Says.
- **Most difficult task? Why?** Pencil barcode scanner.
- **Would you use a cellphone...** Does not own cell phone
  - In public?
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, would you use a PDA...**

    - In public? I would stop and use it...not a multitasker
    - In front of your friends? Yes
    - In a restaurant? Yes
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** Yes for counting carbs, etc. Restaurants don't tell calories so it would be useful.
- **Do you see yourself purchasing a PDA in the future?** When I am a professor.
- **Any comments or questions?** Likes to keep track of calories...uses an online calorie counter website.

G.3 Participant 3

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hand - right thumb pressed
3. **How far did the participant hold the PDA away from them?** 1.5'
4. **Other comments:** Participant finished task very fast.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 5mm/10mm - 5mm if lots of text; 10mm if just pictures
2. **Smallest icon size participant can see:(5-25mm)**5mm
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?**No
6. **Other comments:**Egg illustration was weird

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd time	1st time	1st time

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?**No. Yes.
3. **How far did the participant hold the PDA away from them?**6"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** Left hand held PDA, left thumb pressed. Participant tipped the PDA towards mouth when recording.

Task 4: Socket Scanner Barcode

1.

	Book	Bag of Chips	Soda Can
Successful Completion?	8th try	3rd try	4th try

2. **Did participant move the object or PDA to get the PDA to scan the object?**Moved PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No Practice
4. **Other comments:** Tried wanding PDA - not scanning perpendicular to object.

Task 5: Baracoda Pencil Scanner

1.

	Book	Bag of Chips	Soda Can
Successful Completion?	11	N/A(14)	N/A(13)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No Practice
3. **Other comments:**Scanners have different actions - Socket depends on distance and Baracoda pencil depends on speed; A hold steady vs. wand action.

Other comments

- **Easiest task? Why?** Button press - like clicking a mouse
- **Most difficult task? Why?** Pencil Scanner - Doesn't work
- **Would you use a cellphone...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Only text message
- **If you owned a PDA, would you use a PDA...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** Cool to scan food and get nutritional info.
- **Do you see yourself purchasing a PDA in the future?** Probably
- **Any comments or questions?** Lefty/Righty recording geared towards lefty because wanted to press with right thumb. Scanner button is awkward - weird to use address button. Maybe the voice button would be a good scanner button.

G.4 Participant 4

Task 1: Button Press

1.

	1	2	3	4	5	6	7	8	9
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hand - 2 thumbs to press. Participant divided the buttons in half and used the closest thumb to press the button.
3. **How far did the participant hold the PDA away from them?** 6-8"
4. **Other comments:** Completed task very fast.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 15mm
2. **Smallest icon size participant can see:(5-25mm)**5mm
3. **How far did the participant hold the PDA away from them?**8”
4. **Did participant notice we used illustrations and realistic images?**Yes
5. **Preference of illustrations vs. realistic images?** Illustration - stronger information. Emphasis on characteristics of object
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st time	1st time	1st time

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 9”
4. **Did they have difficulty finding/using the button?**No
5. **Other comments:**Held with left hand, pressed button left thumb

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	3rd try	1st try

2. **Did participant move the object or PDA to get the PDA to scan the object?**Object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 2 times
4. **Other comments:** Left hand held PDA, right hand held book, forearms on table; used to be a check-out at supermarket.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	8th try	N/A(>20)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 time
3. **Other comments:** Has nails 1/8” long. Kept trying can ... it’s hard because of black lines...tried resting can on table.

Other comments

– **Easiest task? Why?** Button Press - it’s easy; no thinking
– **Most difficult task? Why?** Scanning with pen - couldn’t do it
– **Would you use a cellphone...**
  - In public? Depends how many people are around
  - In front of your friends? Yes
  - In a restaurant? No - depends...not with friends

- **If you owned a PDA, would you use a PDA...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? If needed, participant will use it.
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?**
- **Do you see yourself purchasing a PDA in the future?** Yes, because likes to be organized
- **Any comments or questions?** Participant likes gadgets.

G.5 Participant 5

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	2	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - right thumb to select buttons.
3. **How far did the participant hold the PDA away from them?** 8”
4. **Other comments:** Very fast completion time

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 5mm
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?** 6-8”
4. **Did participant notice we used illustrations and realistic images?**No
5. **Preference of illustrations vs. realistic images?** No - does not matter as long as images convey what it is supposed to
6. **Other comments:** Strawberries vs. raspberries...how to differentiate? Do we need to differentiate berries that much? He would prefer the 5mm because when he got used to it he’d like it more for more information on the screen.

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd time	1st time	1st time

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Let go of button too quickly (on press instead of press and hold). Did it correctly afterwards.
3. **How far did the participant hold the PDA away from them?** 6-8”
4. **Did they have difficulty finding/using the button?** Yes, but after test giver told him he did not have a problem.
5. **Other comments:** reflection of light on the screen may be a problem.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd time	1st time	2nd time

2. **Did participant move the object or PDA to get the PDA to scan the object?**Moved the object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**> 5 times
4. **Other comments:** He tried to flip the objects and scan them upside down - the device did.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	7th try	10th try	N/A(7)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** scanned book many times many different ways - played with scanning book for 5 minutes.
3. **Other comments:** Hold book with left hand, pencil with right hand. Book was at a 45 degree angle from the table. If you do not do this right, the pencil is unpredictable. Participant complained the button was difficult to press because of "fat fingers". If I can't get a continuous straight line, it won't work at all.

Other comments

- **Easiest task? Why?** Icon Size - no effort
- **Most difficult task? Why?** Pencil scanner - more effort
- **Would you use a cellphone...** no cell phone
  - In public?
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, would you use a PDA...**
  - In public? Depends on features...would if had a bus schedule
  - In front of your friends? only use if had a reason or wanted to show it off
  - In a restaurant? if he needed it, he would use it independent of place
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?**Yes
- **Do you see yourself purchasing a PDA in the future?** No need for a PDA
- **Any comments or questions?** Pen died after participant used it for 20 minutes!

G.6 Participant 6

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	1	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 - right finger selected buttons
3. **How far did the participant hold the PDA away from them?** 1’
4. **Other comments:**

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 15mm
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?** 1.5’
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** No
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 6”
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** 2 hands used during task

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st time	1st time	1st time

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 3 scans
4. **Other comments:**

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	4th try	N/A(10)	N/A(7)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** practiced 4 times
3. **Other comments:** Participant was surprised to see pencil would scan going both ways (forward and back) over the UPC. Participant was willing to keep trying.

Other comments

- **Easiest task? Why?** Voice Recording - fun to do
- **Most difficult task? Why?** Pencil Scanner - not effective
- **Would you use a cellphone...**
    - In public? Sure
    - In front of your friends? Sure
    - In a restaurant? No
- **If you owned a PDA, would you use a PDA...**
    - In public? Yes
    - In front of your friends? Yes
    - In a restaurant? Maybe
- **If you owned a PDA, where would you keep it?** Backpack
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** Willing to scan foods, but think would stop when novelty wore off
- **Do you see yourself purchasing a PDA in the future?** Maybe
- **Any comments or questions?** Socket scanner was more efficient, but precarious because of where you have to hold the PDA to press the button.

G.7 Participant 7

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hand - Right hand pushed buttons, left hand held PDA
3. **How far did the participant hold the PDA away from them?** 1'
4. **Other comments:** Just like Simon says

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?**2'
4. **Did participant notice we used illustrations and realistic images?**No
5. **Preference of illustrations vs. realistic images?**Real pics better
6. **Other comments:** Wasn't sure about egg picture

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 6"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** 2 hands to hold PDA

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	4th try	7th try

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA moved
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 5 times
4. **Other comments:** held scan button continuously until received feedback.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	N/A(>10)	N/A(>5)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 time
3. **Other comments:**Worked in retail

Other comments

- **Easiest task? Why?** button press - used to pressing buttons - like a cell phone
- **Most difficult task? Why?** Scanning with pen
- **Would you use a cellphone...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes - no problem with using phone at the restaurant table
- **If you owned a PDA, would you use a PDA...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes
- **If you owned a PDA, where would you keep it?** Backpack or purse
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** Yes...wants something in grocery store to keep track of how much her purchase is
- **Do you see yourself purchasing a PDA in the future?** Yes
- **Any comments or questions?**

G.8 Participant 8

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand - right hand. Hesitated at 5-way navigator, but pressed correct button.
3. **How far did the participant hold the PDA away from them?** 9”
4. **Other comments:** Very fast completion time

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?**1'
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** No
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did they have difficulty finding/using the button?** Not sure where button was at first
5. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	1st try	N/A(5)

2. **Did participant move the object or PDA to get the PDA to scan the object?** Object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 4 times
4. **Other comments:**

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	N/A(10)	N/A(7)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**
3. **Other comments:**

Other comments

- **Easiest task? Why?**Button - easy to understand what to do
- **Most difficult task? Why?** Pencil scanning - just is hard
- **Would you use a cellphone...**
  - In public? No
  - In front of your friends? Yes
  - In a restaurant? No
- **If you owned a PDA, would you use a PDA...**

  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? No, don't want to draw attention
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** No - too much trouble
- **Do you see yourself purchasing a PDA in the future?** yes if PDA is cheaper and can be used as a cell phone
- **Any comments or questions?**

G.9 Participant 9

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand - right hand
3. **How far did the participant hold the PDA away from them?** 1.5'
4. **Other comments:** Just like Simon Says

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 5mm
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?**20-24"
4. **Did participant notice we used illustrations and realistic images?** no
5. **Preference of illustrations vs. realistic images?** realistic are neater
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did they have difficulty finding/using the button?** no
5. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	5th try	2nd try

2. **Did participant move the object or PDA to get the PDA to scan the object?** Object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No practice
4. **Other comments:** Only 1 scan on book...got it the first time. Got can, went back to try chips again on 4th try (chips were rested on the table for this try)

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	N/A(5)	N/A(>10)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 3 times
3. **Other comments:** After he got the book, he tried the bag of chips; can was on the table - right hand pen; left hand PDA. “This pen thing sucks” “What a piece of crap” Don’t know why you would use a barcode scanner with a PDA

Other comments

- **Easiest task? Why?** Button press - buttons are well arranged and diagram was accurate
- **Most difficult task? Why?** Pen scanner - it sucks
- **Would you use a cellphone...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes
- **If you owned a PDA, would you use a PDA...** Would not own a PDA
  - In public?
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** No, not concerned about diet
- **Do you see yourself purchasing a PDA in the future?** Not really - keep track of things on paper.
- **Any comments or questions?**

G.10 Participant 10

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand - left hand. Dominant hand
3. **How far did the participant hold the PDA away from them?** 1-1.5’
4. **Other comments:** Thought had to press screen, then realized had to press buttons.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm (if the picture is really, really clear - then maybe 5mm)
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** Yes
5. **Preference of illustrations vs. realistic images?** Drawings because culture is based on drawings.
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st time	1st time	1st time

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 6"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	1st try	N/A(8)

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 2 times
4. **Other comments:** Participant realized scanning to close during first two book scans.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	5th try	N/A(6)	N/A (3)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 5 times...he learned how to create rules (too close, too fast, etc.)
3. **Other comments:** Very frustrated when scanning bag of pretzels

Other comments

- **Easiest task? Why?** Button Press - something you do everyday - press buttons on computer, TV remote, computer games, etc.

- **Most difficult task? Why?** Pencil scanner. Wanted to press it harder when it did not work, but that did not work. Expected it to scan at any speed, but needed just the right amount of speed. First impression - do it slow...but not correct. Did not work on any shiny surfaces.
- **Would you use a cellphone...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Only if needed to
- **If you owned a PDA, would you use a PDA...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes
- **If you owned a PDA, where would you keep it?** Pocket
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** Would not care to scan anything unless it was part of a game
- **Do you see yourself purchasing a PDA in the future?** Maybe
- **Any comments or questions?** Socket scanner is easier to use - use to action of point and clicking

H Older (75-85 Year Old) Participant Datasheets

H.1 Participant 1

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - left hand held PDA, right index pressed - left wrist on table
3. **How far did the participant hold the PDA away from them?** 1.25'
4. **Other comments:** Very fast, no problems

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 25mm
2. **Smallest icon size participant can see:(5-25mm)** 10mm
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** Realistic
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 6"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** 2 hand - left thumb press; right hand balance

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	1st try	N/A(25)

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 2 times
4. **Other comments:** Thought had to waive scanner. Kept trying to scan parallel to lines despite test givers comments that the scanner had to be perpendicular to lines.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	4th try	N/A (21)	N/A(11)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 2 times
3. **Other comments:** Very frustrated with this task. Button is too small. Hard to keep button depressed. Doesn't work.

Other comments

- **Easiest task? Why?** Button press - nothing to it; it was fun
- **Most difficult task? Why?** Baracoda pencil - didn't work; button poorly designed
- **Would you use a cellphone...**
  - In public? No
  - In front of your friends? No
  - In a restaurant? No
- **If you owned a PDA, would you use a PDA...**
  - In public? No
  - In front of your friends? No
  - In a restaurant? NO
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** No
- **Do you see yourself purchasing a PDA in the future?** Not sure what he would use it for - No.
- **Any comments or questions?** Would use a PDA if could check the stock market.

H.2 Participant 2

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - left hand hold and right thumb selects
3. **How far did the participant hold the PDA away from them?** 1'
4. **Other comments:** No problems...just like a laptop

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 25mm
2. **Smallest icon size participant can see:(5-25mm)** 10mm
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** Yes
5. **Preference of illustrations vs. realistic images?** Realistic; Depends on accuracy of symbols.
6. **Other comments:** The bigger the better - # of options not a priority for me; Generic pictures may be better - just a soda can instead of Coca Cola

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd try	2nd try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** No, No, but the participant became cognizant of their mistake after each try.
3. **How far did the participant hold the PDA away from them?** 9"
4. **Did they have difficulty finding/using the button?** A little..had difficulty holding it down. Did not get frustrated; recognized problem. Did not wait for beep until second time on long phrase. Left hand and left thumb used for operating PDA - right hand used for balance.
5. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	1st try	N/A(5)

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 2 times
4. **Other comments:** Knew can barcode was the wrong way. Tried can on table and PDA perpendicular to table.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	N/A(6)	N/A(11)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**
3. **Other comments:** Left hand held PDA, Right hand held pencil. All objects on the table. Not working. Speed has something to do with it.

Other comments

- **Easiest task? Why?** Button press - nothing to do but follow what you see
- **Most difficult task? Why?** Pencil scanning - it doesn't quite work. Wouldn't use it. Would use first 4 tasks though
- **Would you use a cellphone...**
  - In public? No
  - In front of your friends? No
  - In a restaurant? No...only used in case of emergencies
- **If you owned a PDA, would you use a PDA...**
  - In public? Yes...primary reason for carrying it is to use it
  - In front of your friends? Not unless acceptable (i.e. meeting)
  - In a restaurant? No
- **If you owned a PDA, where would you keep it?**

- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** No
- **Do you see yourself purchasing a PDA in the future?** Maybe, if working it would be handy. Likes the recording feature.
- **Any comments or questions?**

H.3 Participant 3

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - right hand holds PDA, left index finger selects buttons
3. **How far did the participant hold the PDA away from them?** 1'
4. **Other comments:** 5 way navigator confusing, but got it. Thought it was weird

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm
2. **Smallest icon size participant can see:(5-25mm)**5mm
3. **How far did the participant hold the PDA away from them?**1'
4. **Did participant notice we used illustrations and realistic images?**No
5. **Preference of illustrations vs. realistic images?** Realistic
6. **Other comments:**Glare problems

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 6"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:**Thought she talked too soon for, "OK message" (short),but it recorded all of it.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	1st try	N/A(14)

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 3 times

4. **Other comments:** Did not recognize pictures on PDA buttons until she read about clock and calendar on task sheet...then it made sense. 1 hand - left hold and left thumb. Likes the read light feedback. Was scanning barcode the wrong way (parallel to the lines), but then thought of her own memory devices...make sure she can read the numbers when she is scanning the barcode.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	4th try	N/A(25)	N/A(31)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No practice
3. **Other comments:**Tried scanning diagonally. Held the pencil backwards at first. Having difficulty with the button because of nails. Has tendency to move off barcode as running pen across it. Looking for the light to tell her if it is scanning or not.

Other comments

- **Easiest task? Why?** Button press - nothing to it
- **Most difficult task? Why?** Pencil scanning - because I wasn't successful
- **Would you use a cellphone...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Maybe
- **If you owned a PDA, would you use a PDA...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Maybe
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** No
- **Do you see yourself purchasing a PDA in the future?** Maybe, wants to look into them more
- **Any comments or questions?** May have arthritis - kept wringing hands and describing joint pain.

H.4 Participant 4

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 - left hand hold PDA, right index finger select buttons. At first rested PDA on lap
3. **How far did the participant hold the PDA away from them?** 2'
4. **Other comments:**

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 25mm
2. **Smallest icon size participant can see:(5-25mm)**15mm
3. **How far did the participant hold the PDA away from them?** 1.5'
4. **Did participant notice we used illustrations and realistic images?**No
5. **Preference of illustrations vs. realistic images?** Both are clear - no preference
6. **Other comments:** Does not like salt and pepper icon

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** 1 hand - left hand held, left thumb pressed - rest hand on table then lift PDA toward self. needed more explanation of what to say when.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	1st try	N/A(23)

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved objects
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 time
4. **Other comments:** Practiced aiming scanner on hand. Moved can instead of handheld...waved PDA across barcode (incorrectly) "This is a hard one" - in regards to the can.

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	9th try	N/A(>10)	N/A(>5)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No practice
3. **Other comments:** Changed the hand that held PDA from right to left (dominant to non-dominant) - got it when held the book and put the PDA on the table.

Other comments

- **Easiest task? Why?** button press - able to do it
- **Most difficult task? Why?** Pencil scanner - couldn't do it
- **Would you use a cellphone...** No cell phone
  - In public?
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, would you use a PDA...** No need for a PDA
  - In public?
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?**
- **Do you see yourself purchasing a PDA in the future?**
- **Any comments or questions?**

H.5 Participant 5

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - held with left and pressed with right
3. **How far did the participant hold the PDA away from them?** 1'
4. **Other comments:** Not sure about first 5-way up picture, but then realized button was a "toggle button" after saw the right, left 5-way pictures.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm
2. **Smallest icon size participant can see:(5-25mm)**5mm
3. **How far did the participant hold the PDA away from them?** 1.5'
4. **Did participant notice we used illustrations and realistic images?** no
5. **Preference of illustrations vs. realistic images?** Realistic is more clear
6. **Other comments:** Angle of incidence is important - glare problems; Could do smaller icons later after learning meaning of each icon (smaller icon = less pointer movement)

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?**6"
4. **Did they have difficulty finding/using the button?** no...but thought headphone jack was the microphone
5. **Other comments:** 1 hand - left thumb on button; held with left hand

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	2nd try	5th try

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA moved
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 time
4. **Other comments:** Left hand held item; Right hand held PDA - participant does not frustrate easily

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	N/A(10)	N/A(10)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**
3. **Other comments:** Kept trying to get pretzels. Not clear which end to scan with (tried back end). Left holding item; right hand holding pencil. Can try various speeds; angles; directions...it doesn't work. Wants feedback if it works. Fast enough and often enough maybe I'll get something...wonders if ambient light has something to do with it.

Other comments

- **Easiest task? Why?** Button press - task is clearly defined; know what to do
- **Most difficult task? Why?** Pencil scanner...inability to complete task
- **Would you use a cellphone...**
  - In public? No
  - In front of your friends? No
  - In a restaurant? No
- **If you owned a PDA, would you use a PDA...**
  - In public? Would if he had to...but make sure it is not obtrusive
  - In front of your friends? Yes...if not an intrusion
  - In a restaurant?

  yes if not an intrusion
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?**
- **Do you see yourself purchasing a PDA in the future?** Maybe
- **Any comments or questions?**

H.6 Participant 6

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	1	0	0	0	0	0	1	0	0

2. **Did the participant use two hands or one hand?** 2 hand - left hand held PDA, right hand pushed buttons
3. **How far did the participant hold the PDA away from them?** 7”
4. **Other comments:** 5-way navigator confusing

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 10mm
2. **Smallest icon size participant can see:(5-25mm)** 10mm
3. **How far did the participant hold the PDA away from them?** 7”
4. **Did participant notice we used illustrations and realistic images?** no
5. **Preference of illustrations vs. realistic images?** Realistic because these images are used in everyday life
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** yes
3. **How far did the participant hold the PDA away from them?** 8”
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	2nd try	3 try

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved Object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 9 times
4. **Other comments:**

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3 tries	N/A(15)	N/A(17)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**
3. **Other comments:** At first participant hovered scanner over UPC. Thought perhaps putting can under table may help because it may not be scanning because of light bouncing off of reflective surface. Can’t reproduce the same 4 bogus numbers occasionally got no matter speed, direction - it’s just pure luck

Other comments

- **Easiest task? Why?** Icon size - it's just looking
- **Most difficult task? Why?** Pen scanning - could not make it respond
- **Would you use a cellphone...**
  - In public? Yes - wouldn't care who is looking
  - In front of your friends? Yes
  - In a restaurant? Yes,as long as not irritating
- **If you owned a PDA, would you use a PDA...** Would not own PDAx
  - In public?
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, where would you keep it?**
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?**
- **Do you see yourself purchasing a PDA in the future?** No, no use for it
- **Any comments or questions?**

H.7 Participant 7

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands - right hand pressed buttons
3. **How far did the participant hold the PDA away from them?** 8"
4. **Other comments:** Did it very fast

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 20mm - it would be larger - easier to see on screen
2. **Smallest icon size participant can see:(5-25mm)** 15mm
3. **How far did the participant hold the PDA away from them?** 8"
4. **Did participant notice we used illustrations and realistic images?** no
5. **Preference of illustrations vs. realistic images?** Realistic
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes, but let up a little too soon. But learned about not letting the button go too soon on the medium length phrase
3. **How far did the participant hold the PDA away from them?** 4-5"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** 2 and - left thumb; right hand held bottom right corner for balance

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	1st try	1st try

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 4 times
4. **Other comments:** Did it with one hand after a few tries (dominant hand)

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	N/A(15)	N/A(10)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 time
3. **Other comments:** Varied speed to see if it would work

Other comments

- **Easiest task? Why?** Button press - obvious; easy to do
- **Most difficult task? Why?** Pen Scanner - couldn't get it to work
- **Would you use a cellphone...** Does not own cell phone
  - In public?
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, would you use a PDA...**
  - In public? Yes
  - In front of your friends? Yes
  - In a restaurant? Yes if he had a need for it...but not use it like some use their cell phones (talking on phone instead of with company)
- **If you owned a PDA, where would you keep it?** A little heavy to keep in pocket...not sure where to keep it.
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** Maybe interested...could help diabetics
- **Do you see yourself purchasing a PDA in the future?** Mabye...I would put it in my car if it had maps on it and could keep mileage data. If I could transfer photos with it...but they are too much money now.
- **Any comments or questions?**

H.8 Participant 8

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	1

2. **Did the participant use two hands or one hand?** 2 hands - right thumb selects;
3. **How far did the participant hold the PDA away from them?** 8"
4. **Other comments:** unsure of 5-way navigator

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 20mm
2. **Smallest icon size participant can see:(5-25mm)**10mm
3. **How far did the participant hold the PDA away from them?** 8"
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** Realistic are better
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd time	N/A	N/A

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** no - participant thought she was pressing the button but did not. Participant was hearing impaired and could not hear the beep or played back message.
3. **How far did the participant hold the PDA away from them?** 6"
4. **Did they have difficulty finding/using the button?** Yes
5. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	7th try	N/A(4)

2. **Did participant move the object or PDA to get the PDA to scan the object?**Moved object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**4 times
4. **Other comments:** You never know when you are going to get it. Tried scanning parallel to barcode lines (incorrect)

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	N/A(12)	N/A(0)	N/A(0)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**
3. **Other comments:** Participant has nails - difficult to press buttons; participant did not get to scan the book and did not try the other two items

Other comments

- **Easiest task? Why?** Button press - easy to follow
- **Most difficult task? Why?** Pencil scanner - could not keep the light on...likes visual feedback
- **Would you use a cellphone...**

    - In public? Yes
    - In front of your friends? Yes
    - In a restaurant? Yes
  - **If you owned a PDA, would you use a PDA...** Would not own a PDA
    - In public?
    - In front of your friends?
    - In a restaurant?
  - **If you owned a PDA, where would you keep it?**
  - **Would you be interested in using a PDA to keep track of your dietary/caloric intake?**
  - **Do you see yourself purchasing a PDA in the future?**
  - **Any comments or questions?** Heard the socket beep when scanned item, but not the voice recorder beep

H.9 Participant 9

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand (right hand)
3. **How far did the participant hold the PDA away from them?** 1.5'
4. **Other comments:** She did it easily

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 25mm
2. **Smallest icon size participant can see:(5-25mm)** 15mm
3. **How far did the participant hold the PDA away from them?** 1.5'
4. **Did participant notice we used illustrations and realistic images?**
5. **Preference of illustrations vs. realistic images?** No
6. **Other comments:** Illustrations because sharper and just as clear as pictures

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Did not press entirely the first time but got it
3. **How far did the participant hold the PDA away from them?** 2'
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** 2 hand - left hold; right index press button

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	2nd try	20th try

2. **Did participant move the object or PDA to get the PDA to scan the object?**Moved object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 2 times
4. **Other comments:** Felt like she was at the super market

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	32nd try	N/A(24)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)**
3. **Other comments:** If it had a bigger button I would do better; Did not get frustrated because I did the best I could. Feared she may puncture pretzels bag. Having difficulty keeping button depressed because of nails. She enjoys this.

Other comments

- **Easiest task? Why?** All easy...enjoyed trying different stuff
- **Most difficult task? Why?** Pencil scanning because she could not get the can.
- **Would you use a cellphone...**
  - In public? No, don't impose on friends... for all three questions
  - In front of your friends?
  - In a restaurant?
- **If you owned a PDA, would you use a PDA...**
  - In public? Maybe, but not ordinarily
  - In front of your friends? Sure
  - In a restaurant? Might....but limit what she'd do in public...don't impose on friends
- **If you owned a PDA, where would you keep it?** Purse
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** If she had it,she would use it. But wouldn't buy it.
- **Do you see yourself purchasing a PDA in the future?** Yes
- **Any comments or questions?** She does not consider herself a technical person...her husband is the technical person. Oddly enough, after the usability test she said she could see herself buying a PDA, but her husband did not want a PDA.

H.10 Participant 10

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hand - left hand held bottom corner; right index finger selected buttons
3. **How far did the participant hold the PDA away from them?** 1.25'
4. **Other comments:**

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 15mm
2. **Smallest icon size participant can see:(5-25mm)**5mm - would use smaller icon as participant became more familiar with icons
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** yes
5. **Preference of illustrations vs. realistic images?** Realistic because easier to identify
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 8"
4. **Did they have difficulty finding/using the button?** No
5. **Other comments:** Just had lung surgery, but was able to do it. 2 hands.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	5th try	7th try

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** None
4. **Other comments:** Holding scanner weird...had wrist in awkward position. Tried using left hand at first, then used right hand and was successful

Task 5: Baracoda Pencil Scanner

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	5th try	N/A(20)	N/A(11)

2. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No practice
3. **Other comments:** Holding scanner odd...not like a pencil. Confusion over scanning numbers and scanning lines.

Other comments

- **Easiest task? Why?** Button press because used to pressing buttons...similar to pressing computer buttons
- **Most difficult task? Why?** Scanning pencil...could not get results
- **Would you use a cellphone...** Don't own cell phone

    - In public?
    - In front of your friends?
    - In a restaurant?
- **If you owned a PDA, would you use a PDA...** Don't know what a PDA would be used for
    - In public? No, not needed
    - In front of your friends? No, not needed
    - In a restaurant? No, not needed
- **If you owned a PDA, where would you keep it?** Wouldn't own one
- **Would you be interested in using a PDA to keep track of your dietary/caloric intake?** No
- **Do you see yourself purchasing a PDA in the future?** No
- **Any comments or questions?**

I Dialysis Patient Participant Datasheets

I.1 Participant 1

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand - Left hand held PDA, right index finger pressed buttons.
3. **How far did the participant hold the PDA away from them?** 1'5"
4. **Other comments:** Participant confused about top of 5-way navigator

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 25mm - The larger the better; details are easier to see.
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** Doesn't matter as long as I can make them out.
6. **Other comments:** Thought egg illustration (5mm) looked like a peanut.

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	Tried 3 times - unsuccessful	Yes	Yes

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Not for the short phrase, but did for the other phrases.
3. **How far did the participant hold the PDA away from them?** 6"
4. **Did they have difficulty finding/using the button?** No
5. **Long Phrase:** I ate steak and fresh vegetables.
6. **Other comments:** Participant normally eats only 2 meals a day.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	4th try	8th try

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA moved
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 time
4. **Other comments:**

Other comments

- **Easiest task? Why?** Icon Size because identifying food is easy.
- **Most difficult task? Why?** Scanning the can was difficult, but with practice I could do it.
- **Any comments or questions?** If I were to use the scanner application. I buy my cans of coke in a box of 24...would I scan the box or the individual can? I don't eat much with barcodes...I eat frozen vegetables (remember to teach individuals that barcodes are on frozen foods).

I.2 Participant 2

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands.
3. **How far did the participant hold the PDA away from them?** 8"
4. **Other comments:** Top of 5-way navigator confused participant. Participant tried to press the plastic around the 5-way navigator instead of the button.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 15mm - The bigger the better.
2. **Smallest icon size participant can see:(5-25mm)** 10mm
3. **How far did the participant hold the PDA away from them?** 2'
4. **Did participant notice we used illustrations and realistic images?** no
5. **Preference of illustrations vs. realistic images?** No preference
6. **Other comments:** Thought banana was a melon rind.

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** yes
3. **How far did the participant hold the PDA away from them?** 4-6"
4. **Did they have difficulty finding/using the button?** No
5. **Long Phrase:** I ate fried chicken, salad, and corn.
6. **Other comments:** Participant eats 1 meal a day.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	3rd try	3rd try	3rd try

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 time
4. **Other comments:** New technique...participant used right hand. Rested PDA on pillow, pressed button, and then scanned the item.

Other comments

- **Easiest task? Why?** Icon size because recognizing food is easy.
- **Most difficult task? Why?** None, all of it was really easy.
- **Any comments or questions?** None of it was difficult except looking at tiny food (5mm). Dialysis patients are told by dieticians to only drink clear colored sodas, but participant prefers koolaid or water. Participant does not think canned vegetables or frozen vegetables have barcodes on them.

I.3 Participant 3

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 2 hands
3. **How far did the participant hold the PDA away from them?** 8”
4. **Other comments:**

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 25mm - just likes the biggest
2. **Smallest icon size participant can see:(5-25mm)** 10mm (could read half of 5mm)
3. **How far did the participant hold the PDA away from them?** 8”
4. **Did participant notice we used illustrations and realistic images?**No
5. **Preference of illustrations vs. realistic images?** No
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** No, but learned after the first attempt.
3. **How far did the participant hold the PDA away from them?** 4”
4. **Did they have difficulty finding/using the button?** No
5. **Long Phrase:**
6. **Other comments:** Used left hand (non-dominant hand) because dialysis need was in right arm.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	2nd try	2nd try

2. **Did participant move the object or PDA to get the PDA to scan the object?**PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 practice
4. **Other comments:** Participant noticed quickly had to play with distance to get scanner to work.

Other comments

- **Easiest task? Why?** Button press because it told me what to do.
- **Most difficult task? Why?** Nothing was difficult.
- **Any comments or questions?** Eats lot of food with barcodes.

I.4 Participant 4

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	1	1	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand - Right hand held PDA, Right thumb selected buttons.
3. **How far did the participant hold the PDA away from them?** 8”
4. **Other comments:**

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 20mm - Can see it better.
2. **Smallest icon size participant can see:(5-25mm)** 10mm
3. **How far did the participant hold the PDA away from them?** 1’
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** No
6. **Other comments:**Only identified broccoli correctly on 5mm screen (tomato, ? , nut, broccoli)

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** yes
3. **How far did the participant hold the PDA away from them?** 6”
4. **Did they have difficulty finding/using the button?**No
5. **Long Phrase:**
6. **Other comments:** Participant eats 3 meals.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	1st try	Gave up after 6 tries

2. **Did participant move the object or PDA to get the PDA to scan the object?**PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 practice
4. **Other comments:** Participant wished there was a way to punch in the barcode like they do at the market when the soda can would not scan.

Other comments

- **Easiest task? Why?** All were easy. (Would not identify one task)
- **Most difficult task? Why?** Nothing was difficult...scanning just would not work sometimes (i.e. can).
- **Any comments or questions?**

I.5 Participant 5

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	6	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** Right hand held PDA, right thumb pressed buttons.
3. **How far did the participant hold the PDA away from them?**
4. **Other comments:** The six errors should not be counted because participant was confused...the participant thought you just had to continue to press the middle button to get to the next screen.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 20 - The bigger, the better.
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?** 8”
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** No preference.
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 6”
4. **Did they have difficulty finding/using the button?** No
5. **Long Phrase:**
6. **Other comments:** Participant eats 2-2.5 meals per day.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	1st try	5th try

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 1 practice
4. **Other comments:**

Other comments

- **Easiest task? Why?** All of it was easy. Everything told me what to do.
- **Most difficult task? Why?** Nothing was difficult.
- **Any comments or questions?** Everything was easy because I take directions well, you just have to tell me what to do. Interested in study, but would not buy a PDA.

I.6 Participant 6

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand - Right hand held PDA, right thumb pressed buttons.
3. **How far did the participant hold the PDA away from them?**
4. **Other comments:** Dialysis needle in left hand.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 15mm **-** Don't need my glasses to read these.
2. **Smallest icon size participant can see:(5-25mm)** 10mm
3. **How far did the participant hold the PDA away from them?** 2'
4. **Did participant notice we used illustrations and realistic images?** Yes
5. **Preference of illustrations vs. realistic images?** Realistic because I can see details better.
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** No, but learned on next phrase.
3. **How far did the participant hold the PDA away from them?** 4"
4. **Did they have difficulty finding/using the button?** No
5. **Long Phrase:**
6. **Other comments:** Participant eats 2-3 meals each day.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	1st try	3rd try

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA

3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 2 practices with book; 2 practices with chips; took 5 tries before successfully scanning can after first success.
4. **Other comments:**

Other comments

- **Easiest task? Why?** All were easy.
- **Most difficult task? Why?**
- **Any comments or questions?** Interested in using a PDA in the future. Smaller people do not have to worry about fluid intake. Uses memory to remember what he is eating, but has difficulties remembering. Dialysis screws up your appetite... I try to eat, but I can't finish it...food does not taste like it used to.

I.7 Participant 7

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	2	0	0	0	0	1	2	2

2. **Did the participant use two hands or one hand?** 1 hand - left hand (non dominant)
3. **How far did the participant hold the PDA away from them?**
4. **Other comments:** Confused by the top and bottom 5-way navigator buttons.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 15mm - I just would.
2. **Smallest icon size participant can see:(5-25mm)** 15mm
3. **How far did the participant hold the PDA away from them?**2'
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** Realistic - don't know why.
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd try	1st try	2nd try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** No, but learned on next tries.
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did they have difficulty finding/using the button?** No

5. **Long Phrase:** (Very long phrase...) I had grits with butter...I love butter, eggs, and I would eat cheese burgers...I love cheese burgers.
6. **Other comments:**Participant broke up long phrase into three parts to record entire message because of tremors (finger slipping off of button).She knew when her finger slipped off because of the audible beep (stop recording), so she pressed the button again and started where she left off. Participant eats 1-2 meals per day.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	1st try	2nd try	Unsuccessful - stopped after 8 tries

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 3 practices
4. **Other comments:** I had to hold the items for the participant because other arm had dialysis needle in it.

Other comments

- **Easiest task? Why?** Button press because it told me what to do.
- **Most difficult task? Why?** Nothing was hard.
- **Any comments or questions?** Participant cannot read. Participant has tremors (shaky hands). Not sure about using a PDA because she is scared of having one. Thinks her daughter would like it more than she. She does not keep track of what she eats...she just avoids a lot of stuff. This is one of the reasons she has lost over 70 pounds since she started dialysis treatment (she is a VERY thin woman).She doesn't eat a lot because food does not taste like it used to.

I.8 Participant 8

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	0	1	0	0	1	0	0	0

2. **Did the participant use two hands or one hand?** PDA was held in left hand, used right thumb to select buttons.
3. **How far did the participant hold the PDA away from them?** 7"
4. **Other comments:** Participant has shoulder shunt instead of a dialysis needle in an arm.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 20mm - Bigger is better.
2. **Smallest icon size participant can see:(5-25mm)** 5mm

3. **How far did the participant hold the PDA away from them?** 6”
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** Realistic images look clearer.
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	Medium Phrase	Long Phrase
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 8”
4. **Did they have difficulty finding/using the button?**No
5. **Long Phrase:**
6. **Other comments:** Mostly eats 2 meals, but sometimes only eats 1 meal.

Task 4: Socket Scanner Barcode

1.

	Book	Bag of Chips	Soda Can
Successful Completion?	1st try	1st try	Unsuccessful after >15 tries

2. **Did participant move the object or PDA to get the PDA to scan the object?** Moved object
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** 5 practices
4. **Other comments:**

Other comments

- **Easiest task? Why?** Button press because it told me what to do.
- **Most difficult task? Why?** Scanning the can of soda because it wouldn’t read it...not really difficult, more frustrating.
- **Any comments or questions?** Participant does not monitor dietary intake. Participant would be interested in study.

I.9 Participant 9

Task 1: Button Press

1.

	1	2	3	4	5	6	7	8	9
# Errors	0	2	0	0	0	0	0	0	0

2. **Did the participant use two hands or one hand?** 1 hand - Left hand held PDA, right index finger pushed buttons.
3. **How far did the participant hold the PDA away from them?** 6”
4. **Other comments:**

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 15mm - Easier to see.
2. **Smallest icon size participant can see:(5-25mm)** 5mm
3. **How far did the participant hold the PDA away from them?** 1'
4. **Did participant notice we used illustrations and realistic images?** No
5. **Preference of illustrations vs. realistic images?** No preference
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	1st try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?** Yes
3. **How far did the participant hold the PDA away from them?** 6"
4. **Did they have difficulty finding/using the button?** No
5. **Long Phrase:**
6. **Other comments:** Participant eats 3 meals a day.

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	3rd try	Unsuccessful after >10 tries

2. **Did participant move the object or PDA to get the PDA to scan the object?** Right hand held PDA as participant moved objects with left hand.
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No practice.
4. **Other comments:**

Other comments

- **Easiest task? Why?** All easy.
- **Most difficult task? Why?**
- **Any comments or questions?** Would be fun to monitor dietary intake with a PDA. Participant has been diabetic since the age of seven. He uses a glucometer to help him with his glucose intake.

I.10 Participant 10

Task 1: Button Press

1.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
# Errors	0	1	5	14	6	50	3	6	3

2. **Did the participant use two hands or one hand?** 2 handed - right arm has dialysis needle.
3. **How far did the participant hold the PDA away from them?** 8"
4. **Other comments:** 5-way navigator (all 5 buttons) confused the participant. When participant was confused, she just kept pressing buttons instead of looking at the button configuration.

Task 2: Pictures

1. **Preferred icon size: (5-25mm)** 20mm
2. **Smallest icon size participant can see:(5-25mm)**10mm
3. **How far did the participant hold the PDA away from them?**8”
4. **Did participant notice we used illustrations and realistic images?** no
5. **Preference of illustrations vs. realistic images?** No preference
6. **Other comments:**

Task 3: Recording Speech

1.

	Short Phrase	**Medium Phrase**	**Long Phrase**
Successful Completion?	2nd try	1st try	1st try

2. **Did participant wait for beep? If not, did they wait for beep on next phrases?**No, but learned on second attempt.
3. **How far did the participant hold the PDA away from them?** 6”
4. **Did they have difficulty finding/using the button?** No
5. **Long Phrase:**
6. **Other comments:**

Task 4: Socket Scanner Barcode

1.

	Book	**Bag of Chips**	**Soda Can**
Successful Completion?	2nd try	5th try	Unsuccessful after >10 tries

2. **Did participant move the object or PDA to get the PDA to scan the object?** PDA
3. **How long did the participant practice scanning the book before going on to the next two tasks? (# of scans?)** No practice
4. **Other comments:**

Other comments

- **Easiest task? Why?** Icon size was easy because easy to read pictures.
- **Most difficult task? Why?** Scanning soda can was difficult because it would not work.
- **Any comments or questions?**

J IRB Application for Study 1

INDIANA UNIVERSITY
BLOOMINGTON CAMPUS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

DOCUMENTATION OF REVIEW AND APPROVAL
of
Research Project Utilizing Human Subjects

Study # 04-8840

TITLE OF PROJECT Personal Digital Assistant Usability Testing

PROJECT DURATION - START DATE 02/10/2004 END DATE 03/15/2004

PRIN. INVESTIGATOR Katie A. Moor SCHOOL/DEPARTMENT Computer Science Department

ADDRESS 150 S. Woodlawn Ave. LH 305 E-MAIL kmoor@cs.indiana.edu PHONE (812) 855-8992

RANK: Faculty ___ Res. Scientist ___ Post-Doc ___ Staff ___ Student: undergrad ___ masters ___ PhD/EdD X

If PI's rank is OTHER than faculty, name of faculty overseeing the research (SPONSOR) Kay Connelly

SPONSOR'S E-MAIL & CAMPUS ADDRESS connelly@cs.indiana.edu, 150 S. Woodlawn Ave. LH 301 PHONE 855-0739

FUNDING AGENCY N/A APPL. DEADLINE N/A

AGENCY PROJECT# _______ New _____ Continuation ____

As the principal investigator, my signature testifies that I pledge to conform to the following:

As one engaged in investigation utilizing human subjects, I acknowledge the rights and welfare of the human subject involved.

I acknowledge my responsibility as an investigator to secure the informed consent of the subject by explaining the procedures, in so far as possible, and by describing the risks as weighed against the potential benefits of the investigation.

I assure the Committee that all procedures performed under the project will be conducted in accordance with those Federal regulations and University policies which govern research involving human subjects. **Any deviation from the project (e.g., change in principal investigator, research methodology, subject recruitment procedures, etc.) will be submitted to the Committee in the form of an amendment for its approval prior to implementation.**

PRINCIPAL INVESTIGATOR:

Katie A. Moor 02/06/2004
(typed/printed name) (signature) (date)

As the faculty sponsor, my signature testifies that I have reviewed this application and that I will oversee the research in its entirety, through the termination report.

FACULTY SPONSOR:

Kay Connelly 02/06/2004
(typed/printed name) (signature) (date)

****

CAMPUS LEVEL REVIEW

This protocol for the use of human subjects has been reviewed and approved by the Indiana University/Bloomington Campus Committee for the Protection of Human Subjects.

_____ Exempt Review ¶#_____, _____ Exempt ¶# _____ with signed/documentation of consent,

_____ Expedited Review, _____ Full Review, _____ Not Approved, _____ Withdrawn

Chairperson/Agent IUB Committee Date

logged in ts __________ approval logged ______ copy to PI __________ notice to SOE __________ rank code __________

test: PI __________ sponsor ____________ co-PI ______________

BLOOMINGTON CAMPUS COMMITTEE for the PROTECTION OF HUMAN SUBJECTS

EXPEDITED/FULL REVIEW CHECKLIST

DIRECTIONS: This form is to be completed and submitted to the Committee when the investigator plans a research project which, in the investigator's judgment, requires expedited or full Committee review. Items 1-7 are the categories which **may** qualify for expedited review. ***If "yes" is the response to any of items 10-13, the study will most likely require full Committee review.***

STUDIES INVOLVING *minors, pregnant women, fetuses, prisoners, persons with mental disabilities and economically or educationally disadvantaged persons* **MAY**, IN THE DISCRETION OF THE CHAIR, REQUIRE FULL COMMITTEE REVIEW.

APPLICABILITY:

(A) Research activities that (1) present no more than minimal risk to human subjects, and (2) involve ONLY procedures listed in one or more of the following categories, may be reviewed by HSC through the expedited review procedures authorized by 45 CFR 46.110 and 21 CFR 56.110. The activities listed should not be deemed to be of minimal risk simply because they are included on this list. Inclusion on this list merely means that the activity is eligible for review through the expedited review procedures when the specific circumstances of the proposed research involve no more than minimal risk to human subjects.

(B) The categories in this list apply regardless of the age of subjects, except as noted.

(C) The expedited review procedure may not be used where identification of the subjects and/or their responses would reasonably place them at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, insurability, reputation, or be stigmatizing, unless reasonable and appropriate protections will be implemented so that risks related to invasion of privacy and breach of confidentiality are no greater than minimal.

(D) The expedited review procedure may not be used for classified research involving human subjects.

(E) The standard requirements for informed consent (or its waiver, alteration, or exception) apply regardless of the type of review.

CIRCLE THE APPROPRIATE CATEGORY NUMBERS THAT APPLY TO YOUR RESEARCH PROJECT AND UNDERLINE, OR HIGHLIGHT, THE SPECIFIC SECTION WITHIN EACH CATEGORY.

1. Clinical studies of drugs and medical devices only when condition (a) **OR** (b) is met.

   (a) Research on drugs for which an investigational new drug application (21 CFR Part 312) is not required. (Note: Research on marketed drugs that significantly increases the risks or decreases the acceptability of the risks associated with the use of the product is not eligible for expedited review.)

   (b) Research on medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.

2. Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture **as follows**:

   (a) from healthy, nonpregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550ml in an 8 week period and collection may not occur more frequently than 2 times per week; **OR**

   (b) from other adults and children* considering the age, weight, and health of the subjects, the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

3. Prospective collection of biological specimens for research purposes by noninvasive means.

   Examples of biological specimens: (a) Hair and nail clippings in a nondisfiguring manner; (b) deciduous teeth at time of exfoliation or it routine patient care indicates a need for extraction; (c) permanent teeth if routine patient care indicates a need for extraction; (d) excreta and external secretions (including sweat); (e) uncannulated (not by a tube inserted into the mouth) saliva collected either in an unstimulated fashion or stimulated by chewing gumbase or wax or by applying a dilute citric solution to the tongue; (f) placenta removed at delivery; (g) amniotic fluid obtained at the time of rupture of the membrane prior to or during labor; (h) supra- and subgingival dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the process is accomplished in accordance with accepted prophylactic techniques; (i) mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings; (j) sputum collected after saline mist nebulization.

4. Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications.)

   Examples of procedures: (a) Physical sensors that are applied either to the surface of the body or at a distance and do not involve input of significant amounts of energy into the subject or an invasion of the subject's privacy; (b) weighing or testing sensory acuity; (c) magnetic resonance imaging; (d) electrocardiography, electroencephalography, thermography, detection of naturally occurring radioactivity, electroretinography, ultrasound, diagnostic infrared imaging, doppler blood flow, and echocardiography; (e) moderate exercise, muscular strength testing, body composition assessment, and flexibility testing where appropriate given the age, weight, and health of the individual.

5. Research involving materials (data, documents, records, or specimens) that have been collected or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis). (Note: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(4). This listing refers only to research that is not exempt.)

[✓ 6.] Collection of data from voice, video, digital, or image recordings made for research purposes.

[✓ 7.] Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (Note: Some research in this category may be exempt from the HHS regulations for the protection of human subjects 45 CFR 46.101 (b)(3). This listing refers only to research that is not exempt.)

[✓ 8.] Use of minors under age 18, or economically or educationally disadvantaged persons.

9. Use of deception. (See item 14 on page 11.)

10. ***Use of prisoners, pregnant women, fetuses, the seriously ill, or persons with mental disabilities, or incompetent individuals.***

11. ***Collection of information or recording of behavior which, if known outside of the research, could reasonably place the subject at risk of civil or criminal liability or damage the subject's financial standing, employability, insurability, reputation, or be stigmatizing.***

12. ***Collection of information regarding sensitive aspects of the subject' s behavior such as drug and alcohol use, illegal conduct, or sexual behavior.***

13. ***This project includes procedures that present more than minimal risk to the subject.***

14. This project includes procedures not listed above.

* Children are defined in the HHS regulations as "persons who have not attained the legal age for consent to treatments or procedures involved in the research, under the applicable law of the jurisdiction in which the research will be conducted." 45 CFR 46.402(a).

BLOOMINGTON CAMPUS COMMITTEE for the PROTECTION OF HUMAN SUBJECTS

SUMMARY SAFEGUARD STATEMENT

Project Title (if you wish to use a different title in the consent statement than is listed on page 3, explain here):

IF ADDITIONAL SPACE FOR RESPONSES IS DESIRED, THIS DOCUMENT MAY BE RETYPED ONTO PLAIN PAPER MAINTAINING THE IDENTICAL ORDER AND EXACT QUESTION WORDING WHILE ADDING EXTRA SPACE WHERE NEEDED.

Do not type on the reverse side of any form.
Use type size no smaller than ARIAL 11 or TIMES NEW ROMAN 12 point.

A. **Briefly describe, in lay terms, the general nature and purpose of the proposed research, and where the study will take place. If student research, indicate whether for a course, thesis, dissertation, or independent research. If the study is only for a course, please review the Student Research Policy to ascertain if this project requires HSC review.**

The purpose of this study is to gather information about the usability of personal digital assistants (small recording devices that fit in the palm of your hand) from people in different age groups. Using participants in different age groups will show us if personal digital assistant applications should be designed differently based on the target user group's dexterity and vision. We will conduct the test using a think-aloud usability technique. The participants will discuss what they are thinking while completing some personal digital assistant tasks (i.e. pushing buttons, selecting icons on a screen, etc.).

The study will be conducted in Lindley Hall room 305 for our first three age groups (15-18 years old, 25-30 years old, and 50-55 years old) and the non-denominational chapel at Bell Trace's Senior Living Community for our fourth age group (75-85 years old). Bell Trace's Senior Living Community is located at 725 Bell Trace Circle, Bloomington, Indiana 47408. We have contacted the activities coordinator, Kathy Aiken ((812) 323-2858) for permission to conduct our study at Bell Trace.

The results will be used for Katie Moor's independent research. The goal of her independent research project is to publish the results at a conference or in a technical report. The results will also be document in her PhD dissertation.

B. **Describe the process by which subjects will be recruited (see item F on page 2), how many (or estimate) subjects will be involved in the research, and how much time will be required of them. List specific eligibility requirements for subjects (or describe screening procedures), including those criteria that would exclude otherwise acceptable subjects. If your study uses only male or female subjects, explain why. For NIH-funded research only, address the inclusion of women, minorities and children in the research. Disclose any relationship between researcher and subjects - such as, teacher/student; superintendent/principal/teacher; employer/employee (see Students as Subjects section in the Policy Manual).**

We will evaluate 4 age groups (15-18 years old, 25-30 years old, 50-55 years old, and 75-85 years old) depending on time availability and willing participants. Ideally 10 participants from each age group will be involved in the study. The entire session should last no more than 1 hour.

Participants will be recruited via flyers, email, and presentations. We will post flyers and email participants in the first three age groups. Flyers and consent forms will be sent home with students (15-18 years old) to give parents and legal guardians ample time to review the material together. We will recruit participants 75-85 years old at Bell Trace's Senior Living Community by posting flyers and holding a short presentation in the non-denominational chapel at Bell Trace on March 2, 2004 at 2:30pm.

Participants will be excluded if they own a personal digital assistant because they will be too familiar with the personal digital assistant's functionality.

C. **Check appropriate box for type of vulnerable subject population involved when investigation specifically studies:**
[X] minors (under age 18), [_] fetuses, [_] pregnant women, [_] persons with mental disabilities, [_] prisoners, [_] persons with physical disabilities, [_] economically or educationally disadvantaged, [_] other vulnerable population.

If any of the above are used, state the necessity for doing so. Please indicate the approximate age range of the minors to be involved.

We want to test people15-18 years olds to see if there are any noticeable differences in dexterity and vision when using a personal digital assistant as compared with older age groups.

D. **List all procedures to be used on human subjects or describe what subjects will do. If done during regular class time, explain what non-participants will do. If you are taping, explain that here (see item 13 on page 11). *Asterisk* those you consider experimental. For those asterisked procedures, describe the usual method(s), if any, that were considered and why they were not used. (See item F on page 2 for more information.)**

A usability testing session will entail the following:

1. Completion of forms: Participants will complete the consent form and background questionnaire. The signed consent form (attached) is the only form that contains unique identification information such as the person's name. This form will be kept in separate files, thus there will be no direct mapping to the data collected in the questionnaires and the audio/video recordings. The background questionnaire (attached) is used to gather general information about the participants such as computer experience, vision, etc. Only a generic identifier is used for the form (i.e. Participant 1).
2. Performance test: The performance test consists of several task that the participants will be asked to accomplish while being observed. Participants will be asked to push personal digital assistant buttons, record a message with the personal digital assistant, scan a UPC with the personal digital assistant scanner, and select an icon on the screen. During the performance test, errors will be noted for each task. The test monitor will also make notes about relevant participant behavior and comments. The entire performance test will be videotaped. After each task, the participant will be asked to fill out a questionnaire documenting physical demand, frustration, and effort.
3. Debriefing: After the final questionnaire has been completed, participants may ask any final questions about the study. We will discuss how well the participant liked using the personal digital assistant and any problems one had completing the tasks. The discussion will be comprised of both close and open-ended questions. The purpose of this open dialogue is to get additional feedback about how the user feels about the personal digital assistant. Additional information about debriefing can be found in our session script (attached).

E. State the potential risks - for example, physical, psychological, financial, social, legal or other - connected with the proposed procedures.

Briefly describe how risks to subjects are reasonable in relation to anticipated benefits. Describe procedures for protecting against, or minimizing, potential risks. Assess their likely effectiveness. If you are using an electrical device that is attached directly to subjects explain how the subjects will be protected from shock.

There is no potential risk connected with participation in the usability testing session.

F. **Describe methods for preserving confidentiality. How will data be recorded and stored, with or without identifiers? If identifiers are used describe the type: names, job titles, number code, etc. How long are identifiers kept? If coding system is used, is there a link back to the subject's ID? If yes, where is the code list stored in relation to data and when is the code list destroyed?**

The session will be recorded using a digital video camera. The video capture will be of the personal digital assistant. No participants or observers will be captured on video. The participants' comments will be audio recorded via the video camera's audio input. The combination of audio and video will allow user comments (audio) to be contextualized in relation to the task being viewed (video) at the time the comment is made.

Material (tapes, notes, questionnaires) will not be directly associated with user information in any form. Documents such as questionnaires and notes will refer to the participant using a generic identifier, e.g. Participant #1. The consent forms will be saved in separate files. The video tape cassettes will only be identified with the date and title of the study. All materials will be kept in restricted access in the Computer Science department offices and will be made available only to the researchers of this study.

How will reports will be written, in aggregate terms, or will individual responses be described? Will subjects be identified in reports (see item 5 on page 10)?

In the report individual responses and quotations may be described as well as aggregate results. Subjects will not be identified by name in the report, but rather as "participant said such and such". The focus of usability reports is in aggregated data. Quotations, responses or observations are only noted for emphasis.

Describe disposition of tapes/films at the end of the study. If tapes are to be kept, indicate for how long and describe future uses of tapes.

The recordings will be transcribed for analysis and will be destroyed upon completion of the project, in April 2004.

G. **What, if any, benefit is to be gained by the subject? In the event of monetary gain, include all payment arrangements (amount of payment and the proposed method of disbursement), including reimbursement of expenses. If class credit will be given, list the amount and the value as it relates to the total points needed for an A. List alternative ways to earn the same amount of credit. If merchandise or a service is given, indicate the value. Explain the amount of partial payment/class credit if the subject withdraws prior to completion of the study. (See policy at http://www.indiana.edu/~resrisk/compensation.html)**

The benefit to the participants is simply to be involved with the future design of personal digital assistant applications. Participants will also be awarded with a gift of $10.00. If participants decide after reviewing the consent form that they do not wish to participate in the usability testing, they will not be awarded the gift. However, participants that continue on, even if they leave part way, will receive compensation. Participants will be able to discontinue their involvement or decline further participation at anytime with no penalty.

H. **What information may accrue to science or society in general as a result of this work?**

The findings from this study will help in the future design of personal digital assistant interfaces. Researchers create personal digital assistant applications for people in different age groups without thinking if the target group can use the personal digital assistant. This study will shed light on various age groups abilities to use personal digital assistants.

I. **Coinvestigators, Cooperating Departments, Cooperating Institutions. If there are multiple investigators, please indicate only one person on the Documentation of Review and Approval (page 3) as the principal investigator; others should be designated as coinvestigators here. Coinvestigators, not signing on page 3, should sign here, pledging to conform to the sentences on page 3. If you anticipate that another department or institution may be involved in this research, list that here. If you are working with another institution, please include a letter of cooperation from that institution.**

Co-Investigators:

- Yu-Hsiu Li (yuhli@indiana.edu)

Signature Date

- Dorrie Hutchinson (dohutchi@indiana.edu)

Signature Date

- Kelli Gehlhausen (kgehlhau@indiana.edu)

Signature Date

CONFLICT OF INTEREST - ADDENDUM TO APPLICATION PACKET

Effective 10/1/02

Please provide the following information as the last section of your research statement, regardless of the source of funding for the proposed research or the level of review:

1. Does anyone who will participate in the design, conduct, or reporting of the proposed research have a "significant financial interest," as defined in the University's Policy on Conflict of Interest, {http://www.indiana.edu/~resrisk/conflict.html} that is related to the subject matter of the research? If so, please describe the interest(s)

   NO

2. If the answer to (1) is yes, would that interest reasonably appear to affect, or be affected by, the design, conduct, or reporting of the proposed research? Please explain why or why not.
3. If the answer to (2) is yes, has this significant financial interest already been disclosed through a conflicts of interest disclosure form? If so, please append to this application a copy of the disclosure form and any other information indicating when and by whom the disclosure was reviewed, whether or not a conflict was identified, and if a conflict was identified, any steps taken to avoid, manage, resolve, and (where applicable under federal law) report that conflict. If a conflicts management plan was entered into, please attach a copy of that plan.

If a potential conflict of interest related to the proposed research is identified, based on external financial interests of the person(s) designing, conducting, or reporting the research, the Committee will work with the investigator(s) to develop appropriate language for the Informed Consent Statement or Study Information Sheet addressing the potential conflict.

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Below are examples of conflicts of interests in hypothetical situations where human subjects are involved. They may also raise general conflict of interest questions which would be handled pursuant to the campus procedures on conflicts of interests.

- X has a grant to conduct trials of a new hearing aid. The year before, X who designed the new hearing aid licensed the product to Clear as a Bell, Inc. In return, X received a 10% share of the Company. X has a conflict of interest: His financial interest in the business that makes the product may bias his research into its effectiveness. The conflict must be disclosed to the IRB, which may decide that X's conflict be disclosed to the subjects in the informed consent, and will need to consider whether or not any further conflicts management may be required.
- X, a faculty member at the School of Education, sets up a corporation to do educational testing of children with learning disorders. X is president of the corporation and owns 80% of the shares of the company. X had devised a new instrument and wishes to test its validity. Her protocol to the IRB states X will test children in a number of schools in the state. If the test proves to be effective, X intends to license use of the test to her corporation. X has conflict of interest. Her financial interest is significant. The IRB needs to know of the conflict so that it can determine whether or not the subjects (the children and the parents) need to be informed of the conflict of interest, and how to best monitor the conflict.
- X is a faculty member at HPER. X has developed a plan of exercise for obese adults. X's plan is set forth in his book on exercise. X has human subjects approval to run an exercise clinic for both therapeutic and research purposes. X requires participants to buy X's book and video-tape on exercise. X has a conflict of interest which needs to be disclosed to and evaluated by the IRB.
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INDIANA UNIVERSITY
BLOOMINGTON CAMPUS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

STUDY AMENDMENT
of
Research Project Utilizing Human Subjects

Study # 04-8840

NOTE TO INVESTIGATORS: Study amendments may not be instituted until written approval from the IUB Campus Committee for the Protection of Human Subjects has been given. Return this form to: HSC, Caramichael Center L03, 530 E. Kirkwood Ave., IUB. Please complete in a legible manner! This entire page MUST be on a single sheet of paper. Use this as a cover page and attach pages with the information requested in items 1 and 2.

TITLE OF PROJECT Personal Digital Assistant Usability Testing

PRIN. INVESTIGATOR Katie A. Moor SCHOOL/DEPARTMENT Computer Science Department

ADDRESS (campus or US) 150 S. Woodlawn Ave. LH 305 E-MAIL kmoor@cs.indiana.edu PHONE (812)855-8992

FUNDING AGENCY: N/A

****

PLEASE USE THIS AS A COVER PAGE.
ATTACH PAGES with the INFORMATION REQUESTED in items 1 and 2.

1. Describe the proposed change(s) and rationale for the change(s). Include any changes to project start and end dates. If submitting a revised questionnaire or survey, please include a copy **with** changes highlighted.

During business hours (9-5), we will be conducting our usability tests in the conference room in Lindley Hall room 215 so I do not disturb my fellow lab mates. If the conference room in Lindley Hall room 215 is not available, I will conduct the test in my advisor's office Lindley Hall room 301E. If my advisor's office is unavailable, my lab mates have agreed to let me use my office (initial testing place in original application) in Lindley Hall room 301E. Participants will be told at least the day before the test what room to meet in.

2. Describe how the amendment will affect the risk:benefit ratio for subjects.

This amendment will increase the benefit ratio for subjects because no one but the test givers and participants will be in the room. There is no additional risk with this amendment.

3. Does the proposed amendment require changes in the Consent Statement/Information Sheet? No
If the answer is **yes**, check the appropriate line and attach a copy of the revised Consent Statement/Information Sheet, **with** changes highlighted.

______ The new Consent Statement/Information Sheet is in addition to the current one
______ The new Consent Statement/Information Sheet is to replace the current one.

Katie A. Moor
Principal Investigator (typed/printed name) ________ (signature—must be PI's own signature) ________ (date)

Kay H. Connelly
Faculty Advisor/Sponsor (typed/printed name) ________ (signature—must be sponsor's own signature) ________ (date)

****

CAMPUS LEVEL REVIEW

______ The Amendment of this protocol for use of human subjects has been reviewed and approved by the IUB Campus Committee for the Protection of Human Subjects.

______ Exempt review ¶#______ ______ Exempt review with documentation of consent ¶#______

______ Expedited review ______ Full Committee review

________________ Chairperson/Agent IUB Committee Date ________

logged in ts ________ approval logged ________ copy to PI ________ notice to SOE ________ rank code ________

test: PI ________ sponsor ________ co-PI ________

INDIANA UNIVERSITY
BLOOMINGTON CAMPUS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

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FUNDING AGENCY: N/A

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PLEASE USE THIS AS A COVER PAGE.
ATTACH PAGES with the INFORMATION REQUESTED in items 1 and 2.

1. Describe the proposed change(s) and rationale for the change(s). Include any changes to project start and end dates. If submitting a revised questionnaire or survey, please include a copy **with** changes highlighted.

We would like to continue our usability test until the end of June because we did not recruit as many people as we wanted to. We would also like to usability test at Meadowbrook Retirement Community to help increase our 75-85 year old sample size. We will present the same presentation we presented at Bell Trace (in original application) and conduct usability tests at Meadowbrook

2. Describe how the amendment will affect the risk:benefit ratio for subjects.

This amendment will increase the benefit ratio for subjects because it will give them more leeway in scheduling usability exams. There is no additional risk with this amendment.

3. Does the proposed amendment require changes in the Consent Statement/Information Sheet? No
If the answer is **yes**, check the appropriate line and attach a copy of the revised Consent Statement/Information Sheet, **with** changes highlighted.

______ The new Consent Statement/Information Sheet is in addition to the current one
______ The new Consent Statement/Information Sheet is to replace the current one.

Katie A. Moor		
Principal Investigator (typed/printed name)	(signature—must be PI's own signature)	(date)
Kay H. Connelly		
Faculty Advisor/Sponsor (typed/printed name)	(signature—must be sponsor's own signature)	(date)

****

CAMPUS LEVEL REVIEW

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______ Expedited review ______ Full Committee review

Chairperson/Agent IUB Committee ______ Date ______

logged in ts ______ approval logged ______ copy to PI ______ notice to SOE ______ rank code ______

test: PI ______ sponsor ______ co-PI ______

INDIANA UNIVERSITY
BLOOMINGTON CAMPUS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

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ADDRESS (campus or US) 150 S. Woodlawn Ave. LH 305 E-MAIL kmoor@cs.indiana.edu PHONE (812)855-8992

FUNDING AGENCY: N/A

****

PLEASE USE THIS AS A COVER PAGE.
ATTACH PAGES with the INFORMATION REQUESTED in items 1 and 2.

1. Describe the proposed change(s) and rationale for the change(s). Include any changes to project start and end dates. If submitting a revised questionnaire or survey, please include a copy **with** changes highlighted.

On March 29 we submitted an IRB asking to usability test until the end of June. The amendment was approved; however we forgot to submit a new consent form. Here is the new consent form for approval.

2. Describe how the amendment will affect the risk:benefit ratio for subjects.

This amendment will increase the benefit ratio for subjects because it will give them more leeway in scheduling usability exams. There is no additional risk with this amendment.

3. Does the proposed amendment require changes in the Consent Statement/Information Sheet? Yes
If the answer is **yes**, check the appropriate line and attach a copy of the revised Consent Statement/Information Sheet, **with** changes highlighted.

______ The new Consent Statement/Information Sheet is in addition to the current one
___X__ The new Consent Statement/Information Sheet is to replace the current one.

Katie A. Moor
Principal Investigator (typed/printed name) ____________ (signature—must be PI's own signature) ________ (date)

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Faculty Advisor/Sponsor (typed/printed name) ____________ (signature—must be sponsor's own signature) ________ (date)

****

CAMPUS LEVEL REVIEW

______ The Amendment of this protocol for use of human subjects has been reviewed and approved by the IUB Campus Committee for the Protection of Human Subjects.

______ Exempt review ¶#_____ ______ Exempt review with documentation of consent ¶#_____

______ Expedited review ______ Full Committee review

____
Chairperson/Agent IUB Committee Date ____________

logged in ts _________ approval logged _________ copy to PI ____________ notice to SOE ___________ rank code ________

test: PI _____________ sponsor ____________ co-PI ______________

K IRB Application for Study 2

IUPUI AND CLARIAN INSTITUTIONAL REVIEW BOARDS & SUBCOMMITTEES REVIEWS
EXEMPT RESEARCH CHECKLIST

DIRECTIONS: This form is to be neatly typed and submitted to the IRB only when the investigator is contemplating the initiation of a research project which, in the investigator's judgment, is exempt from normal IRB review. The IRB will then determine whether the activity is covered by these regulations.

Research activities are exempt from regulations for the protection of human research subjects when the ONLY involvement of human subjects falls within one or more of the categories below. **These exemptions do not apply to research involving prisoners, fetuses, pregnant women, human in vitro fertilization, or when there is additional involvement of human subjects beyond the categories listed below, when deception of subjects may be an element of the research, or when the activity might expose the subject to discomfort or harassment beyond levels encountered in daily life. The exemption of categories 2 or 3 below of exempt research does not apply when individuals under the age of 18 are subjects of the activity, except for research involving observations of public behavior when the investigator(s) do not participate in the activities being observed.**

Effective April 14, 2003, the Health Insurance Portability and Accountability Act (HIPAA) now clarifies policies and procedures relating to de-identification of health information. Please refer to the HIPAA Research SOPs for details. Thus, considerations for research that is exempt must qualify based on previous regulations (45CFR46) as well as HIPAA regulations when protected health information is used.

Check the appropriate category(ies) that applies to your research project:

☐ 1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special educational instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods. [45CFR46.101(b)(1)]

☒ 2. This category applies only when the information gathered about the individual does NOT pertain to his/her health. Otherwise, see #3 below.

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless the following two conditions exist: (i) information obtained is recorded in such a manner that the human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability or reputation. For more details, see the 2nd list of categories below (#3). [45CFR46.101(b)(2)]

☐ 3. This category applies when the information gathered about the individual pertains to his/her health.

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior as long as the subjects cannot be identified, directly or through identifiers linked to the subjects. (See the list of identifiers under 7.d. below for details). [45CFR46.101(b)(2)]

☐ 4. All research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures or observation of public behavior that is not exempt under categories 2 or 3 above, (i) if the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter. [45CFR46.101(b)(3)]

☐ 5. Research and demonstration projects which are conducted by or subject to the approval of Department of Health and Human Services (DHHS), and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs. [45CFR46.101(b)(5)]

☐ 6. Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture. [45CFR46.101(b)(6)]

☐ 7. Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. [Note: *To qualify for this exemption ALL of the data, documents, records, or specimens must be in existence **before** the project begins*]. In addition, indicate which of the following apply(ies): [45CFR46.101(b)(4)]

☐ a. The data, documents, or records do NOT include health information.

☐ b. The existing data, documents, records, pathological specimens, or diagnostic specimens utilized were obtained by written legal permission prior to April 14, 2003 (e.g. through an informed consent, a waiver of informed consent, or other expressed written legal permission).
Please define:

☐ c. The health information pertains only to decedents.

☐ d. The health information is de-identified. (Note: to qualify for this exemption, either all identifiers must be removed or sufficient number of identifiers removed to be statistically de-identified. See the list of eighteen identifiers below or the Use and Disclosure of Health Information for Research Standard Operating Procedures for details.
De-identified data must have the following data removed:

- Name
- All geographic subdivisions smaller than a state, including street address, city, county, precinct, zip codes if the geographic unit of combining all the same three initial digits contains more than 20,000 people
- All elements of dates (except year) for dates directly related to an individual, including birth date, admission date, discharge date, date of death; and all ages over 89 and all elements of dates (including year) indicative of such age, except that such ages and elements may be aggregated in a single category of age 90 or older.
- Telephone numbers
- Fax numbers
- Electronic mail addresses
- Social security numbers
- Medical record numbers
- Health plan beneficiary numbers
- Account numbers
- Certificate/license numbers
- Vehicle identifiers and serial numbers, including license plate numbers
- Device identifiers and serial numbers
- Web universal resource locators (URLs)
- Internet protocol (IP) address numbers
- Biometric identifiers, including finger and voice prints
- Full face photographic images and any comparable images; and
- Any other unique identifying number, character, or code.

e. The health information is in a Limited Data Set as defined by HIPAA.

☐ ☐ Check here if the data will be received from a covered entity (e.g. division, department, or practice plan) separate from that of the investigator. If this is the case, a data use agreement must be established between the entity(ies) supplying the data and the investigator.

☐ Check here if the data will be obtained from within the investigator's own covered entity (e.g. his/her own data or that of the department). No data use agreement is necessary.

A Limited Data Set is defined as follows: A limited data set must exclude 16 specified identifiers that are listed in the regulations, including: name, street address, telephone and fax numbers, e-mail address, social security number, certificate/license number, vehicle identifiers and serial numbers, URLs and IP addresses, and full face photos and other comparable images. The limited data set could include the following identifiable information: admission, discharge, and service dates, date of death, age (including age 90 and older), and five digit zip code.

If, after having completed the Exempt Research Checklist, the investigator still believes the study qualifies as exempt research, complete the rest of this page and submit the original to:

RESEARCH AND SPONSORED PROGRAMS Union Building Room 618 IUPUI	OR	METHODIST IRB OFFICE (for Clarian [at Methodist] IRB) Academic Affairs - Research B Building, Room 349 Methodist Hospital

Note that the study cannot be initiated until written acceptance for the IRB is given.

PLEASE ALLOW 5-10 WORKING DAYS FOR EXEMPT REVIEW PROCESSING.

SECTION I: INVESTIGATOR INFORMATION

Principal Investigator: Welch, Janet L. **Department:** Nursing

(Last, First, Middle Initial——must have faculty/staff status or faculty sponsor must sign)

Building/Room No.: NU 414 Phone: 274-8091 E-Mail: jwelch@iupui.edu

Contact Person: Phone: E-Mail:

If this is a Student Protocol, List Name of the Student: Katie Moor Phone: computer science – Bloomington – 812-855-8992

Project Title: Personal Digital Assistant (PDA) Usability Testing

Sponsor/Funding Agency: N/A PI on Grant:

Sponsor Protocol #/Grant #: Period: From: to

Sponsor Type: ☐ Federal; ☐ State; ☐ Industry ☐ Not-for-Profit ☒ Unfunded; ☐ Internally Funded

Grant Title (if different from project title):

SECTION II: RESEARCH DESCRIPTION

Describe the general purpose, nature, and duration of the study, providing a description of the proposed research objectives and procedures below (in lay terms). Attach a copy of any research instruments (e.g. survey, questionnaire, interview guide).

This is a preliminary project prior to submitting a R21 proposal to NIH. The purpose of this study is to determine the usability of personal digital assistants (PDA). The sample will be 10 patients currently receiving out-patient hemodialysis therapy. Participants will complete personal digital assistant tasks, such as pushing buttons, selecting icons on a screen, recording voice messages, and scanning UPCs with a PDA scanner. Participants will provide background information and will answer questions at the end of task performance. Data will be collected while participants are undergoing dialysis treatment and will last no longer than 1 hour. No names will be recorded. Results from this study will help us determine if PDAs should be designed differently based on manual dexterity and visual acuity.

Results from this study will also be used by Katie Moor, an IU PhD Student in Computer Science, in a publication, presentation, and/or dissertation report.

Signature of Principal Investigator: Date:

Recorded in the Minutes of:

L Additional Material for Institutional Research Board Applications

In this section we present the additional materials we submitted with our Institutional Research Board (IRB) application. Included here is our recruitment materials, NASA TLX forms, background questionnaire,usability testing transcript, and IRB proof of passing the usability study test.

Indiana University – Bloomington
Personal Digital Assistant Usability Testing
Other Supporting Documents

In this section, we will present our supporting documents.

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CALL FOR VOLUNTEERS

The Security for Ubiquitous Resources Group (SURG) at Indiana University is looking for volunteers to participate in a study evaluating the usability of personal digital assistants (PDAs). We are looking for people ages **15-18 years old, 25-30 years old,** and **50-55 years old** to participate in our study.

What, where, and when?
We will begin holding sessions the week of **Monday, February 23** and continue through **Friday, March 5, 2004**. The sessions will be held in Lindley Hall, the computer science department building.

The appointment includes completion of a brief background questionnaire and a performance test that includes completion of 5 tasks. After each of the 5 tasks you will be asked to complete a brief questionnaire. You will have complete hands-on access to the personal digital assistant. We would like to video record the session unless you have specific objections. All information recorded will be kept confidential. The interview session is scheduled to take no more than **1 hour**.

If you are interested in participating, please send me an email (kmoor@cs.indiana.edu) or call me at (812) 855-8992 with times you are available during **Monday, February 23, 2004** through **Friday, March 5, 2004**. Please respond with **multiple time options** so we can schedule accordingly.

Thanks!
In appreciation for your help, we will give you a **gift of $10.** Your participation will help in the design of future personal digital assistant interfaces.

Katie A. Moor (kmoor@cs.indiana.edu, (812) 855-8992)

PDA Usability Evaluatio
Contact Katie Moor
(812) 855-8992

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(812) 855-8992

CALL FOR VOLUNTEERS

The Security for Ubiquitous Resources Group (SURG) at Indiana University is looking for volunteers to participate in a study evaluating the usability of personal digital assistants (PDAs). We are looking for people 75-85 years old to participate in our study.

What, where, and when?

A **personal digital assistant** is a personal recorder that fits in the palm of your hand. People use the recorders to keep track of appointments, finances, etc.

On **Tuesday, March 2nd** at **2:30pm** we will have a short presentation in the nondenominational chapel to tell you more about the study. After the presentation, interested people can schedule appointments to participate in the study. All appointments will be held in the chapel.

The appointment includes completion of a brief background questionnaire and a performance test that includes completion of 5 tasks. After each of the 5 tasks you will be asked to complete a brief questionnaire. You will have complete hands-on access to the personal digital assistant. We would like to video record the session unless you have specific objections. All information recorded will be kept confidential. The interview session is scheduled to take no more than **1 hour**.

If you are interested, please come to the presentation, send me an email (kmoor@cs.indiana.edu) or call me at (812) 855-8992.

Thanks!
In appreciation for your help, we will give you a **gift of $10**. Your participation will help in the design of future personal digital assistant interfaces.
Katie A. Moor (kmoor@cs.indiana.edu, (812) 855-8992)

CALL FOR VOLUNTEERS

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What, where, and when?
We will begin holding sessions the week of **Monday, February 23** and continue through **Friday, March 5, 2004**. The sessions will be held in Lindley Hall, the computer science department building.

The appointment includes completion of a brief background questionnaire and a performance test that includes completion of 5 tasks. After each of the 5 tasks you will be asked to complete a brief questionnaire. You will have complete hands-on access to the personal digital assistant. We would like to video record the session unless you have specific objections. All information recorded will be kept confidential. The interview session is scheduled to take no more than **1 hour**.

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Thanks!
In appreciation for your help, we will give you a **gift of $10.** Your participation will help in the design of future personal digital assistant interfaces.

For more information, check out our website at http://www.cs.indiana.edu/surg/PDA

Katie A. Moor (kmoor@cs.indiana.edu, (812) 855-8992)

Recruiting Website
(http://www.cs.indiana.edu/surg/PDA)

Personal Digital Assistant Usability Testing

Home FAQ Contact Us About SURG

The Security for Ubiquitous Resources Group (SURG) at Indiana University is looking for volunteers to participate in a study evaluating the usability of personal digital assistants (PDAs). We are looking for people **15-18 years old, 25-30 years old, 50-55 years old,** and **75-85** years old to participate in our study.

What, where, and when?

We will begin holding sessions the week of **Monday, February 23** and continue **through Friday, March 5, 2004**. The sessions will be held in Lindley Hall, the computer science department building.

The appointment includes completion of a brief background questionnaire and a performance test that includes completion of 5 tasks. After each of the 5 tasks you will be asked to complete a brief questionnaire. You will have complete hands-on access to the personal digital assistant. We would like to video record the session unless you have specific objections. All information recorded will be kept confidential. The interview session is scheduled to take no more than **1 hour**.

If you are interested in participating, please send me an email (kmoor@cs.indiana.edu) or call me at (812) 855-8992 with times you are available during Monday, February 23, 2004 through Friday, March 5, 2004. Please respond with multiple time options so we can schedule accordingly.

Thanks!

In appreciation for your help, we will give you a gift of $10. Your participation will help in the design of future personal digital assistant interfaces.

Katie A. Moor (kmoor@cs.indiana.edu, (812) 855-8992)

Personal Digital Assistant Usability Testing FAQ

Home **FAQ** **Contact Us** **About SURG**

1. What is a Personal Digital Assistant (PDA)?

   A personal digital assistant is a personal recorder that fits in the palm of your hand. People use the recorders to keep track of appointments, finances, etc.

2. Is the study testing/judging my abilities?

   Absolutely not - we are testing the design of the personal digital assistant. If you cannot do something with the personal digital assistant, most likely other people will have problems too. We simply want to identify these problems to help people create personal digital assistant applications avoid these problem areas.

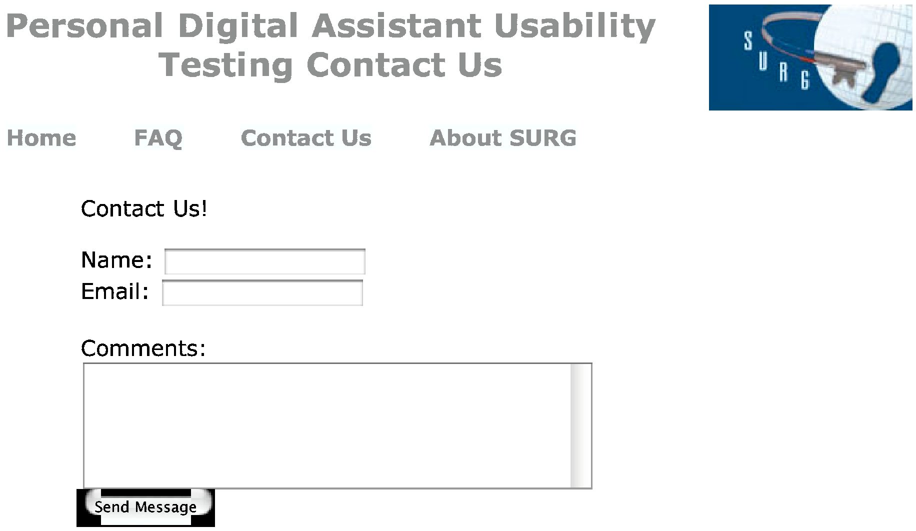
3. Can I stay while my teenager participates in the study?

   Of course. We encourage parents to come to the study and ask any questions they would like.

4. Will I get the gift of $10 if I do not finish the study?

   Yes, you will receive the gift even if you leave party way. You can choose to discontinue your involvement in the study at any time without penalty.

   However, if you decide after reviewing the consent form (and not signing the consent form) that you do not wish to participate in the usability testing, you will not be awarded the gift.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Send Message

Personal Digital Assistant Usability Testing Contact Us

Contact Us!

Name:
Email:

Comments:

SURG: Security for Ubiquitous Resources Group

ABOUT SURG PEOPLE PROJECTS PUBLICATIONS INTERNAL

The Security for Ubiquitous Resources Group (SURG) investigates security issues in ubiquitous computing. The key attributes of our target environment are:

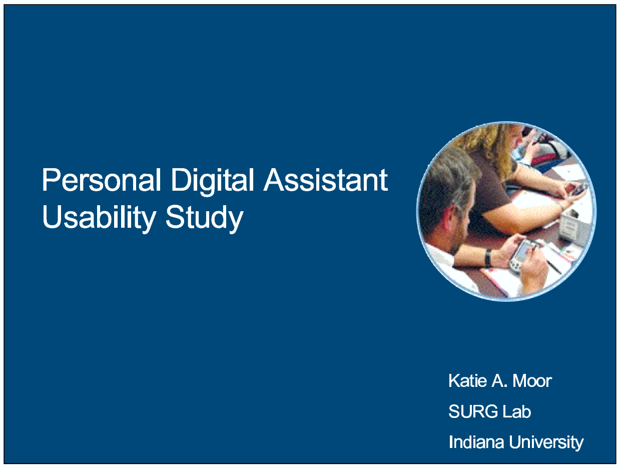
- Sensors and processors embedded in the physical environment
- Mobile devices and users
- Collaborative applications
- Context-aware (physical and virtual) applications
- Non-technical users

Because of the prevalence of non-technical users, our research emphasizes the usability of security mechanisms. We are currently investigating security as pertains to:

- patient-oriented, health-care information systems,
- policy conflict-resolution in "smart space" environments
- configuration and management of access control for "smart spaces"

If you are interested in becoming a researcher in the SURG lab, please contact professor Kay Connelly.

Recruiting Presentation



Personal Digital Assistant Usability Study

Katie A. Moor
SURG Lab
Indiana University

Hello, thank you for coming to my talk today. My name is Katie Moor and I am a research assistant at Indiana University's Security for Ubiquitous Resources Group. I am here today to tell you all about a study myself and a few students are conducting to learn more about the usability of personal digital assistants. I'll talk more about personal digital assistants later. However, here is a quick glimpse of a personal digital assistant in this picture on the right.

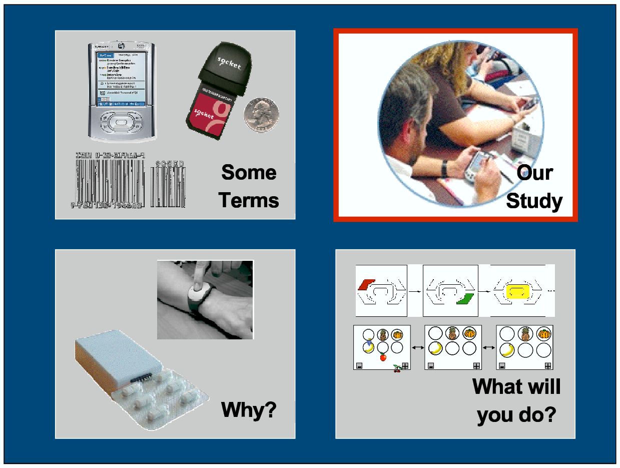
Some Terms

Our Study

Why?

What will you do?

Before I officially begin the presentation, I will discuss some terms I will use throughout the presentation.



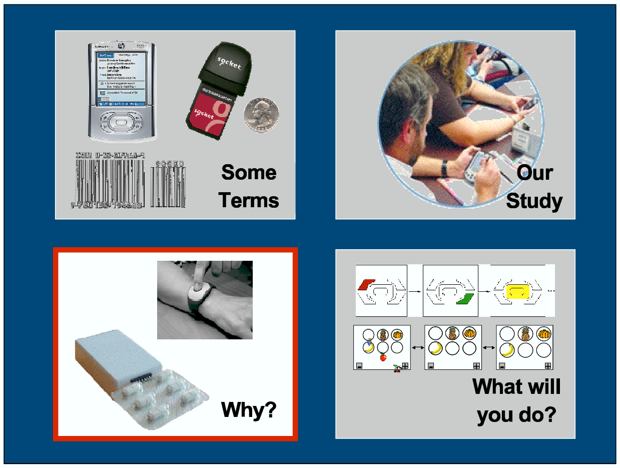
Some Terms

Our Study

Why?

What will you do?

After I introduce some vocabulary, I will tell you more about the study I am conducting.



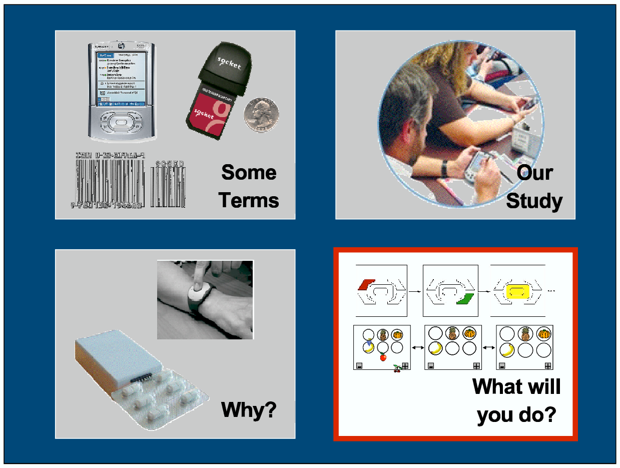
Some Terms

Our Study

Why?

What will you do?

Then, I will tell you about why you should be interested in my study.



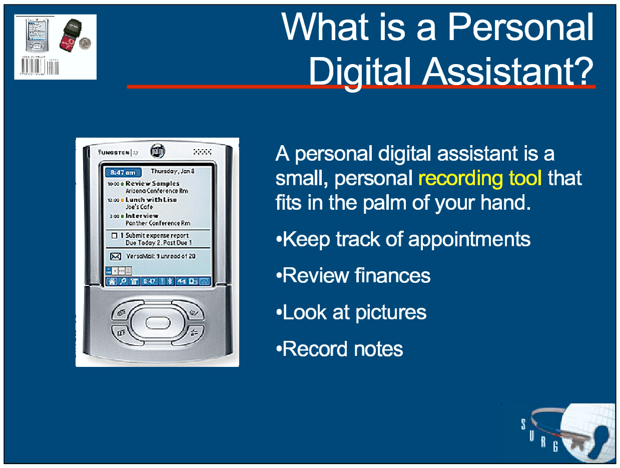
Some Terms

Our Study

Why?

What will you do?

Finally, I will tell you what you will do during the study if you choose to participate.



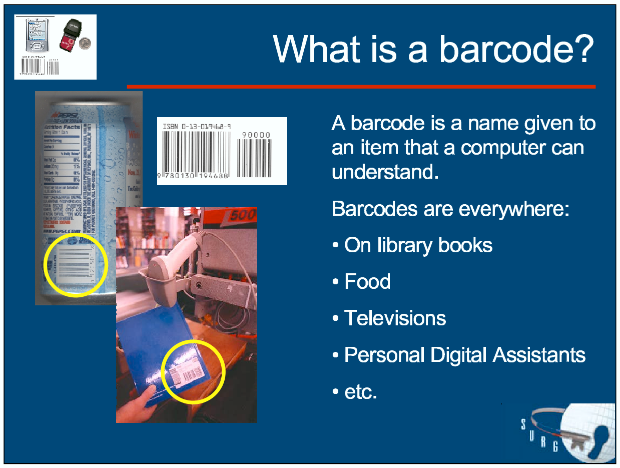
What is a Personal Digital Assistant?

A personal digital assistant is a small, personal recording tool that fits in the palm of your hand.

- Keep track of appointments
- Review finances
- Look at pictures
- Record notes

Like I said at the beginning, I am doing a study on personal digital assistants…but what's a personal digital assistant any how? Think of a personal digital assistant as a small, personal recording tool that fits in the palm of your hand. You may have heard of these – some people call them PDA's, palms, (etc). Here is what one looks like [raise personal digital assistant]. Has anyone heard of these?

Great (or No problem!). Personal digital assistants let people keep track of their appointments, review finances, look at pictures, record notes, look at video – personal digital assistants can do more and more each year.



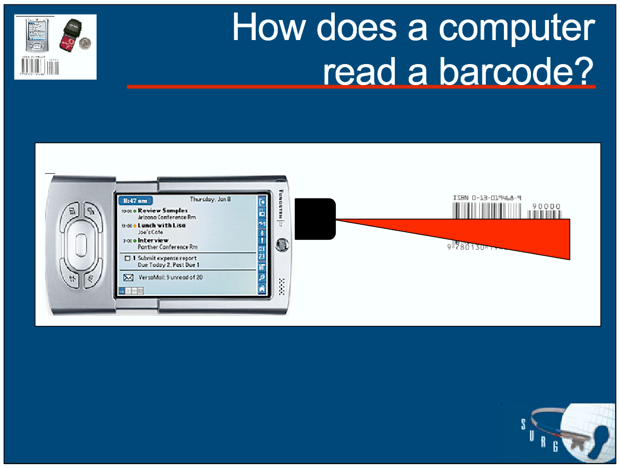
What is a barcode?

A barcode is a name given to an item that a computer can understand.

Barcodes are everywhere:

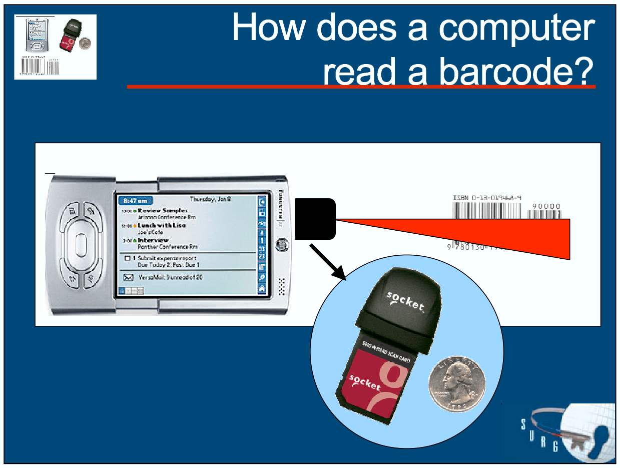
- On library books
- Food
- Televisions
- Personal Digital Assistants
- etc.

Another term you'll hear me use is barcode. You may also have heard barcodes referred to as UPCs when you do refunds. A barcode is a name given to an item that a computer can understand. I look around here and I identify this [hold up can of soda] as a can of soda. However computers have a hard time storing words, so instead when they see a soda can they think 120500 – the barcode number [point to barcode].



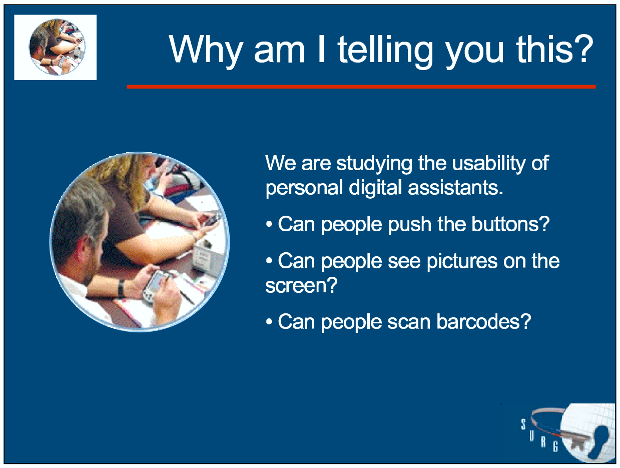
How does a computer read a barcode?

Some of you may wonder how does a computer read a barcode? Well, here we see a personal digital assistant [point to PDA] with a scanner [point to scanner]. The scanner emits a beam of light at the barcode. The scanner we are using in our study takes a small picture of the barcode and reads the lines as numbers. Then the scanner tells the personal digital assistant what numbers it has read.



How does a computer read a barcode?

The scanner we are using [point to scanner on top of PDA] is very small – a little bigger than the size of a quarter!

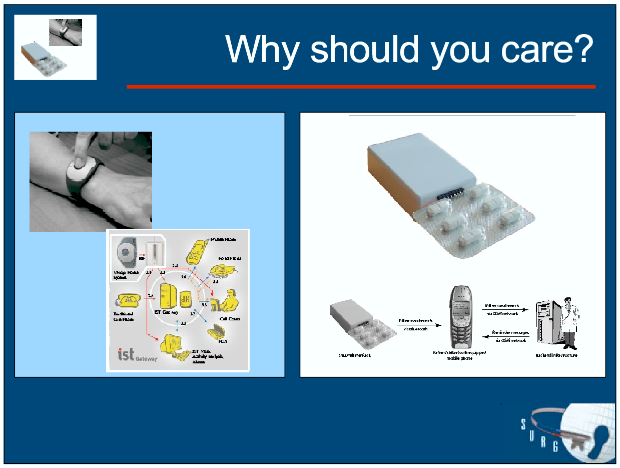


Why am I telling you this?

We are studying the usability of personal digital assistants.

- Can people push the buttons?
- Can people see pictures on the screen?
- Can people scan barcodes?

Why am I telling you about personal digital assistants and scanners? Well, my group and I are studying the usability of personal digital assistants. We want to know if people can push the buttons, see pictures on the screen, and scan barcodes.

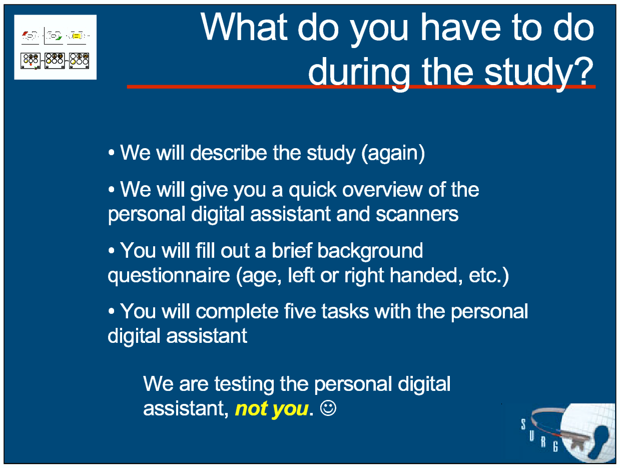


Why should you care?

Why should you care about my study? That’s a very good question. Right now, researchers all over the world are working on programs that run on personal digital assistants to help people of all ages. Here on the left in the light blue box we see a bracelet with a button on it. If a person feels they are in trouble (physically, mentally), they push the button. By pushing the button, information is passed to loved ones [point to cell phone], doctors, etc. There have been other projects where instead of a bracelet people carry a personal digital assistant or cell phone.

In the white box you can see a pill blister pack with a small box attached to it. The small box keeps track of when you take your pills. When you take a pill, the box tells your cell phone you took a pill. The cell phone tells your doctor you took your pill. If you forget to take your pill, your doctor will send your cell phone a message to remind you to take your pill. However, we have to make sure the user can use a cell phone first.

At this time it takes so long to make these applications, they cannot test their products on people to make sure people can press the buttons, operate the devices, etc. before marketing them. That is where our study comes in. We hope to figure out what various age groups can do with personal digital assistants and pass that information on to people creating these programs so they are immediately usable for target age groups.

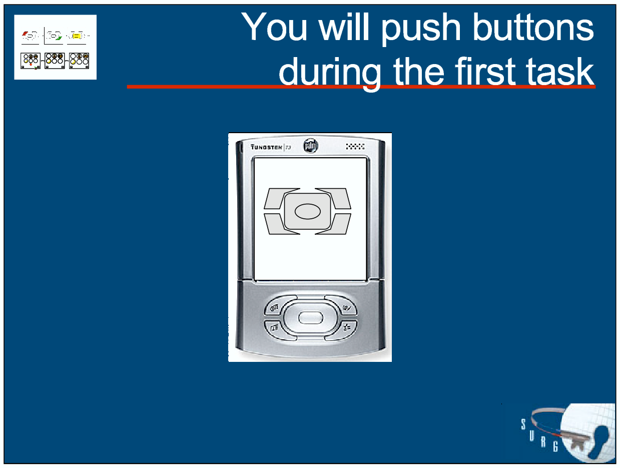


What do you have to do during the study?

- We will describe the study (again)
- We will give you a quick overview of the personal digital assistant and scanners
- You will fill out a brief background questionnaire (age, left or right handed, etc.)
- You will complete five tasks with the personal digital assistant

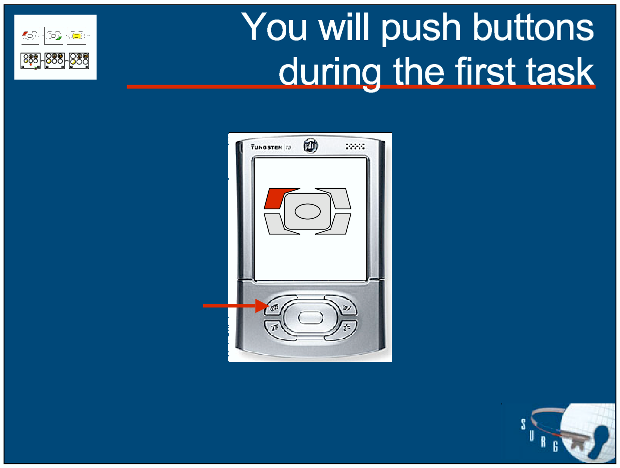
We are testing the personal digital assistant, ***not you***. ☺

So, what do you have to do during the study? When you come to participate in the study, we will describe the study to you again. Then, we will give you a quick overview of the personal digital assistant and scanners. You will fill out a brief background questionnaire. We want to know approximately how old you are, if you are left or right handed, things, if you have problems viewing screens, etc. After filling out a brief background questionnaire, you will complete five tasks. After each task you will complete a short questionnaire where we hope we can get an idea of how easy or difficult the task was. The most important thing to remember is that we are testing the personal digital assistant. Not you ☺



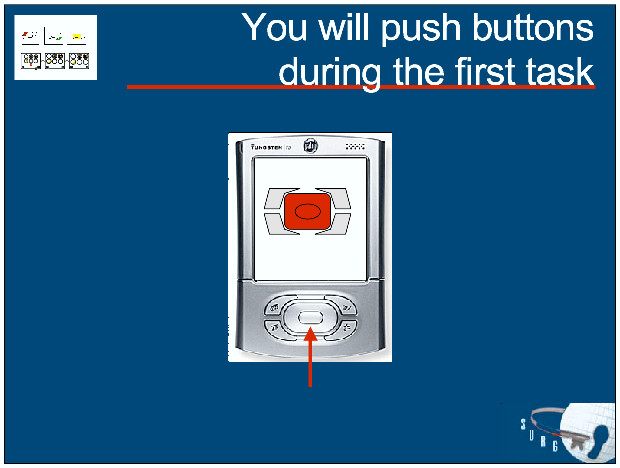
You will push buttons during the first task

During the first task you will push buttons on the personal digital assistant. Here you can see the screen has a picture of the buttons on the personal digital assistant [point to the screen and handheld buttons].



You will push buttons during the first task

The screen will “light up” a button on the screen. Your job will be to press the same button on the personal digital assistant.



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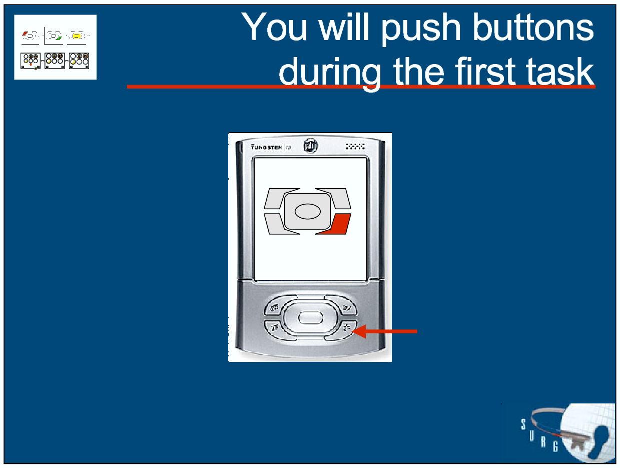

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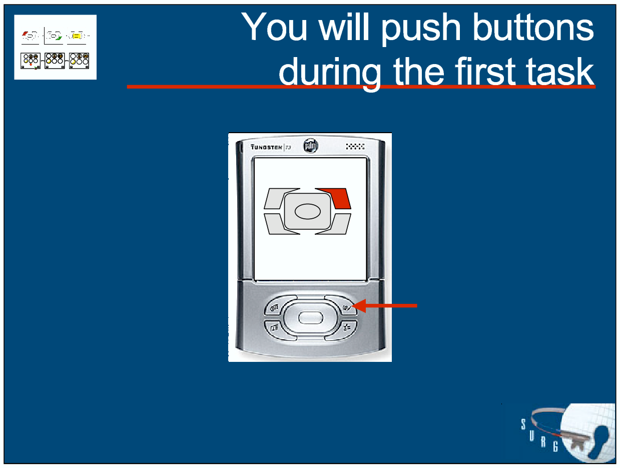

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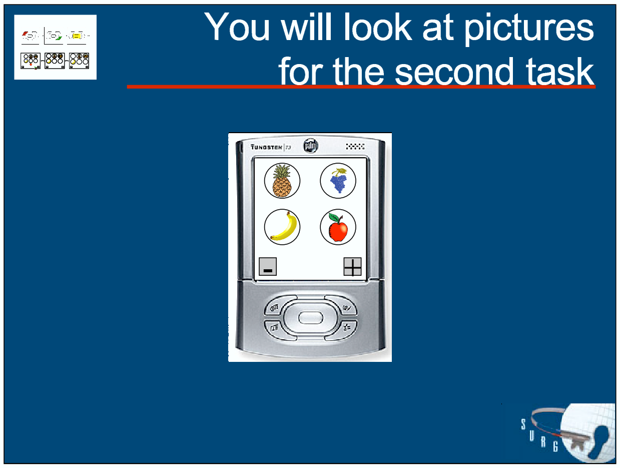
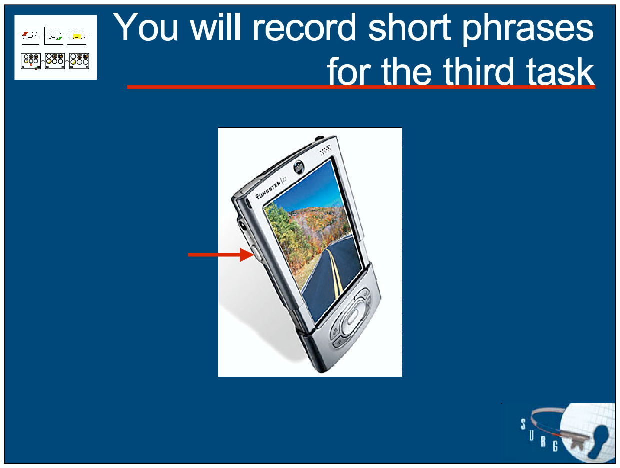


You will look at pictures for the second task

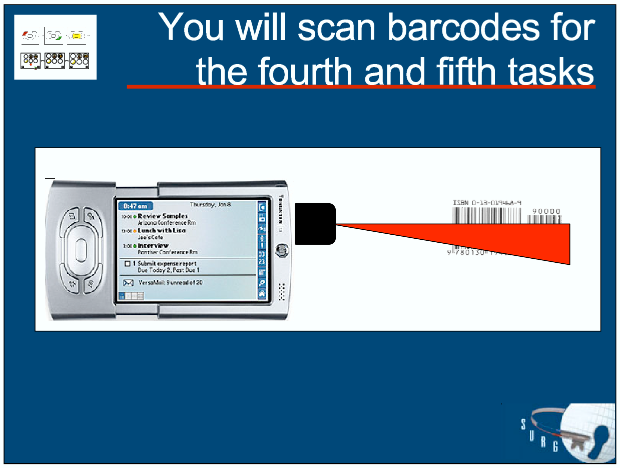
TUNGSTEN T3

For the second task you will look at pictures on the personal digital assistant screen. This will be similar to an eye exam. We will ask you if you can tell us what each picture is on the screen. If you cannot, we'll make the pictures bigger by pressing the plus sign in the bottom right corner [point to plus sign]. If you can, we'll make the pictures smaller by pressing the minus sign on the bottom left corner [point to minus sign].



You will record short phrases for the third task

For the third task you will get to record your voice on the personal digital assistant. Here [point to button on PDA] is a button that activates voice recording. You will record three messages during this task.



You will scan barcodes for the fourth and fifth tasks

8:47 am
Thursday, Jan 8
10:00 Review Samples
Arizona Conference Rm
12:00 Lunch with Lisa
Joe's Cafe
3:00 Interview
Panther Conference Rm
1 Submit expense report
Due Today 2, Past Due 1
VersaMail: 9 unread of 20
TUNGSTEN
ISBN 0-13-019468-9
90000
9 780130
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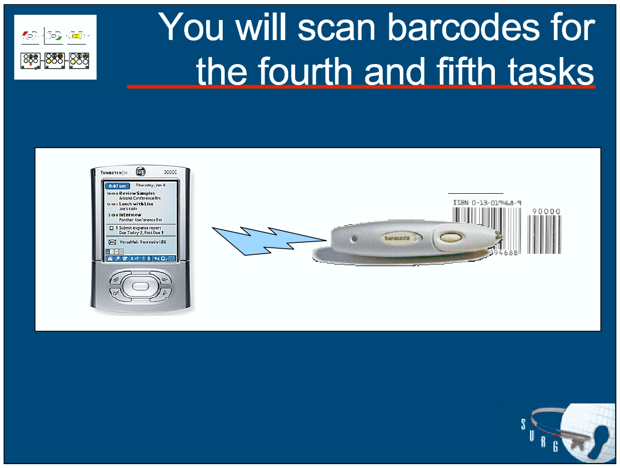
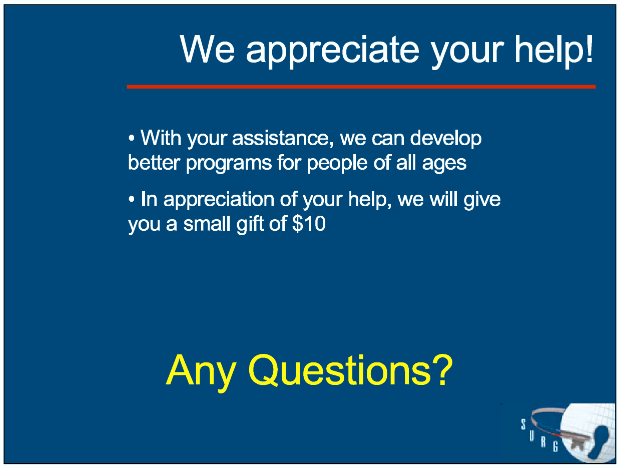
You will scan barcodes for the fourth and fifth tasks. We’ll ask you to scan three different barcodes. During the fourth task, you will use a small scanner on top of the personal digital assistant [show scanner].



You will scan barcodes for the fourth and fifth tasks

During the fifth task, you will use a pencil scanner [hold up pencil scanner]. For the pencil scanner, you push this button [show button] and run the pencil tip over the barcode. The barcode will tell the personal digital assistant what barcode it read without any wires (wirelessly).



We appreciate your help!

- With your assistance, we can develop better programs for people of all ages
- In appreciation of your help, we will give you a small gift of $10

Any Questions?

After that, you are all done. We would really appreciate it if you could help us. Your assistance will help develop better programs for people of all ages in the future. In appreciation of your help, we will give you a small gift of $10. Thank you for your time. Any questions?

Offical Use	
Participant #	

Personal Digital Assistant (PDA) User Studies
Background Questionnaire

Please check the box in your preferred answer. If you have any questions, please inform Katie.

1. Gender

Male ≤ Female ≤

2. Age:

15-18 ≤ 25-30 ≤ 50-55 ≤ 75-85 ≤

3. Do you have problems reading a computer or television screen? If so, please explain.

Yes ≤ No ≤

4. Do you wear glasses when reading a computer or television screen?

Yes ≤ No ≤

5. Are you color blind? If so, how sever?

Yes ≤ No ≤

6. Do you use a TV remote control? If you use a TV remote control, please tell us below how easy or difficult you find using a TV remote control.

Yes ≤ No ≤

7. Do you use a cell phone? If you use a cell phone, please tell us below how easy or difficult you find using a cell phone.

Yes ≤ No ≤

8. Do you have any experience using computers?

Yes ≤ No ≤ (If your answer is NO, please go to the question 8.)

How often do you use a computer?

Rarely ≤ Sometimes ≤ A lot ≤

9. Do you have any experience using a personal digital assistant?

Yes ≤ No ≤ (If your answer is no, please skip the next question.)

How often do you use a personal digital assistant?

Rarely ≤ Sometimes ≤ A lot ≤

10. What hand do you write with or do most activities with?

Left hand ≤ Right hand ≤ Both hands ≤

Post-Task Questionnaire

Please circle one of the **bold** and CAPTIAL words in each sentence that you felt was reflective of the task you just completed.

1. Did the task require more **PHYSICAL DEMAND** (physical exertion) or more **FRUSTRATION** (irritation, discouraged)?
2. Did the task require more **EFFORT** (how hard you worked) or more **PHYSICAL DEMAND** (physical exertion)?
3. Did the task lead to **FRUSTRATION** (irritation, discouraged) or did the task require more **EFFORT** (how hard you worked)?

RATING SHEET

Please rate how much physical demand, effort, and frustration you felt while completing the task by putting an X on the rating scales below. Low means you did not feel any of the listed feelings. High means you felt a lot of the listed feelings.

PHYSICAL DEMAND (physical exertion/activity)

Low **High**

EFFORT (how hard you worked)

Low **High**

FRUSTRATION (irritation, discouraged)

Low **High**

OVERALL (your impression of overall workload the task entailed)

Low **High**

SOURCES-OF-WORKLOAD TALLY SHEET

SCALE TITLE	NUMBER OF TIMES THIS SCALE WAS CIRCLED – THE SCALE’S WEIGHTING	RAW RATING GIVEN	ADJUSTED RATING - WEIGTING X RAW RATING
MENTAL DEMAND			
PHYSICAL DEMAND			
TEMPORAL DEMAND			
PERFORMANCE			
EFFORT			
FRUSTRATION			

Total count = ________ Total Adjusted Rating = ________

WEIGHTED RATING = (Sum of Adjusted Ratings) divided by 15 = _________

(NOTE - The total count is included as a check. If the total count is not equal to 15 then something has been miscounted. Also, no weight can have a value greater than 5.)

Instruction Script for the Usability of Personal Digital Assistants

[Introductions]

My name is Katie Moor. I'm the principal investigator of the personal digital assistant usability testing project. I'll be working with you in today's session.

[Overview of the session]

In my field of research, people make applications for personal digital assistants with specific age groups in mind. Unfortunately, creating personal digital assistants take a lot of time to create. Researchers do not have time to usability test their applications leading to lots of questions about whether specific age groups can use a personal digital assistant. We are curious to see if users in various age groups can use personal digital assistants.

Today, you will complete a background questionnaire and a short questionnaire after five personal digital assistant tasks. None of the programs you will be using come with personal digital assistants you could buy at the store. All applications we are using today we have created or bought from vendors. We are testing the personal digital assistant, not you.

Today's session will last for approximately **1 hour**. If you want to stop for a break at any time, feel free to do so.

Do you have any questions so far?

[Overview of the Personal Digital Assistant]

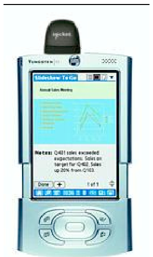


Figure 1: Tungsten T3 with Scanner

Before we begin the personal digital assistant evaluation I'd like to tell you more about the personal digital assistant. A personal digital assistant is simply a tool people use for keeping track of dates, finances, telephone numbers, and other items. All personal digital assistants have a screen [point to screen] used for viewing information and selecting information [touch screen and select on icon]. All personal digital assistants have buttons [point to buttons] for selecting or viewing additional information [push button]. The personal digital assistant we are using today has a button on the side [point to button] that allows us to record a message when we push the button [push button, record, "Testing, 1 2 3," and play back the recording].

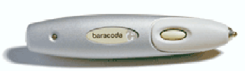


Figure 2: Baracoda

The personal digital assistant we are using today has some extra tools we will use. Our personal digital assistant has two scanners [point to black scanner on top of personal digital assistant and point to the

Baracoda pencil]. Some applications require users to scan barcodes on food items. We can use the scanner on the personal digital assistant by pushing this button [push scanner button and show the reflected scanner light on your hand]. We can use the barcode scanning pencil by pushing the button on the pencil like this [press button on scanner and reflect the scanner light on your hand].

Feel free to ask me any questions at this time.

[Testing personal digital assistant, not you! Not a timed evaluation.]

I'd like to stress before we continue that we're testing the usability of the personal digital assistant, not your abilities. If you find some of the tasks we ask you to do difficult to complete, rest assured other people will also think the tasks are difficult. Our jobs is to document these difficulties so future personal digital assistant applications will not require people to do these actions.

If at anytime you encounter problems with the tasks, feel free to move on to the next task. These tasks are not timed so you should not feel any time pressure. Spend the amount of time on a task that you would normally spend if using a tool like this one.

[Background questionnaire and video consent form]

There are a couple of things we need to do before we begin the evaluation…

With your permission, we would like to **videotape today's session** so that we can analyze the data in depth at a later stage. The videotape will not be used for any other purpose and will be kept in a restricted area in the Computer Science department. Please read and sign this consent form that states you understand the purpose of this study and you give us permission to collect your input in the form of video recording and questionnaires.

[Administer consent form and give participant a pen.]

We have a short background questionnaire to give us an idea of your background.

[Hand background questionnaire to participant.]

[Explain tasks]

We have a total of **5 tasks** for you to complete using the personal digital assistant. You have before you a task packet that contains a brief introduction. Each page contains a separate task scenario. After each task, please fill out the included questionnaire. The questionnaire will ask you how much physical demand, effort, and frustration you felt during the task. By physical demand we mean if the activity required you to push or move the personal digital assistant.

Was the task easy or demanding? Did you have to do the task slower than you would have liked to. By effort, we mean how hard did you have to work mentally and physically to complete the task. Frustration simply means how irritated or discouraged you felt during the task.

[Think Aloud]

We'll be asking you to **"Think Aloud"** as you work. Tell us what you are going to do next. For example, if I was given the personal digital assistant and told to turn it on. I would say, "I'm not sure what button to push, but I guess I will push this button on top with the green line." If you don't understand how something works or if you expect certain things to happen, please voice this. Any thoughts or impressions do not hesitate to say out loud: **confusion, frustrations, praises are welcome**. "Think Aloud" will help us gain a better understanding of your interactions with the personal digital assistant.

I may also ask you from time to time to tell me what you are thinking. Usually, when people are involved or concentrating they tend not to speak. But during this time, your thoughts are important to us.

Before I hand you the tasks, I would like to emphasize that these **tasks are not timed**.
However, if you are having trouble with the tasks, you may stop at any time.

Again, if you need to take a break at anytime, just let us know.

Do you have any questions before we begin?

[List Tasks]

[Select button dexterity test.]

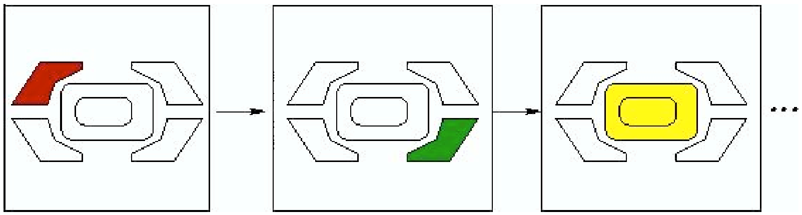


Figure 3: Mock-up of screen shots for the button dexterity test.

Task 1: On the screen, you will see buttons similar to the buttons on the personal digital assistant. The buttons on the screen will take turns lighting up. As soon as the button on the screen lights up, push the corresponding button on the personal digital assistant. You will complete the task when the screen says, "Finished Task 1." Signal me when you feel you are done. Any questions before we begin?

[Give post-task (NASA-TLX) questionnaire]

[Select icon vision test.]

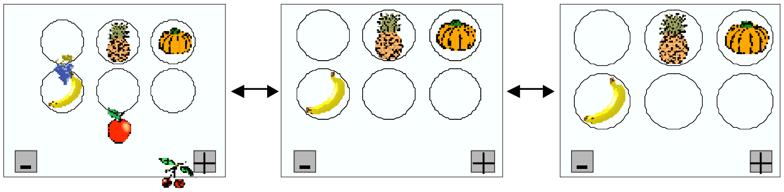


Figure 4: Mock-up of screen shots for vision test. We will begin the test on a screen with medium size icons and then increase or decrease the size based on the participant's responses.

Task 2: On the screen, you will see pictures. Please tell me if you can see the pictures clearly. I will continue to make the pictures smaller and larger based on your responses. Any questions before we begin?

[Give post-task (NASA-TLX) questionnaire]

Task 3: On the left side of the personal digital assistant is a button used to record messages. When you press the button, the personal digital assistant will beep when it is ready to begin recording. For the personal digital assistant to record your voice, you must continue to press the button until you are done speaking. Please press the button and say, “Okay!.” Let go of the recording button.

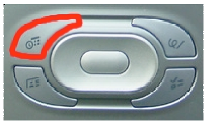
Please record the following message, “ Task 3 is complete. I pressed the button.” Let go of the recording button.

Please record the following message, “Today is a day I will always remember. I am helping design better interfaces for future handheld applications.”

Signal me when you feel you are done. Any questions before we begin?

[Give post-task (NASA-TLX) questionnaire]
[Play back three recordings and record participant feedback.]

[give book with barcode facing up, bag of chips, and soda can to participant]
[allow participant to practice scanning book]



Task 4: The button on the front of the personal digital assistant with the clock and calendar on it (upper left corner button) is the “scanner button.” When you push this button, the scanner on the top of the handheld will work. The personal digital assistant will beep when the barcode has been scanned. Please feel free to play with the scanner and scan the book barcode. When you feel you are comfortable with the scanner, try scanning the bag of chips and soda can.

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Signal me when you feel you are done. Any questions before we begin?

[Give post-task (NASA-TLX) questionnaire]

[Select Baracoda scanning application]

Task 5: The barcode scanning pencil can wirelessly tell the personal digital assistant what barcode it reads. All you have to do is push the button on the pencil and run the pencil over the barcode. The barcode will show up on the screen of the personal digital assistant. Please rescan each of the barcodes from Task 4. Signal me when you feel you are done. Any questions before we begin?

[Give post-task (NASA-TLX) questionnaire]

[Session completion]

This wraps up the evaluation of the personal digital assistant.

Thank you for your feedback.

[Ask questions that clarify actions taken or comments said]
Once again, I'd like to thank you for coming today. Your participation will help us design better personal digital assistant interfaces in the future.

Do you have any questions or comments about today's session? If you have any questions, feel free to contact me at any time.

Phone Transcript

If a person calls who is interested in participating in the study, here is how we will handle the call.

SURG Member: Hello, SURG Lab. <Name> speaking.
[Person interested in study]
SURG Member: Thanks for calling about participating in our study. What age group do you fall under?
[Check to see if we have openings in that age group. If we do not, thank the person for calling.]
SURG Member: We do have openings in that age group. To participate in the study, we must ask if you own a personal digital assistant.
[If they own a personal digital assistant, thank the person for calling.]
SURG Member: What times are you available to participate in the study?
[Check times, block off a time if it is free and get the person's information (Name, phone number/email). If no times are available, take the person's information and give to Katie to coordinate an alternative time.]
[If person is under 18 years old, please remind him/her to bring their parent or legal guardian to sign the consent form.]

Proof of Passing IU Test for Using Humans in Research

Principal Investigator: Katie A. Moor

Date: Fri, 7 Nov 2003 15:17:18 -0500 (EST)
From: rcr@indiana.edu
To: kmoor@cs.indiana.edu
Cc: connelly@cs.indiana.edu
Subject: Human Subjects Protection Test Results

This message is to confirm that Katie Moor completed the Indiana University Human Subjects Protection Test (test ID: 1068236238) on 07 November 2003 at 3:17 PM with a score of 85%. (A passing score is 70%).

Faculty Sponsor: Kay Connelly

Date: Fri, 7 Nov 2003 13:23:20 -0500 (EST)
To: connelly@indiana.edu
Subject: Human Subjects Protection Test Results
From: rcr@indiana.edu

This message is to confirm that Katherine Connelly completed the Indiana University Human Subjects Protection Test (test ID: 1068229399) on 07 November 2003 at 1:23 PM with a score of 90%. (A passing score is 70%).

Co-Investigator: Yu-Hsiu Li

First Name: Yu-Hsiu
Last Name: Li
Test ID: 1046662391
Date Taken: 2003-03-02

This person passed the test with a score of 70% or greater. If any fields are blank, they were either not recorded with the registration or the was taken on paper rather than on the Web.

Co-Investigator: Dorrie Hutchison

Date: Tue, 4 Nov 2003 17:37:44 -0500 (EST)
From: rcr@indiana.edu
Reply-To: rcr@indiana.edu
Subject: Human Subjects Protection Test Results
To: dohutchi@indiana.edu

This message is to confirm that Dorrie Hutchison completed the Indiana University Human Subjects Protection Test (test ID: 1067985463) on 04 November 2003 at 5:37 PM with a score of 90%. (A passing score is 70%).

Co-Investigator: Kelli Gehlhausen

First Name: Kelli
Last Name: Gehlhausen
Test ID: 1068095505
Date Taken: 2003-11-06

This person passed the test with a score of 70% or greater. If any fields are blank, they were either not recorded with the registration or test was taken on paper rather than on the Web.