PROJECT PROPOSAL:

Medicine Reminder Device for an Independent Forgetful Woman & Shampoo and Conditioner Voice Device for People with Vision Problems in the Shower

By: Sheldon Bish, Karla Sittnick, Kenta Umetsu

Client Contact: Brooke Hallowell, Ph.D., CCC-SLP, F-ASHA
Associate Dean, Research and Sponsored Programs
Director, School of Hearing, Speech and Language Sciences
College of Health and Human Services
Grover Center
Ohio University
Athens, OH 45701
hallowel@ohio.edu
Medicine Reminder Device for an Independent Forgetful Woman:

Executive Summary

This proposal contains the description and details of this project. The plan is to help a client remember to take her medicine at the right time with the correct dosage while caretakers can see the records of when the client took the medicine. In order to efficiently explain the contents of the project, the topics that will be discussed are the background of the client, her condition, and a description of what she requires to help her deal with her condition. A thorough explanation of the purpose, objectives, and features of the device will be specified to improve comprehension on how the device operates and how it will successfully help the client.

There are variations on devices out on the market that resemble the product of this project. The degree in which they are similar and dissimilar in comparison will be discussed in this proposal. Elements of other devices that will be incorporated into the design of our product and reasons for their incorporation will be described. A breakdown of the project budget and cost comparisons for related products to this device will be incorporated. Overall, this proposal gives a complete description of the project background, purpose, product design and implementation methods that result in optimal satisfaction for the client.

1. Introduction

1.1. Background

A medicine reminder is needed for an independent, forgetful woman in the Ohio Respite Volunteer Program. Mrs. Smith, an 80-year-old woman, is required to take medicine twice a day for a number of medical conditions. Although she lives with her husband who has been overseeing her medication schedule, she strives for independence with her daily routine. Mrs. Smith is bright and sociable, but has frequent states of confusion that impair her ability to reliably stick to her medication schedule. Missing doses of her medication poses serious consequences for her health and increases her states of confusion. Mrs. Smith is unhappy that her husband is taking such responsibility for her medication because she is able to perform everything else in her daily routine independently. Mrs. Smith denies that she has states of confusion that lead to her forgetfulness with respect to her medication schedule.

Mrs. Smith does not have trouble manipulating containers, liquids, or pills. She is physically capable of taking her medication independently once reminded or prompted to do so. However, she must be reminded when it is time to take her medications and with that, which ones to take. Because of Mrs. Smith’s states of confusion, it is also hard to receive a reliable response to whether or not she has taken her medication, at what time it was taken, and more specifically which specific medications were taken. Mrs. Smith would like to regain full independence in her daily routine, but without a reliable reminder to take her medication she remains unable.
1.2. Purpose of Project

The purpose of the device is to solve three problems simultaneously. To prevent Mrs. Smith from forgetting to take her medication, the device will alert or prompt Mrs. Smith when it is time to take her medication. To prevent errors from being made in regards to which medication and dosage amount should be taken at which times throughout the day, the device will communicate to Mrs. Smith which medications and dosage amounts need to be taken at that time. To prevent question over which medications were taken, when they were taken, and in which amounts, the device will keep a log built on Mrs. Smith’s input to whether she has or has not taken her medications at specified times. The device will fulfill all three of these requirements with respect to Mrs. Smith’s medication schedule. At the same time, medications prescribed to an individual are always changing. Therefore, the device must allow adjustable input of times, medications, and dosages by the user.

Besides reliability, two other important features will be focused on while designing the device. These important features will be simplicity of the device and that the device is designed to have a positive affect on the user. Simplicity will be focused on by making the device as fool-proof as possible. In the case that Mrs. Smith is in a state of confusion, the communication between her and the device should be as straightforward as possible. The goal to design a device that will have the greatest positive affect on the user is being targeted by designing a device with gaming options. The most important outcome of this project is that Mrs. Smith, or any user, is happy with the device. In order to help build a positive attachment to the device, Mrs. Smith will be able to use the device for more that just a personal alarm system. With gaming capabilities within the device, Mrs. Smith will be able to provide herself with fun and entertainment. The device will come preloaded with games, as well as, the capability to add new games in the future. The more time in general that Mrs. Smith is able to spend with the device, the more comfortable she will become.

1.3. Previous Work Done By Others

1.3.1. Products

There are several products out on the market which are called medicine reminder devices. There are many variations in the degree of complexity between each product depending on the needs of the patient. Medicine reminder devices mainly focus on reducing worries for the patients such as a missed dose, double dose, inconsistent dosing and medication levels, identifying pulls or pill bottles for people with decreased vision, opening and closing pill bottles, privacy regarding the type and quantity of medication.

The simplest of these designs are the labeled cases. These are plastic containers which have labels of the days of the month or week on the top of the cases. These are commonly used with patients who are prescribed pills to take once a day.
Each labeled part of the container will hold the medicine which the patient will take for that day. An example of this type of case can be commonly seen with birth control pills which must be taken everyday.

Another type of medicine reminder devices are for patients who prefer to have an audio reminder to inform them that it is time to take their medicine. This type of medicine reminder device commonly includes a digital pill reminder timer box, medicine alarm container, and a pill alarm holder case. Variations on the shape of the box include circular cases or rectangular cases. Most products have a 24 hour countdown alarm function which can be set with various buttons on the device. Key features including easy reading displays on the front of the device and compact packaging of the product so that it can be fit in pockets.

Non container type medicine reminder products are also out in the market. Most of these products are in the form of vibrating watches. These watches are alarm vibrating medical reminder watches that look like a normal watch so it does not attract outside attention. They are advertised as being great for patients with Parkinson’s disease, ADD/ADHD, Diabetes, Asthma, HIV/AIDS or any patient who wants a discreet and practical alarm watch to remember to take medications when need be. It is also for reminders of patient appointments, eating meals, performing medical tests and other daily activities.

Shown below are pictures of some of the products mentioned above as a sample.
1.3.2. Patent Search Results

There were many different patents relating to medicine reminder devices when searching online at freepatentonline.com. Depending on the design of our medicine reminder device, we may need to look further into specific patents. Most of the search results of the patent that was read were on existing product types which examples are given in the previous section with pictures. The differences in the patent are very picky in detail so it is hard to determine if any of them actually apply to our design yet without our final design decision.

2. Project Description

2.1. Objective

The device will provide a solution to all three problems associated with Mrs. Smith and her medication schedule. At the same time, the device will be simple, convenient, and reliable. The first problem associated with Mrs. Smith and her prescription schedule is independently remembering when it is time to take her medication. Mrs. Smith has frequent states of confusion, but once she is prompted to take
specified medications, she is able to carry out the task on her own. The solution to this problem is a programmable alarm system. The device will be programmable. The user will be able to set multiple alarms throughout the day to let Mrs. Smith know it is time to take her medication.

The second problem associated with Mrs. Smith and her medication schedule is that not all medications are taken at the same time everyday, or for that matter, some are taken at multiple times and others just once a day. As confusion might arise with different sets of medications being taken at different times throughout the day, the device will prompt Mrs. Smith to take specified medications and dosage amounts at desired times throughout the day. Again, the device will be initially programmed by the user. The medicine name, dosage amount, and dosage times will be input by the user. At the times the alarm goes off a prompt similar to “It is time to take you medication, are you ready?” will appear on the screen. The device will actively communicate with Mrs. Smith throughout each session. When Mrs. Smith is ready to take her medication she will be able to communicate that with the device. The device will then one by one tell her which medications she has to take and in turn ask for a response of “yes” or “no” as to whether or not she has taken the medication. Along with which medications Mrs. Smith has to take, the device will also communicate to her the dosage amount that she is supposed to take.

The last problem associated with Mrs. Smith’s medication schedule is the inability to get a reliable answer from Mrs. Smith as to whether or not she has taken her medication. Since it is impossible to build a convenient device that could actually tell if Mrs. Smith has physically taken the medication, the most reliable way to keep track of her medication consumption is through her response at that moment. Since Mrs. Smith is capable of taking her medication on her own once prompted, it is safe to say that she will be able to give a reliable response when taking her medication as to whether she indeed took it. At the same time, the input Mrs. Smith will be asked for will be as simple and error-proof as possible. When prompted to take a specific medication, the device will ask simple questions such as, “Have you taken 1 capsule of Tylenol?” Mrs. Smith will then be able to respond “yes” or “no” to the device. The device will keep a log of the time, medication and dosage amount for every dose throughout the day that Mrs. Smith has communicated she has taken.

2.2. Methods

Upon choosing a design for the device, the first decision to make was whether to design a device from scratch or to alter an existing device. A device built from scratch would be able to be designed exactly to the user’s requirements, however the capability of the device to be used for gaming was uncertain. An altered, existing device has the capability to be remodeled to the user’s requirements and gives the user the option of millions of pre-existing games along with up-and-coming games of the future. The decision to use an existing device was made based on the request that gaming capabilities would allow Mrs. Smith to have a positive association with the device.

While searching through existing products and devices, the PDA (Personal Data Assistant) seemed to be the best base model for our project. The PDA has gaming capabilities, the ability to store, input, and output data, and is easily programmable. Since
the new device is being designed around an existing device there are two important aspects of design to focus on. The first aspect of the design is in the medication alarm program itself. The second aspect of the design is the outer features of the device. The PDAs that exist on the market today contain a keyboard filled with unnecessary buttons for Mrs. Smith’s situation. Unnecessary buttons can lead to increased confusion, agitation, and distress with the device, therefore steps will be taken to redesign the external aspects of the device to increase the simplicity and ease of use of the device.

The medication alarm program will provide solutions to all three of Mrs. Smith’s problems, along with providing added features to make Mrs. Smith’s, as well as her husband’s day to day life easier. The program will provide a reliable alarm system for Mrs. Smith and her medication schedule. The alarm will have volume and vibrate capabilities. In the case that Mrs. Smith would be attending a function where it is polite to turn off cell phones and other devices that emit noise, she would be able to switch her device to vibrate to provide a reliable, but private alert that it is time to take her medication. At the same time, in a noisy location, Mrs. Smith will be able to select a louder alarm or an alarm/vibrate combination to alert her that it is time to take her medication. The program will have a variety of alarms to choose from. By providing a variety of alarms, the user will be able to choose an alarm that best fits their needs and liking. The option to turn the alarm to vibrate will also allow for a discrete and private alarm.

The program will alert Mrs. Smith when it is time to take her medication. In the case that the user is using the device for other tasks, the program will override other programs for that moment without disrupting the outcome of those programs. If Mrs. Smith is in the middle of a game or puzzle, the program will pause the game until Mrs. Smith is finished with her medication schedule. The option to “snooze” the medication schedule for five or ten minutes would also be included as a choice of the operator. The “snooze” option will be built with specific limitations to be sure that performing the task is not prolonged for a specific amount of time. When the alarm sounds, a question will appear asking the user if they are ready to begin the medication session. The user will be able to choose “yes” if they are ready and “no” if they would like to “snooze”. Once the user has communicated to the device that they are ready to take their medication by selecting the “yes” option, the device will begin outputting stored information about the specific session.

Once a medication session is initiated, the device will begin communicating which medications need to be taken. At this point in time, the user will read on a visual display which medications will be taken in the session and be able to prepare the medications to be taken. When the user is ready to begin taking the first medication, the program will prompt the user to take a designated dose of the first medication. The prompt will also ask the user for input as to whether or not they have taken the medication. The prompt will be similar to “Take 1 capsule of Tylenol. Please respond “Yes” if you have taken 1 capsule of Tylenol or “No” if you were unable to take 1 capsule of Tylenol.” Although this is wordy, a simpler version, “Please respond yes or no” could be placed in the program as an option, but in a state of confusion, telling the user exactly what they are saying yes or no to may lead to more reliable answers. Once the user has answered “yes” or “no” to whether they have taken the first medication, the second medication will show up in the same format and ask for the same input from the
user. The second medication will display with it’s individual dosage information and
input of “yes” or “no” will again be asked for from the user to move on to additional
medications in that session. When all the medications for a session have been
communicated and input has been received by the device from the user, the program will
give a congratulatory sound or vibration, along with a completion message. An example
of a completion message would be “Session Complete!” The message could be
personalized by the user, but a default such as the example will be provided. A
completion message will communicate to the user that they have successfully taken all of
their medication and could display the next time medication needs to be taken. A display
that includes the next scheduled time that medication is to be taken can help the user to
better plan ahead during their day. For example, if the user is going to be going out, they
will know whether or not they need to take their medication along with them or if they
will be home before the next scheduled session.

The program will also keep a log of all the interaction between the device and the
user. The time, dosage, and specific medication name will be recorded each time the user
tells the device “yes” or “no”. The log will be stored by date within the program and
accessible to the user and caretaker at all times.

The alert system will be based upon input from the user. The user will be able to
enter the name, description, dosage amount, and times to be taken for each medication.
The input area will be in a secure section to avoid accidental alteration of the alarm
system. Other features of the program will include a prompt to go to the pharmacy. By
entering the number of pills when receiving a new bottle, the program will be able to
count the amount of pills left every time the user responds “yes”. Once the minimum
amount is reached, the program will prompt the user to refill the prescription.

The second part of the design has to do with the external casing and other
physical adjustments made to the PDA. Since PDAs have full keyboards and unnecessary
keys for the situation at hand, adjustments will be made to simplify the device. Enclosing
keys only necessary for initial input of medications but unnecessary for gaming and
communicating with the program will make the device less confusing and easier to use.
The other problem with an existing PDA is the small size of the symbols, letters, numbers
and words printed on the buttons. Adjustments will be made to the text size and buttons
to accommodate users with vision problems. The last important feature of the device will
be convenience. The device will be easily transportable and convenient to carry
anywhere. Whether going out for the day or traveling for weeks, the device is small
enough to fit into a pocketbook or even a pocket.

3. Budget

The cost of the device can be divided into three general areas. The first area is the
cost of the existing device that will be altered. The cost of a PDA generally falls in the
range of $100 to $300 dollars. The second area of the project will affect the overall cost
of the device is the individual cost for games. The average cost of a wide variety of
games accessible for PDAs fall in the range of $10 to $20 dollars. Depending on the
number of games requested by Mrs. Smith, the cost of this area will vary. The last area
where costs may be accumulated is for adjustments made to the external portion of the
device. The cost of any parts needed to alter the outer casing and features of the device should not exceed $60. The most important part of the device is the program, which will provide a reliable alarm system for Mrs. Smith. Although this feature of the device is by far the most important, writing the program alone will contribute least to the expenses of the device.

4. Conclusion

The device offers Mrs. Smith a reliable way to be 100% independent in her daily routine. The device is able to solve all three problems associated with Mrs. Smith and her medication schedule. The device provides a reliable alarm system which can be adjusted for loud or quiet areas. The device also allows Mrs. Smith to “snooze” her session in the case that she is busy doing another task. Mrs. Smith will be able to communicate with the device throughout each session. In the case that Mrs. Smith is suffering from a state of confusion, the device will walk her through the session. Prompting her to take a specific dosage of each medication individually for the session, will prevent Mrs. Smith from being confused with which medications she should take after the alarm goes off. The last problem associated with getting a reliable answer from Mrs. Smith as to whether she has taken her medication will also be solved by the device. As long as Mrs. Smith can actively communicate with the device at the time she is taking her medication, unsure answers later on will not be the only evidence that she has taken her medication. The device will provide a reliable log of medication, time, and dosage amount that can be accessed by the user or caretaker to be sure that everything has gone smoothly.

The device will also provide Mrs. Smith with fun and entertainment. The ability to have a wide variety of games that can be updated at any point in time will provide Mrs. Smith with a never ending source of activity. Mrs. Smith will be able to use the device while traveling or just hanging around at her house. The more time Mrs. Smith is able to spend actively using the device will increase her ease of use of the device and her positive association of the device. The device will also provide Mrs. Smith and her husband or caretaker with important information, such as when it is time to go to the pharmacy. The device will be rechargeable and come with an adaptor to charge it through a wall outlet. The rough budget estimate for the device is anywhere from $230.00 to $500 dollars. The majority of the cost of the device comes from the PDA and cost of each of the individual games. The price could be reduced greatly for the program itself, however the cost of a device to load it onto would be equivalent to a PDA. The PDA is important to building a positive relationship between Mrs. Smith and the device because it has the capability to be used with a wide variety of games for fun and entertainment. The PDA device is tailored to the needs of Mrs. Smith in that it is convenient to carry, provides fun, entertainment, and a reliable alarm system. The capabilities and assurance provided by the device far outweigh the cost of the device.
Executive Summary:
This proposal contains the description and details of this project, the aim of which is to help a client discern the shampoo from the conditioner bottles while she is in the shower. In order to effectively explain the nature of the project, the topics that will be discussed are the background of the client, her condition, and a description of what she requires to help her deal with her condition. A detailed description of the purpose, objectives, and features of the device will be given along with detailed schematics to help give a better understanding of how the device works and how it will effectively help the client.

There are many devices on the market that resemble the product of this project, and the extent to which they are similar will be discussed in this proposal. Elements of other devices that will be integrated into the design of our product and reasons for their integration will be described. A breakdown of the project budget and cost comparisons for similar products to this device will be included. Overall, this proposal gives a complete account of the project background, purpose, product design and implementation methods that result in optimal satisfaction for the client.

1 Introduction

1.1 Background
Mrs. Smith is an elderly woman that suffers from poor memory and vision. These ailments make it difficult for Mrs. Smith to distinguish shampoo and conditioner bottles while she is in the shower. Her daughter has tried labeling the bottles in large letters, however, Mrs. Smith still couldn’t see the words well enough to read them. Mrs. Smith has a pair of glasses, but of course she cannot effectively wear them in the shower. Her daughter has also tried coloring the bottles different colors to help her mother distinguish the bottles, however, due to Mrs. Smith’s lacking memory, she tends to forget which color represents which bottle. Her daughter has even tried using bottles of different shapes and sizes, but Mrs. Smith still can’t remember which is which.

1.2 Purpose of the Project
The aim of this project is to develop a device that will help Mrs. Smith to reliably make a distinction between shampoo and conditioner bottles while in the shower. Other options have failed for Mrs. Smith because the effectiveness of those solutions relied on her memory and vision.

Mrs. Smith needs a device that will not only show physical differences between the two bottles, but will also remind her of the distinction between them while she takes a shower.

1.3 Previous Work Done by Others
Few devices have been found that help users identify physical objects by means of verbal indication. The majority of devices that do are used as toys for small children to remember the names of shapes and colors. There is lots of technology on the market that gives verbal feedback from visual cues such as sensory security systems that set off alarms that emit verbal warnings when a motion sensor is tripped. That device is very similar to
the one being developed in this project and both work from analogous rudimentary principles.

1.3.1 Patent Search Results
There are currently no listed on an assistive voice feedback device for physical object recognition.

2. Project Description

2.1 Objectives
Instead of using large lettered labels, or color coding, this device should make use of Mrs. Smith’s auditory capabilities by emitting an audible “Shampoo” or “Conditioner” in order to make it easier for Mrs. Smith to recognize the bottle that she holds in her hand. The device should be compatible with bottles of many different sizes, and shapes.

The device is expected to be used in the shower; therefore it should be waterproof and contain non corrosive parts. Although Mrs. Smith will not necessarily be carrying the device around, it need not be heavy. A lighter device would be less of a hazard than a heavy device in the event that the device falls from the position where it is mounted.

This device will consist of a rack that holds two bottles. The rack will have two lights of different colors that serve to help distinguish the pocket that each bottle is to be held in. Because of Mrs. Smith’s lacking memory, these lights will not be enough for her to distinguish the shampoo from the conditioner bottles. This is why proximity sensors will be implemented that will sense the presence of an object in each pocket, and will be used as a trigger for the audible “Shampoo” or “Conditioner” from the device. The device will be simple to use, safe, and require little to no work on the part of the user, while offering a convenient place to hold the shampoo/conditioner bottles.

2.2 Methods
The device will consist of two pockets forming part of a rack that hold the shampoo and conditioner bottles. What will make these pockets so special is that they will be deep enough to keep the bottles in place, and wide enough to hold different sized bottles. Shampoo/conditioner bottles come in many different shapes, however if the pockets are of a circular shape of large diameter, a wide array of different bottles should fit comfortably.

Mrs. Smith will be informed of which bottle is which by simply removing a bottle from the device. This will be possible due to proximity sensors that can sense the presence of an object in each pocket, namely, the shampoo and conditioner bottles. These sensors will go to work the second that Mrs. Smith picks a bottle out of a pocket by triggering an audible voice that says “Shampoo” or “Conditioner” (See figure 5).

At this point, Mrs. Smith will know the contents of the bottle that she will be holding, however, what if after using the shampoo/conditioner; she forgets which pocket holds which bottle? The solution to this problem lies in the two lights that are directly
above each pocket. The color of each light corresponds to the color of sticker that is put on each bottle (See Figures 2 & 3). This way, once Mrs. Smith is finished using the shampoo and conditioner, she will not put the shampoo bottle in the conditioner pocket or the conditioner bottle in the shampoo pocket. This keeps the device from telling Mrs. Smith that she has pulled out the conditioner bottle when it is really the shampoo bottle or vice versa the next time she takes a shower.

For convenience, a hook and soap tray could be added underneath the rack to hold some of her shower accessories, making the shampoo/conditioner identification device a worthy replacement for any current shower racks that she might already have.

The outer casing of the device would have to be mildew resistant, as current shower racks on the market are prone to getting mildew on them from the shower. The casing will have holes at the bottom of each pocket to keep the water from flooding the pockets. The product will use low impedance waterproof speaker.

The hook at the top of the device will be used to hang the device from any bar, pipe, or protrusion in the shower area. This gives Mrs. Smith the option to put the device in any place that she finds convenient for her. Because the device hangs for mounting, it will be high up, around eye level, for easy access. No bending down for bottles on the bathtub’s rim edge. Most existing shower racks on the market tend to slide on the pipes, lines or protrusions from which they hang. This device will have high-grip material on the hook to help keep the shower rack from moving or sliding on the line from which it is hanged.

This device will be powered by four AA batteries. In the interest of battery life, the device will have an on/off switch, for when the device is not in use. The device will use special splashproof speakers for safe use in the shower.
Figure 1 (Left): Side View of Device
Figure 2 (Right): Front View of Device

Figure 3 (Left): Shampoo Bottles with Color Stickers
Figure 4 (Right): Top-Down View of Device Showing Drainage Holes.
3. Budget

The costs for this project include the cost of the 2” waterproof speaker which should not cost more than $20, the proximity sensors should not cost more than $50 each. The cost of a standard hanging shower rack should not cost more than $10. Two LED lights of different colors should be very cheap, and not cost more than $5. The cost of PC board production and AA battery casing and on/off switch should cost roughly $50. This brings the estimated total estimated cost of production up to $175.

4. Conclusion

This project provides the client with a way to easily distinguish the shampoo bottle from the conditioner bottle while she takes showers. With it’s waterproof design, our device will be safe to use, even when it is submerged underwater, proving it’s safety in the shower. The device conveniently holds the shampoo and conditioner bottles in two large solid pockets and senses the presence or absence of each bottle with the use of proximity sensors. The device will be programmed to emit an audible “Shampoo” or “Conditioner” upon removal of a bottle from its respective pocket. To keep the bottles from being put in the wrong pocket, there are two lights on the device that correspond to the color stickers placed on each bottle. Drainage holes keep water from flooding each pocket. The device can be hanged by it’s attached hook anywhere there is a protrusion in the shower. Grippy material will line the hook region to prevent slippage. The device will run by 4 AA batteries with a long battery life if left on nonstop. Turning the device off via the on/off switch after use should extend that battery life considerably.
The rough budget estimate for the production cost of this device is $175. Components that contribute to the cost are the waterproof speakers, LED lights, proximity sensors, generic two pocket shower rack, PC board and AA battery casing. The cost of production per unit product would drop drastically with mass production by at least 70% bringing the estimated cost to consumers (given that the product is under mass production) to at least $52.00. Given that the proposed device practically does not exist anywhere else in the world, $175 is a small price to pay for an easy to use, safe and reliable device that is custom built to suit a client’s needs.