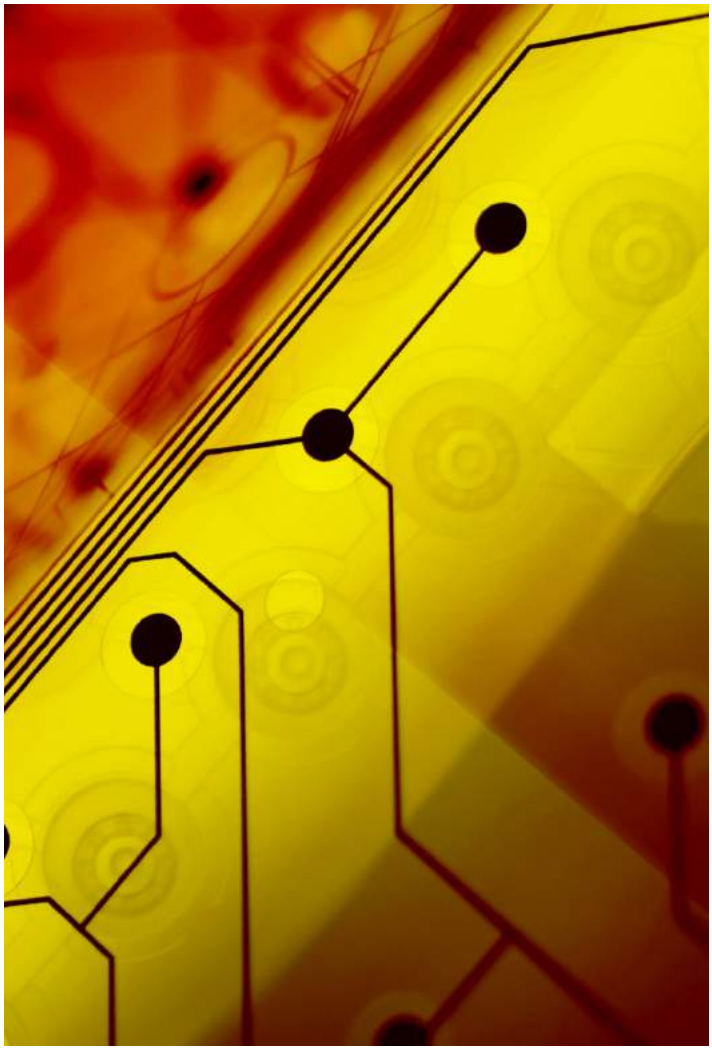

Assistive Technology Intervention Process

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Abstract

The purpose of the Seven Hills Assistive Technology Intervention Process was to develop a process by which to introduce assistive technology in Seven Hills' homes. The team accomplished this by designing a quantitative measurement tool, a catalog of assistive technology options and a comprehensive process for Seven Hills to follow when introducing technology. The team proved the process provides people with disabilities opportunities to increase their independence through the use of assistive technology by implementing the process in several Seven Hills homes. The team recommends that Seven Hills Foundation continues to use and improve this process in its efforts to expand the Assistive Technology department.

Acknowledgements

This project would not have been possible without the help of several people whom we would like to acknowledge. First, we would like to thank our sponsor, Seven Hills Foundation, for giving us the opportunity to do this project. We would like to especially thank Jean Des Roches, for all her assistance with our project. Her knowledge, excitement and leadership set a great example and she was always a pleasure to work with.

We would also like to thank Martha Rivera, Christina Brown and Lisa Mensah, who are the resident directors of the community homes, for their enthusiasm and willingness to work with us. They were able to provide us with valuable information about their residents as well as how the community homes work. Assistant resident director, Isaac, was also a great resource to have, and he was able to answer many questions about the home. He was always professional and willing to discuss ideas with us. We would like to thank all other staff from the homes we worked with for their willingness to help.

We would like to thank Mike Kendrick, Director of Facilities, for his assistance and enthusiasm. He was always cooperative, flexible and a pleasure to work with even when we asked to install technology systems he was not yet familiar with in homes he oversees.

We would like to thank Heather Borelli for running our orientation and giving us insight on training staff. She was able to answer many questions and offer ideas for training staff to use the process we discuss in this paper.

Thanks also to Jonathan Worcester, Seven Hills psychologist, for his insight on our measurement tool and for showing us examples of tools he uses now. He gave us insight that allowed us to further develop our tools.

Our final thanks go to our advisors at Worcester Polytechnic Institute: Professor Robert Traver and Professor Jian Zou for all the guidance they were able to provide throughout the project. Their comments were very helpful and allowed us to elevate the level of our work.

Executive Summary

Throughout the project the team generated a few recommendations that the sponsor, Seven Hills, could do to improve upon the assistive technology (AT) intervention process that was developed over the course of seven weeks. The catalog of AT that the team developed should be redesigned and implemented as a database. Entry of new items should be made more simplistic and become accessible to almost everyone within the organization. The steps for assessing individuals should become part of Seven Hill's existing clinical evaluation process. By integrating the assistive technology intervention process into the clinical evaluations, Seven Hills will be able to determine needs for assistive devices during intake into the foundation. Seven Hills should also apply the team's process across all programs. While this project worked primarily with one affiliate of Seven Hills, assistive devices offer opportunities of greater independence to more than just the NeuroCare program. Lastly, Seven Hills would benefit from transferring the responsibilities of implementing the AT intervention process to the appropriate department or individuals, whoever it may best fit.

The team gathered the aforementioned recommendations through the analysis of the seven week project. The team witnessed the benefits of assistive devices through the reevaluation process. The team focused on two residents from three different homes across Seven Hills. One individual has communication difficulties so the team introduced iPad applications that improve literacy, as well as an application that offers pictures to help build sentences and then speak them aloud. Another resident has use of only one hand and is limited to a wheelchair. The team found assistive devices that can complete activities the resident would like to do with the use of her one hand. The team also researched assistive technology to improve difficulties that an entire home had. By making the residents' TV and lights operational through their iPads, the residents were given more independence.

The primary goal of the project was to design an assistive technology intervention process. The first step of the process is to establish a preliminary assessment through the use of the teams designed Independence Measurement Tool (IMT). The tool, along with its complementary manual, was designed to test activities of daily living and assess the level of independence of each individual. Areas of possible improvement can be

identified after each individual is assessed using the IMT. Once an activity of daily living that could be improved was decided upon, research for assistive devices was done. The team created a catalog of over 100 assistive devices, organized by the activities of daily living from the IMT. The catalog offers potential solutions to difficulties common among people with disabilities. Once a technology is chosen, it can be implemented within the home to assist the individual. The final step reevaluates the success of the technology by reusing the IMT and manual to notice objective difference in the performance of activities of daily living.

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Introduction

The Seven Hills Foundation project aimed to enhance the quality of life for people with disabilities living in residential homes. Quality of life means independence and safety for people with cognitive and physical disabilities. Through its 3,600 employees in 170 locations, adults and children with disabilities are supported, educated and empowered so they are better prepared for life's challenges. In accordance with the mission and vision statements of Seven Hills Foundation, this project helped further their leadership, commitments and success in helping people with disabilities live more fulfilled lives.

This project builds on previous works. These include the use of low-tech assistive technology to assist people with disabilities. A team created kits that consisted of several tools to help people with disabilities performs tasks of daily living in an easier way. This project expands on that project by using high tech assistive technology and exploring a way to assess the success of the technologies. By combining low tech and high tech solutions, this project creates a process by which to introduce any assistive technology device to Seven Hills' homes.

This project will serve as a framework for future efforts in providing assistive technology for people with disabilities. It offered more safety as tasks became easier to perform. The project produced a comprehensive process to outfit existing homes with appropriate technology to increase independence and safety of the residents. The team analyzed the current conditions of the people in three different homes and developed recommendations to equip such homes with ideal technologies. The project designed technology systems that work seamlessly with Apple devices that are already in place in most homes. The team designed a measurement tool on which these systems were assessed based on level of improvement and independence gained for each resident. While conducting the analysis, the project considered costs of each plan to economically suit Seven Hills Foundation. Through evaluating the success of each plan, the project was able to provide a suitable solution to our sponsors to take appropriate steps in installing assistive technologies.

Literature Review

Developmental Disabilities

The Developmental Disabilities Assistance and Bills of Right Act defines a developmental disability as "a disability that originated at birth or during childhood and substantially restricts the individual's functioning in several major activities."(The Developmental Disabilities Assistance and Bill of Rights Act of 2000, 2000) These disabilities are attributed to a cognitive and/or physical impairment and are evident before an individual reaches the age of twenty-two. According to the Centers for Disease Control and Prevention, these developmental disabilities are caused by "impairment in physical, learning, language, or behavior areas (Center of Disease Control and Prevention, 2015)." Depending on the severity of the disability, these conditions can limit a person's ability to function normally. According to Seven Hills Foundation's website, common disabilities present in Seven Hills' homes include Autism Spectrum Disorder and Acquired or Traumatic Brain Injuries.

Acquired or Traumatic Brain Injury

Sevens Hills Foundation also provides support to people who may have acquired brain injuries later in life. Acquired Brain Injury (ABI) describes brain damage caused by events after birth. ABI can be caused by airway obstruction, near drowning, or even a stroke. Traumatic Brain Injury (TBI) describes brain injury caused by a direct blow to the head.

Assistive Technology

There exist many different technologies to assist people with developmental disabilities. According to "What is Assistive Technology," the Assistive Technology Act of 1988 describes assistive technology as any item or piece of equipment that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. Assistive technology devices and equipment can be classified under low tech or high tech. Low-tech assistive technology devices are generally less expensive and do not have complex features. They include prescription glasses, canes, handheld magnifiers and manual wheelchairs. On the other hand, high tech

devices are sophisticated and more costly. They include tablets, power wheelchairs and digital hearing aids.

Low Tech Assistive Technology

In the project, Development of a Low Tech Assistive Technology Kit (Ghion, Lou, Oakley, and Valley, 2015), the team designed tool kits filled with low-tech items that would help the people with disabilities living in the Seven Hills community. The tools inside these kits made daily tasks that would normally be difficult for people with disabilities easier to accomplish. The kits included items such as rotating iPad stands, twist ties, pole brackets, and sticky adhesive materials. In response to recommendations provided by this project, Seven Hills' community decided their next project would be to pursue more high tech assistive technology (Ghion, Lou, Oakley, and Valley, 2015).

High Tech Assistive Technology

High tech assistive technology includes devices such as computers, smartphones, tablets, robots and more. They provide a number of benefits that low-tech assistive technology cannot. Computers can do things exceedingly faster than humans and this technology can integrate multiple components of a home to work together. Smartphones can control lights, temperature and other aspects of the home.

A potentially useful aspect of computers is the ability to use a personal assistant to help people with disabilities. It is possible to prompt Siri, or other personal assistants, to create reminders or calendar activities. One common daily trouble for people with cognitive disabilities is keeping track of tasks and time. There are computer programs that supply, for example, daily calendars. The program will remind the user when certain things must be completed and the details of that task. Furthermore the program can be made to help the user by breaking down the task into steps that someone with cognitive disabilities will easily comprehend. The personal assistant is compatible with most operating systems (Scherer, Hart, Kirsch, and Schulthesis, 2005). Personal assistants and computers offer all people with cognitive disabilities support with daily activities.

Another type of high tech assistive technology is home automation. Although home automation is relatively new, there exist many smart

technologies to automate daily tasks within the home. These technologies can often be used collectively through an interface or operating system. Such technologies are, but are not limited to, lights, doors, windows, or garage doors. Certain operations that might normally trouble certain people can now be automatic and activated through the touch of a button. The prospective benefits of home automation include the ability to enhance safety and independence of the people with disabilities. According to "Needs and Solutions - Home Automation and Service Robots for the Elderly and Disabled", the study conducted several surveys to determine with what parts of daily living people with disabilities desire help. In the Helsinki University of Technology study, elderly people and people with disabilities showed a desire for technology to help with movement, lifting and several other activities. The study concluded that movement, lifting, loneliness, cleaning, maintaining personal hygiene, shopping and getting dressed all presented problems. The study examined the effects of some home automation technologies including, but not limited to, robots.

Apple has launched HomeKit, a framework that connects all Apple devices and many third party devices. HomeKit connects a home's products to a smart device such as an iPhone, iPad or Mac. By using an application on a smart device, one can communicate with many third party devices such as outlets, thermostats, locks and more. Companies such as iDevices, Philips, Haier and Honeywell are committed to producing many of these third party devices. This platform shows promise to alleviate some stress of daily tasks, such as movement and lifting. Through voice commands, it reduces the amount of moving one needs to do (Apple 2015).

Assessment Methods

Matching Person and Technology Model

With all the possible assistive technology, it is essential that a method for determining appropriate technology for disabilities be established. It is a myth that people with the same disability benefit from the same devices (Sohlberg, 2011). According to "Assistive Technology Assessment - Find the Right Tools", a poor match between the devices and the users frequently leads to the abandonment of the technology. There are many factors that need to be taken into account and as such there are many methods

for matching people to technology. A popular system is known as the Matching Person and Technology (MPT) Model. The basic design addresses three ideas. The first idea is the "characteristics of Milieu (environment and psychosocial setting) in which the assistive technology is to be used". The second is "pertinent features of the individual's personality, preference, and temperament". Lastly the MTP model is concerned with "salient characteristics of the assistive technology itself" (Galvin and Scherer, 1996).

Another method for matching technologies is given in the book, *Evaluating, Selecting, and Using Appropriate Assistive Technology*. The book contains multiple chapters that examine various disabilities and how to select appropriate assistive technology. For the case of blindness, the book suggests certain technologies that offer substantial support. When people have this particular disability, it is generalized that synthetic speech and voice commands will provide the best solution. These are the best solutions because voice recognition allows blind people the ability to operate computers and other electronics without having to press buttons. Synthetic speech gives them the ability to enjoy reading by allowing computers to speak the words audibly (Galvin, Scherer, 1996).

Questionnaires

The MPT method requires a lot of human input and analysis for determining appropriate technologies. However, there are two systems for matching assistive technologies using computer algorithms. This separates the human from the determination more than the MPT method does. The two algorithm systems benefit because the decision process offers the most logical results. The first method uses the TechMatch questionnaire. The questionnaire "helps clinicians and caregivers match people with cognitive impairments to computer tools". The caregiver completes a survey in collaboration with the client, and the program generates a response profile and algorithms that lead to individualized technology recommendations" (Sohlberg, M. M., 2011). The second computer-based method is known as the Compensation Techniques Questionnaire (CTQ). It is "a survey instrument used to collect information to establish the primary areas of need, past successes or challenges using strategies/devices, and current strategy use (Sohlberg, 2011)." These systems offer quick and reliable matching of assistive technologies to people with disabilities.

Another method to match assistive technologies to the disabilities they will help is the Assistive Technology Assessment (ATA). This model is derived from the MPT method. Unlike the MPT, however, the ATA idea consists of five steps. The first step is to "define the problem" and consider the types of assistive technology that may help the residents. The next step is to "gather relevant data", which can include information about the resident's environment, strengths and needs. The third step is to "generate potential solutions", where all the information collected will be analyzed to identify which services can potentially increase the resident's independence. The next step is to conduct trials and implement a trial plan in order to collect data about how the technologies affect the residents. This includes creating a rubric or other form of measurement tool that is able to determine success. According to "Assistive Technology Assessment - Find the Right Tools", the last step is to analyze all the results, determine the most appropriate devices and develop a plan to implement the recommended technology. This method is widely used to determine the types of assistive technology to use for students with learning disabilities. This system can also be used to assess the residents of Seven Hills.

Functional Independence Measure

A measurement tool used to assess the capabilities of people with disabilities is the Functional Independence Measurement (FIM) tool. The purpose of the FIM is to provide a "uniform system of measurement for disability" and "indicate how much assistance is required for activities of daily living (Wright 2000)." The FIM consists of 18 items of daily living (13 motor and 5 cognitive). Some items on the FIM are eating, bathing, toilet transfer, and memory. The instrument scores on a 7 point ordinal scale, with a 7 being completely independent, to 1 being completely dependent. After the instrument is applied and a total score is recorded, the score can be used to diagnose individuals. People with certain disabilities, on average, score similarly, within a degree of variation.

Functional Assessment Measure

In addition to the Functional Independence Measurement instrument, the team researched the Functional Assessment Measurement (FAM) instrument. The FAM is an addition to the FIM, adding 12 more activities of daily living to the test and therefore testing a larger and more comprehensive list of daily

activities. Because the FAM is an add-on to the FIM, the scoring of the FAM is the same. The FAM offers another level of assessment in order to properly diagnose people with disabilities. A version of the FIM and the FAM can be found in Appendix B, showing all the items and to which test they belong.

Home Automation as an Assistive Technology

This project will not be the first attempt to create a home automation system in order to help people with disabilities. There are several previous efforts. The Brain Injury Rehabilitation Trust (BIRT) completed one such study in the UK. In the study they designed a BIRT Assistive Technology (BAT) House and had a couple of individuals with brain injuries live in the house. The residents stayed in the house for 4-5 weeks each. Table 1 in Appendix A displays a summary of their needs, goals and technology solutions. Individuals were admitted to the BAT House after a period of intensive residential neurobehavioral rehabilitation (Encarnacao, Azevedo, Gelderblom, 2013).

During this time, a multidisciplinary team completed a thorough assessment of the individual's abilities and needs. This included formal neuropsychological assessment, as well as assessments of independence in Activities of Daily Living (ADL). The process included an assessment of whether the identified needs could be supported through the use of smart house technology. Individuals identified as having the potential to benefit from a period of transitional living with the technological support provided by the BAT House were referred to the service. In the results, the source stated that both participants acknowledged the helpfulness of features such as reminders. Clinical and support staff initially expressed some reservations about the project and were nervous about using the technology. Over time, they became more confident in the process and remarked that it helped identify the participants' needs (Encarnacao, Azevedo, Gelderblom, 2013).

A case study titled, "Episodic Memory Visualization in Robot Companions Providing a Memory Prosthesis for Elderly Users" demonstrates that a home care robot can assist users. The robot's memory visualization can serve as cognitive prosthetics by assisting users who have poor short-term memory (Encarnacao, Azevedo, Gelderblom, 2013).

In Italy, the University of Trento conducted a study on the effects that an automated home could have on people with disabilities. They wanted to "improve the accessibility and the use of the home environment for people with disabilities" (Goodacre, McCreadie, Flanagan, Lansley, 2007). The case evaluated how well the "Casa Satellite" provided an opportunity for people with Down syndrome to live independent of everyday assistance. This particular instance illustrates that home automation can help people with disabilities.

Methodology

This project designed a process to implement technology systems that enhance the quality of life for people with disabilities within Seven Hills Foundation. In the first step, the team assessed the capabilities of the residents through the use of a measurement tool. The tool was designed to assess individuals by testing and scoring activities of daily living. With this information, the team then analyzed technology options and matched these to specific disabilities. The team found technology devices that served the individual and worked with Apple devices. Apple devices are located throughout Seven Hills and are easily obtained by the residents. In addition to the fit, the cost of the technology was stated. After implementing technology in the home, the residents were assessed again to gauge the change in independence. Figure 1 represents the methodology structure.

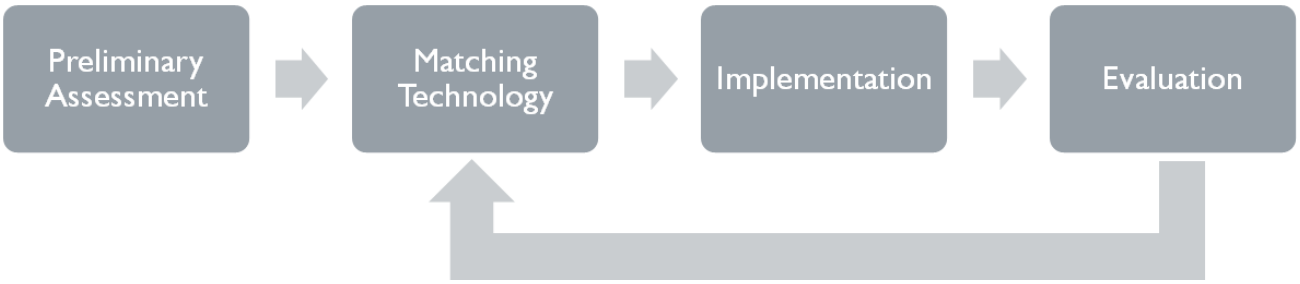


Figure 1

Preliminary Assessment

Preliminary assessment determined the needs of the clients with disabilities. In order to assess the needs of the people with disabilities the team interviewed staff members. Our approach also included interviews with the participants and observatory measures to assess the needs of Seven Hills' residents. A measurement tool was required when assessing the people with disabilities to ensure objective measurements were recorded. Without a baseline assessment the team could not properly evaluate the success of the assistive technology implemented later.

The team collected preliminary assessments for twelve individuals living in three homes. The assessments can be seen in Appendix C. The team was advised by the residential directors and our sponsor to focus on one

resident from each home. These residents include Joseph (from house A), Sally (from house B) and Andrew (from house C). Joseph struggles with communication. He knows very few words and cannot talk. Sally has limited mobility in one arm and struggles with activities such as buckling her wheelchair seat belt, cracking eggs and plugging in her iPad to charge. She also cannot reach elevated objects as she is in the wheelchair. Andrew has trouble with cooking. He wants to learn how to cook better but is also in a wheelchair.

Designing the Measurement Tool

The purpose of the measurement tool was to provide a method to measure the capabilities of people living in Seven Hills' residences. The process for designing the measurement tool began through study of previously developed tools. The tools researched are used for similar assessments. The Functional Independence Measure (FIM) and the Functional Assessment Measure (FAM) are two instruments that were particularly useful. The name for the tool that the team developed was the Independence Measurement Tool (IMT). The IMT includes 34 activities of daily living and scores on a 7-point scale. The team drew inspiration from the FIM and FAM to make this tool but further developed the IMT to address the needs of Seven Hills' residents. The residential directors, a psychologist from Seven Hills Foundation, our sponsor, and our advisors reviewed the measurement tool. The team also developed a manual to help assist the staff in using the IMT. The manual included detailed instructions on how to score each category.

House Residents

The residence directors and staff were capable of telling the team useful information about the residents. The residence directors are the people who reside over and watch the people with disabilities on a regular basis. By conducting interviews with the residential directors we established what the directors believe were the capabilities of the residents. Through their recommendations the team developed a good understanding of the perceived limitations of the residents. The residence directors also performed the preliminary assessment of the individuals by using the measurement tool the team developed. Because the directors work everyday with the residents, they were able to obtain accurate scores without disrupting the routine of the home.

The residence directors assessed the individuals prior to implementing technologies. This assessment helped identify activities of daily living that technology could make easier. Using this information, the team developed several solutions that could be presented to the residents and staff of the homes.

Residential Directors and Staff

Based on the established level of cognitive disabilities that the residential directors and staff declared, the team conducted an interview with the residents of the home. The interview sought the degree of independence and safety as determined by the residents themselves. The team received useful input regarding the limitations of the residents and what assistive technology they wanted.

The team observed the residents and came up with our own baseline examination. The team was able to observe communications and memory capabilities through informal interview moderated by the residential directors. Through visual observation the team saw aspects of mobility and transfer. The team designed a rubric that assessed and gathered objective data. The purpose of the rubric was to measure changes in the resident's lives, in terms of skill, attitude, and knowledge. By watching the daily activities of the people, the team established three things. The first was what kind of activities the individuals were expected to do on their own. The second was the activities they had difficulty with. The third was the activities that could be helped by assistive technology.

Compilation of Assistive Technologies

The team compiled a list of assistive technologies from databases online. These technologies went into a catalog. The catalog was organized by the categories on the Independence Measurement Tool and consists of over 100 technologies. New technologies can easily be added to the catalog as they are developed or found. This catalog is absolutely necessary to match technologies to individuals' needs. It provides a growing database of potential solutions that allows staff to easily find and choose from among many technologies in minutes.

Matching Technologies

With an assessment of the disabilities in hand, appropriate technologies were selected to improve the life of the residents. This was done using Techmatch questionnaire as well as Assistive Technology Assessment (ATA) ideologies. Both methods use the data that is collected in order to match technologies to five user domains. These domains are ability of technology use, user environment, user needs, cognitive ability and personal situation. The team selected appropriate devices based on what the team thought would aid the residents best. For example, Apple's HomeKit offers a variety of products. These products include lights, locks, thermostats and even sensors. These products were integrated to work seamlessly through a smart device, such as an iPad.

The team used the preliminary assessment to identify categories in which the individuals could use assistance. Lower relative scores signaled an area of possible improvement to the team. The team conducted interviews with the staff and residents to gauge interest in technology and the aspect of improving certain activities of daily living. While low scores might normally be a signal, the residents might feel they would rather work on another activity of daily living. Using this information, the team was able to develop several recommendations for the staff and residents of the home. The staff influenced recommendations based on their interest and skill level with certain technologies. All of the technology used in this project can be seen in Appendix E. The team completed cases illustrating the effectiveness of our process.

Joseph wants to learn how to read better. He has a strong desire to get his driver's license. He knows that he must be able to read to achieve this goal. The team was able to find several literacy applications for his iPad. These applications offer a low stress, fun atmosphere to learn how to recognize and read words. The team also identified a need for an Augmentative Alternative Communication (AAC) device for Joseph. Joseph is able to understand words when spoken to, but unfortunately can only speak a handful of the words in response. This device will help Joseph communicate with people in his home, at work, and in public more easily. The AAC application is called Proloquo2Go and offers picture and word recognition to construct sentences. It also includes a text to speech option so Joseph can be able to communicate again.

Sally wanted to be able to perform certain tasks such as reaching high items, cracking eggs, buckling her seat belt and charging her iPad with the use of only one hand. The team was able to find a grabber and egg cracker that required the use of one hand. The team also found a Qi charger kit that allowed Sally to charge her iPad by just placing it on a circular platform. The team used the Qi charger, equipped with an adapter to suit the older iPad's charging port. The team also modified her iPad case so the Qi charger fit inside the case. That allowed Sally to place the iPad accurately by fitting the circular hole on the case with the circular platform.

House A also expressed the need to control lights and power to the TVs. The team found a WeMo LED starter set and the WeMo switch to address these needs. The LED lighting kit provides a smart lighting option. The lights can be turned on and off through the use of a smart device. The switch allowed users to control power to a particular device. It was used to turn the TV on and off without pushing the button on the remote or TV.

Implementing Technology

After developing the list of devices that appeared to best fulfill the needs of the residents, the next step was to implement the ideas on a small-scale level. Applying the process to the selected homes provided a reference point to determine the practicality of the proposed process. Implementation of the design required all residents to agree to participate so that no one's privacy was infringed upon. Realistically every project has a budget, so one was agreed upon in advance of the implementation. The team made sure the budget was followed.

Once the appropriate technology was determined, it was necessary to see how well it worked. To improve the design of the technology system, a feedback mechanism was implemented. An assessment loop was used in the operation to make appropriate changes that best fit the needs of the individuals. The feedback loop included reapplying the measurement tool and observing changes in the responses of the individuals. Feedback was used to alter the design to further fit the user's specific needs that were not addressed initially.

The team implemented the technology discussed above and taught the staff and residents to use it. It is important to teach both parties so they

can help each other. For Proloquo2Go, a more complicated application, formal lessons were scheduled for the staff.

Evaluation

In order to determine the success of the technology systems, a three-part evaluation was applied. The measurement tool assessed the amount of independence and safety gained due to the implementation of the assistive devices. The team compared this evaluation to the results of the preliminary assessment. It provided a quantitative way to measure the success of the technology systems.

The team held post implementation interviews with staff and residents to obtain their opinions of the systems. Staff members were able to notice differences in individuals' behavior and mood while the residents were able to discuss what they liked and disliked.

The project conducted a budgetary review of the technology systems. The review included the cost of any equipment and the cost to maintain such equipment.

Results

The team received preliminary assessments for twelve individuals from three different homes. The Resident Directors for these homes shared that the tool was very easy to use and made a lot of sense, even with only informal training. They commented that this tool was easier to use than a lot of other tools they are formally trained to use.

The team also found some positive changes in the resident's independence due to the implemented technology. The results were determined by a change in the resident's IMT scores. A higher score on a specific category indicates that the technology has helped the resident become more independent in that aspect of daily living. The final assessments can be found in Appendix D.

House A

In house A, Proloquo2Go gave Joseph the ability to communicate in a way that he was not able to do before. Before the team introduced Proloquo2Go, Joseph would become frustrated trying to ask for something or express himself. Proloquo2Go gave him a voice through the text to speech feature. In addition to helping Joseph communicate with staff, friends and family independently, the app will also aid Joseph's spelling skills and improve his ability to construct sentences. Other applications were also set up for Joseph to improve his literacy. These applications include Phonics Genius, Word Magic and Simplex Spelling HD - DOLCH Sight Words. These apps form a suite of progressive courses for Joseph to follow in that order. As Joseph continues to use these apps, we expect improvements in his communication and literacy skills. House A also implemented smart LED lighting and smart switches for residents. This system allows the residents to control the lights and other devices from their iPad. Before, residents with trouble moving had to move or call for assistance to turn lights or other devices on or off. Some residents would also forget to turn off their television when they would leave for the day. This system allows residents with restricted mobility to control lights with the touch of a button. It also allows for scheduling of the devices to turn them off at particular times.

After receiving the final assessments, the team observed that most of Joseph's scores stayed the same as the preliminary assessment scores. The

team concluded that this might because of the learning curve that comes with the technology, as well as the short time Joseph had with the technology. The team expects that as time passes and Joseph becomes more familiar with the newly implemented devices, his independence and safety will improve.

House B

In house B, the implemented devices increased Sally's independence. The first device, a grabber, gives Sally the ability to reach and get things that are far away without having to stand up or stretch. When the team observed Sally using the grabber, they noted that she could now reach the clothes at the top of her closet, allowing her to store clothes where she couldn't before. The second device, an egg cracker, gave Sally the ability to crack an egg with one hand, which increases independence while cooking. Sally used to rely on someone to crack her egg to make a meal. The egg cracker has a steep learning curve, so progress won't be immediately evident and it may take some time to get used to. With practice she will be able to use the device to crack eggs independently. The last device, a QI charger, made charging an iPad much easier for Sally. The limited use of Sally's hand makes it difficult for her to hold an iPad and plug the charger in at the same time, so the easy placing of an iPad on a base to charge made Sally much more independent.

Sally's reassessment scores show small improvements in dressing because she can now reach all of the items in her closet. As with Joseph, there is a learning curve on some of Sally's technology and as time passes the team expects Sally's scores to increase in cooking and use of technology as well.

Budgetary Review

The team was required to provide a budgetary review of the project. The purpose of the budgetary review is to offer insight to the cost of particular technologies, giving an idea of what budget someone would need to help a person with disabilities. At the beginning of the project the team and our sponsor agreed on a budget of $500. That budget was later modified to include an additional $200 for applications on the iTunes store. The team managed to easily stay within our budget while introducing all the assistive devices in the homes. Buying all the assistive devices described before cost a total of $226.97, including shipping and handling costs. Table 2 includes the cost the

team paid for each individual item. The sponsor was able to get access to all apps on the iTunes store that the team requested and therefore, the team did not have to spend any of the budgets on apps. The cost for the apps will be displayed in Table 2 for informational purposes.

While the team was able to stay within the budget, the cost to buy each item could fluctuate. Depending on the vendor and time in which the items are needed, the cost can be more or less. The team needed the assistive devices relatively soon due to the short length of our project time and therefore paid more for faster shipping. This can be avoided if proper planning is done. The team also spent more money on WeMo devices because of the vendor purchased from and the necessity for fast shipping. Most devices the team listed in the catalog are sold through multiple vendors, and therefore doing appropriate shopping can save money. The catalog shows the estimated cost of each item.

Item	**Cost**	**Quantity**
WeMo Smart LED Lighting Starter Set	$68.70	1
WeMo Switch	$38.99	2
2 pack of iPhone/iPad 8pin Female to 30pin Male Adapter	$5.85	1
26 inch EZ Grabber Reaching Aid	$13.88	1
One Handed Egg Cracker	$9.49	1
Qi Wireless Charger Kit for Apple iPhone/iPad	$33.98	1
Shipping	$17.09	1
	Total	226.97
Apps		
Proloquo2Go	$199.00	1
Phonics Genius	Free	1
Word Magic	$0.99	1
Simplex Spelling HD	$4.99	1
	Total	$204.98

Table 2

Recommendations

Database

The technology catalog developed by the team is a good place to get ideas for which types of technology could prove helpful for challenges faced. However, the possibilities for technology are almost endless, so it would be very beneficial to create a database where more technology could be added as it is found. There are often many different applications or iterations of a product with small differences, such as aesthetics. Although it seems tiny, these differences may prove to be the deciding factor for why someone prefers one piece of technology over another. Another advantage of having the technology in a database is the fact that it is easier to access and update than a collaborative document.

Integration into Clinical Evaluations

The next step is to move this process to part of the clinical evaluations during intake into the Foundation. This will get the individual, their guardian(s) and any staff who support them to start thinking about what technology is available. The assistive technology can help achieve the goals set forth in an Individualized Service Plan (ISP). This is something Seven Hills' Assistive Technology department is pushing for and we advise that they use this process as the foundation.

Expansion Across Affiliates

The team worked primarily with Seven Hills NeuroCare during the project, but there are many more people within other affiliates who may benefit from Assistive Technology. The process was built to be general enough that other affiliates would be able to perform the same process with just minor changes to suit that program. Seven Hills Community Services might benefit the most from incorporating this process because they operate residences similar to those operated by NeuroCare.

Transition of Responsibilities

After completion of the project, responsibility for conducting the process will be transferred to Seven Hills. It is recommended that they follow the same process that the team outlined. This process is where the IMT

is administered by the RD of the home, a meeting is conducted with the RD and the resident, technology is matched to fit the highest perceived need, the technology is implemented, and the person is reevaluated following the implementation. When the team introduced the technology, brief training sessions were held with the staff and residents to provide proficiency on the basics. After Seven Hills takes over the process, they will need to provide in-depth training of each type of technology. These training sessions will likely be held with one for the staff first, then a session for the resident(s) who receive the technology.

Increase Detail of Measurement Tool

The IMT that the team developed contains thirty-four items. These provide an accurate picture of the person's capabilities. The IMT also indicates areas that can be improved through the use of assistive technology. Although the list of items on the measurement tool is already comprehensive, it is still possible to further break down each of the items. Breaking down the items into areas that are more detailed and easier to assess will make the tool even easier to use.

Perform Quarterly Reevaluations

Not all of the improvements will be evident immediately. It could take weeks or even months to see improvements. For this reason, the team recommends quarterly reevaluations be performed using the IMT. In this way, the person's technology needs are sure to be fulfilled because if it is discovered that the target area has not improved, a team can work to find and implement other technology solutions.

Final Personalized Recommendations

As a result of working with so many people, not every single problem discovered was addressed in the duration of the project. In order to assure the technology solutions work as intended, staff may need to prompt the resident. This will remind the resident they should be using the technology rather than just try to push through a task they are struggling with.

During the project, Joseph in house A was given Proloquo2Go and multiple literacy apps. In order for these to make a difference it is the responsibility of the staff to ensure he is using the literacy apps when he

feels comfortable and is willing to do so. The team believes if he uses the apps for 15-30 minutes 3-5 times per week it will improve literacy. The staff should also remind him that he should be using Proloquo2Go to communicate rather than showing pictures or physical objects. Once the staff believes Joseph has progressed significantly with phonics and spelling, they should assist him in downloading or direct him to download the app "Vocabulary Builder Grade 6." The app contains flashcards to teach words, then quizzes to test knowledge and retention. This app is part of a suite developed by Pearson containing 6 apps (Vocabulary Builder Grade 6-12). He can progress through the suite as his vocabulary improves.

Proloquo2Go is a very versatile AAC app that can be customized as Joseph's literacy and communication skills improve. Once he progresses far enough, a whole new app may be appropriate. One such app is verbally, and other options are included in the catalogue. Verbally requires a certain level of literacy so there may be another app that serves as an intermediate step if necessary.

Sally is a resident in house B who received a few low-tech solutions as well as a QI charger. She is fairly independent and has found ways of doing things without using the technology. The staff should be cognizant of that and if they notice her performing a task without the technology, she should be reminded that it might make it easier for her.

Appendices

Appendix A: Needs, Goals and Solutions

Table 1. Summary of Needs, Goals and Technology Solutions.

Needs	Goals	Technology solution
Personal Care		
Level of hygiene	To ensure that RK/PT keeps an adequate level of hygiene	Monitor number of showers taken, and flag if none or more than 2 are taken daily
Domestic skills		
Safety within the kitchen	To ensure that RK/PT remembers to turn appliances off (hob and oven) once cooking is completed	Prompt to turn hob (10') and oven (1h) off if left unattended Auto-switch off and pager message to staff if no action upon prompt
	To ensure that fridge and freezer are kept at correct temperatures at all times	Prompt to close fridge/freezer and pager message to staff if no action
General safety and wellbeing		
Safety within the house	To ensure that RK/PT do not let strangers in the house.	Pager message to staff if RK/PT opens the door to strangers
	To ensure that RK/PT returns to the house every evening	Pager message to staff if there is no house occupancy by 22:00
	To ensure that PT does not leave the house after 22:00	Prompt that it is too late to leave the house is played when PT appears to be leaving the house. Pager message to staff if PT leaves the house after 22:00
Functional routine	To ensure that RK/PT keeps a functional routine	Occupancy data and appliance usage recorded, overnight bedroom exits counted, instances of non-fridge usage within 24h counted
Memory	To ensure that RK/PT takes the house keys with him when leaving	Prompt to take keys is played when RK/PT appears to be leaving the house

The results of a study on the needs, goals and technology solutions for people with disabilities.

Appendix B: FIM and FAM

FUNCTIONAL INDEPENDENCE MEASURE™ AND FUNCTIONAL ASSESSMENT MEASURE
Brain Injury

Scale:
7 Complete Independence (timely, safely)
6 Modified Independence (extra time, devices)
5 Supervision (cuing, coaxing, prompting)
4 Minimal Assist (performs 75% or more of task)
3 Moderate Assist (performs 50%-74% of task)
2 Maximal Assist (performs 25% to 49% of task)
1 Total Assist (performs less than 25% of task)

(Patient Stamp)

	SELF CARE ITEMS	Adm	Goal	D/C	F/U
1.	Feeding				
2.	Grooming				
3.	Bathing				
4.	Dressing Upper Body				
5.	Dressing Lower Body				
6.	Toileting				
7.	Swallowing*				
	SPHINCTER CONTROL				
8.	Bladder Management				
9.	Bowel Management				
	MOBILITY ITEMS (Type of Transfer)				
10.	Bed, Chair, Wheelchair _____				
11.	Toilet _____				
12.	Tub or Shower _____				
13.	Car Transfer* _____				
	LOCOMOTION				
14.	Walking/Wheelchair (circle)				
15.	Stairs				
16.	Community Access*				
	COMMUNICATION ITEMS				
17.	Comprehension-Audio/Visual (circle)				
18.	Expression-Verbal, Non-Verbal (circle)				
19.	Reading*				
20.	Writing*				
21.	Speech Intelligibility*				
	PSYCHOSOCIAL ADJUSTMENT				
22.	Social Interaction				
23.	Emotional Status*				
24.	Adjustment to Limitations*				
25.	Employability*				
	COGNITIVE FUNCTION				
26.	Problem Solving				
27.	Memory				
28.	Orientation*				
29.	Attention*				
30.	Safety Judgement*				

*FAM items

	Admt	Date	D/C	Date		Admt	Date	D/C	Date
RN	_____	_____	_____	_____	ST	_____	_____	_____	_____
PT	_____	_____	_____	_____	PSY	_____	_____	_____	_____
OT	_____	_____	_____	_____	REC	_____	_____	_____	_____

Functional Independence Measure and Functional Assessment Measure tool

Appendix C: Independence Measurement Tool

Test Administrator Name: _____ Date: _____ Phone Number: _____

Test Administrator Signature: _____ Resident Address: _____

Independence Measurement Tool

	Skill	Score	Duration	Notes
	Self Care Items			
1	Toileting/Bowel Movements			
2	Feeding			
3	Cooking			
4	Bathing			
5	Dressing Lower Body			
6	Dressing Upper Body			
7	Brushing teeth			
8	Shaving			
9	Laundry			
10	Exercise			
11	Brushing hair			
	Mobility Items			
12	Walking			
13	Stairs			
14	Car Transfer			
15	Bed Transfer			
16	Shower/Tub Transfer			
17	Toilet Transfer			

Standard scoring is as follows:

7- participant performs all actions, independently, either with or without assistive devices

6 - participant performs all actions with cuing, coaxing or prompting from staff, but no cont

5 - participant performs between 80% and 100% of the actions with excessive physical sup

4 - participant performs between 60% and 80% of the actions with excessive physical supp

3 - participant performs between 40% and 60% of the actions with moderate physical supp

2 - participant performs between 20% and 40% of the actions with excessive physical supp

1 - participant performs between 0% and 20% of the actions with maximum physical suppo

N/A - not applicable, participant does not perform action

	Communication Items			
18	Reading			

Side A of the Independent Measurement Tool

19	Writing			
20	Speaking			
21	Nonverbal			
	Cognitive Items			
22	Problem Solving			
23	Short Term Memory			
24	Long Term Memory			
25	Attention			
26	Orientation			
	Environmental Control Items			
27	Lights			
28	Doors			
29	Temperature			
30	Windows			
31	Blinds			
32	Entertainment			
33	Use of Technology			
34	Cleaning			
	Miscellaneous Items			
35				
36				
37				
38				

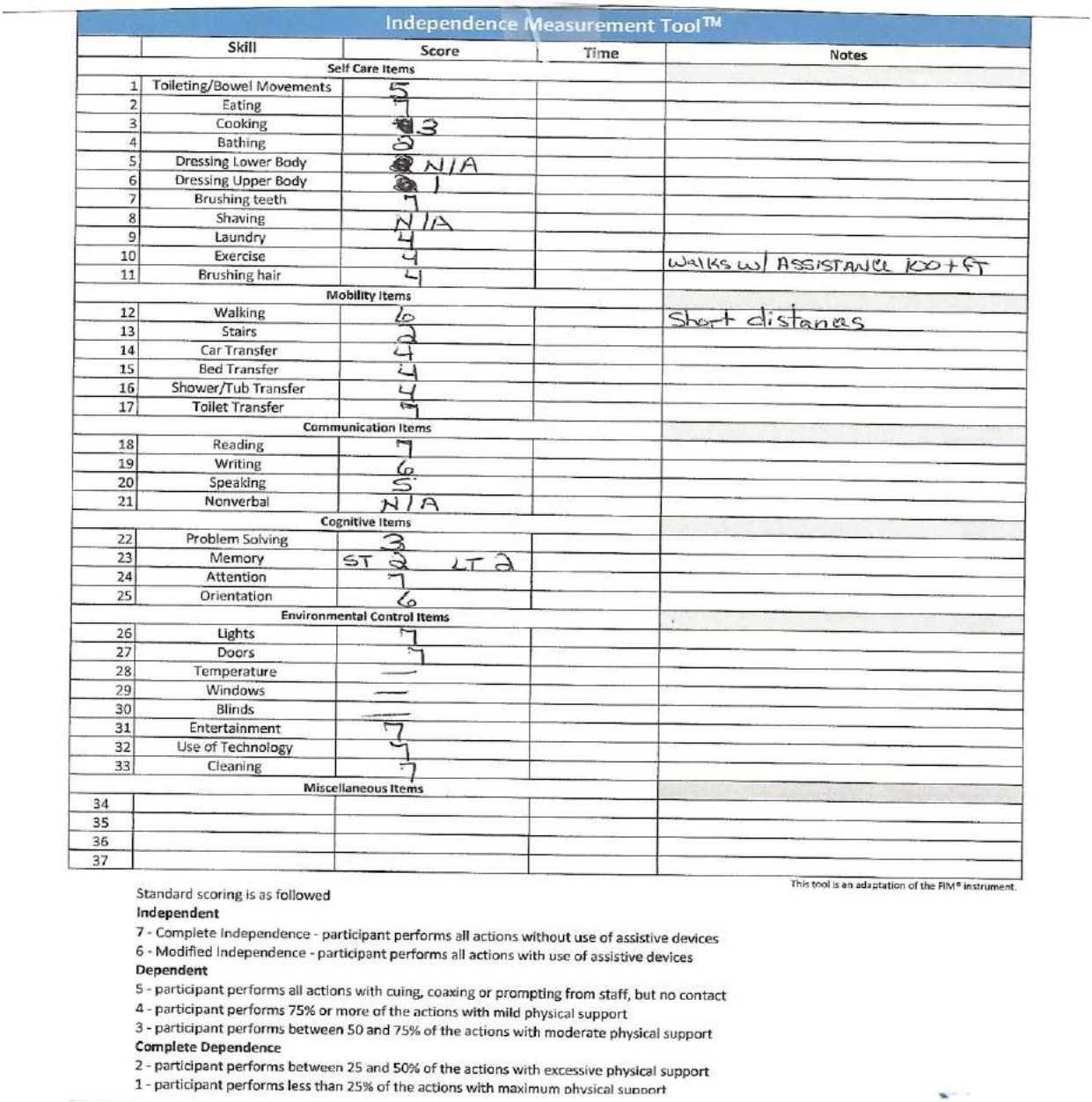
Standard scoring is as follows:

7- participant performs all actions, independently, either with or without assistive devices
6 - participant performs all actions with cuing, coaxing or prompting from staff, but no cont
5 - participant performs between 80% and 100% of the actions with excessive physical sup
4 - participant performs between 60% and 80% of the actions with excessive physical supp
3 - participant performs between 40% and 60% of the actions with moderate physical supp
2 - participant performs between 20% and 40% of the actions with excessive physical supp
1 - participant performs between 0% and 20% of the actions with maximum physical suppo
N/A - not applicable, participant does not perform action

Resident Name: _____

Side B of the Independence Measurement Tool

Appendix D: Initial Assessments



Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	5		
2	Eating	7		
3	Cooking	1.3		
4	Bathing	0		
5	Dressing Lower Body	N/A		
6	Dressing Upper Body	1		
7	Brushing teeth	7		
8	Shaving	N/A		
9	Laundry	1		
10	Exercise	4		walks w/ assistance 100+ ft
11	Brushing hair	7		
	Mobility Items			
12	Walking	6		Short distances
13	Stairs	2		
14	Car Transfer	4		
15	Bed Transfer	7		
16	Shower/Tub Transfer	4		
17	Toilet Transfer	7		
	Communication Items			
18	Reading	7		
19	Writing	6		
20	Speaking	5		
21	Nonverbal	N/A		
	Cognitive Items			
22	Problem Solving	3		
23	Memory	ST 2 LT 2		
24	Attention	7		
25	Orientation	6		
	Environmental Control Items			
26	Lights	7		
27	Doors	7		
28	Temperature	1		
29	Windows	1		
30	Blinds	1		
31	Entertainment	7		
32	Use of Technology	1		
33	Cleaning	7		
	Miscellaneous Items			
34				
35				
36				
37				

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75% or more of the actions with mild physical support

3 - participant performs between 50 and 75% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50% of the actions with excessive physical support

1 - participant performs less than 25% of the actions with maximum physical support

Initial Assessment for Sally

Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items		Second Shift.	
1	Toileting/Bowel Movements	7	3-9p.	
2	Eating	7	5pm.	
3	Cooking	4	10AM.	
4	Bathing	7	9AM.	
5	Dressing Lower Body	7	10AM	
6	Dressing Upper Body	7	10AM	
7	Brushing teeth	6	9:30AM	Making Noises |
8	Shaving	6-4	10:AM	Depends | day - need Assisted | cuts.
9	Laundry	6	11 AM.	
10	Exercise	6	AM.	
	Mobility Items			
11	Stairs	6		
12	Car Transfer	6-		Have to seat on Back | no safe infant.
13	Bed Transfer	6		
14	Shower/Tub Transfer	7		
15	Toilet Transfer	7		
	Communication Items			
16	Reading	1		
17	Writing	1 (by mommy)		By memory | can't talk
18	Speaking	1 (Limitations)		Limitations a few words.
	Cognitive Items			
19	Problem Solving	1		
20	Memory	1		
21	Attention	5		
22	Orientation	2		
	Environmental Control Items			
23	Lights	7		
24	Doors	7		
25	Temperature	1		
26	Windows	1		
27	Blinds	1		
28	Entertainment	7		
29	Use of Technology	4		
30	Cleaning	5		

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75\% or more of the actions with mild physical support

3 - participant performs between 50 and 75\% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50\% of the actions with excessive physical support

1 - participant performs less than 25\% of the actions with maximum physical support

Independence Measurement Tool™				
	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	3		
2	Eating	3		
3	Cooking	3		
4	Bathing	3		
5	Dressing Lower Body	3		
6	Dressing Upper Body	3		
7	Brushing teeth	3		
8	Shaving	3		
9	Laundry	1		
10	Exercise	1		
11	Brushing hair	3		
	Mobility Items			
12	Walking	1		
13	Stairs	NA		
14	Car Transfer	3		
15	Bed Transfer	4		
16	Shower/Tub Transfer	1		
17	Toilet Transfer	3		
	Communication Items			
18	Reading	1		
19	Writing	1		
20	Speaking	4		
21	Nonverbal	4		
	Cognitive Items			
22	Problem Solving	3		
23	Memory	3		
24	Attention	2		
25	Orientation	2		
	Environmental Control Items			
26	Lights	2		
27	Doors	3		
28	Temperature	NA		
29	Windows	NA		
30	Blinds	NA		
31	Entertainment	6		
32	Use of Technology	6		
33	Cleaning	3		DISHWASHER
	Miscellaneous Items			
34	RS4/RS3 TV	6		
35		6		
36				
37				

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75% or more of the actions with mild physical support

3 - participant performs between 50 and 75% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50% of the actions with excessive physical support

1 - participant performs less than 25% of the actions with maximum physical support

Initial Assessment for Participant A

Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	7		
2	Eating	7		
3	Cooking	5		
4	Bathing	7		
5	Dressing Lower Body	7		
6	Dressing Upper Body	7		
7	Brushing teeth	7		
8	Shaving	7		
9	Laundry	7		
10	Exercise	7		
11	Brushing hair	7		
	Mobility Items			
12	Walking	6		
13	Stairs	7		
14	Car Transfer	7		
15	Bed Transfer	7		
16	Shower/Tub Transfer	7		
17	Toilet Transfer	7		
	Communication Items			
18	Reading	7		
19	Writing	7		
20	Speaking	7		
21	Nonverbal	7		
	Cognitive Items			
22	Problem Solving	5		
23	Memory	ST 3 LT 4		
24	Attention	7		
25	Orientation	7		
	Environmental Control Items			
26	Lights	7		
27	Doors	7		
28	Temperature	7		
29	Windows	7		
30	Blinds	7		
31	Entertainment	7		
32	Use of Technology	7		
33	Cleaning	5		
	Miscellaneous Items			
34				
35				
36				
37				

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75% or more of the actions with mild physical support

3 - participant performs between 50 and 75% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50% of the actions with excessive physical support

1 - participant performs less than 25% of the actions with maximum physical support

Initial Assessment for Participant B

Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	6 or 1	sporadic	varies based on incontinence episode
2	Eating	7		
3	Cooking	7		
4	Bathing	6 or 1	sporadic	varies based on incontinence episode
5	Dressing Lower Body	7		
6	Dressing Upper Body	7		
7	Brushing teeth	NA		
8	Shaving	1		
9	Laundry	1		
10	Exercise	2		
11	Brushing hair	7		cont'd
	Mobility Items			
12	Walking	6		
13	Stairs	6		
14	Car Transfer	4 or 6		Depends on vehicle
15	Bed Transfer	7		
16	Shower/Tub Transfer	7 or 1		varies based on incont. episode
17	Toilet Transfer	7		incap.
	Communication Items			
18	Reading	4		
19	Writing	4		
20	Speaking	7		
21	Nonverbal	5		
	Cognitive Items			
22	Problem Solving	1		
23	Memory	1		
24	Attention	4		
25	Orientation	4		
	Environmental Control Items			
26	Lights	7		
27	Doors	7		
28	Temperature	NA		
29	Windows	NA		
30	Blinds	7		
31	Entertainment	1		
32	Use of Technology	1		
33	Cleaning	5		
	Miscellaneous Items			
34				
35				
36				
37				

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75% or more of the actions with mild physical support

3 - participant performs between 50 and 75% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50% of the actions with excessive physical support

1 - participant performs less than 25% of the actions with maximum physical support

Initial Assessment for Participant C

Independence Measurement Tool™				
	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	5 8 4		
2	Eating	7		
3	Cooking	4		
4	Bathing	4		
5	Dressing Lower Body	4		
6	Dressing Upper Body	4		
7	Brushing teeth	5		
8	Shaving	4		
9	Laundry	4		
10	Exercise	2		
	Mobility Items			
11	Stairs	1		
12	Car Transfer	1		
13	Bed Transfer	4		
14	Shower/Tub Transfer	4		
15	Toilet Transfer	4		
	Communication Items			
16	Reading	7		
17	Writing	7 8 5		
18	Speaking	7		
	Cognitive Items			
19	Problem Solving	5 8 4		
20	Memory	2		
21	Attention	2		
22	Orientation	2		
	Environmental Control Items			
23	Lights	7		
24	Doors	7		
25	Temperature	7		
26	Windows	7		
27	Blinds	7		
28	Entertainment	7		
29	Use of Technology	7		
30	Cleaning	2		

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75\% or more of the actions with mild physical support

3 - participant performs between 50 and 75\% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50\% of the actions with excessive physical support

1 - participant performs less than 25\% of the actions with maximum physical support

Initial Assessment for Participant D

Independence Measurement Tool™				
	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	4		
2	Eating	5		
3	Cooking	3		
4	Bathing	5		
5	Dressing Lower Body	5		
6	Dressing Upper Body	5		
7	Brushing teeth	5		
8	Shaving	2		
9	Laundry	4		
10	Exercise	1		
	Mobility Items			
11	Stairs	5		
12	Car Transfer	5		
13	Bed Transfer	6		
14	Shower/Tub Transfer	5		
15	Toilet Transfer	5		
	Communication Items			
16	Reading	5		
17	Writing	5		
18	Speaking	5		
	Cognitive Items			
19	Problem Solving	4		
20	Memory	2		
21	Attention	2		
22	Orientation	2		
	Environmental Control Items			
23	Lights	6		
24	Doors	6		
25	Temperature	1		
26	Windows	1		
27	Blinds	1		
28	Entertainment	3		
29	Use of Technology	3		
30	Cleaning	3		

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75\% or more of the actions with mild physical support

3 - participant performs between 50 and 75\% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50\% of the actions with excessive physical support

1 - participant performs less than 25\% of the actions with maximum physical support

Initial Assessment for Participant E

Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	1		
2	Eating	2		
3	Cooking	1		
4	Bathing	2		
5	Dressing Lower Body	2		
6	Dressing Upper Body	2		
7	Brushing teeth	2		
8	Shaving	1		
9	Laundry	NA		
10	Exercise	1		
11	Brushing hair	NA		
	Mobility Items			
12	Walking	4		
13	Stairs	NA		
14	Car Transfer	NA		
15	Bed Transfer	6		
16	Shower/Tub Transfer	4		
17	Toilet Transfer	3		
	Communication Items			
18	Reading	NA		
19	Writing	1		
20	Speaking	4		
21	Nonverbal	2		
	Cognitive Items			
22	Problem Solving	1		
23	Memory	1		
24	Attention	1		
25	Orientation	1		
	Environmental Control Items			
26	Lights			
27	Doors	6		
28	Temperature	NA		
29	Windows	NA		
30	Blinds	NA		
31	Entertainment	NA		
32	Use of Technology	NA		
33	Cleaning	NA - 1		(MAY PUT DISHES IN DISHWASHER)
	Miscellaneous Items			
34				
35				
36				
37				

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75% or more of the actions with mild physical support

3 - participant performs between 50 and 75% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50% of the actions with excessive physical support

1 - participant performs less than 25% of the actions with maximum physical support

Initial Assessment for Participant F

Independence Measurement Tool™				
	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	6		
2	Eating	6		
3	Cooking	1		
4	Bathing	6		
5	Dressing Lower Body	6		
6	Dressing Upper Body	6		
7	Brushing teeth	6		
8	Shaving	2		
9	Laundry	2		
10	Exercise	1		
	Mobility Items			
11	Stairs	1		
12	Car Transfer	6		
13	Bed Transfer	6		
14	Shower/Tub Transfer	6		
15	Toilet Transfer	6		
	Communication Items			
16	Reading	2		
17	Writing	2		
18	Speaking	1		few words.
	Cognitive Items			
19	Problem Solving	6		
20	Memory	6		
21	Attention	6		
22	Orientation	6		
	Environmental Control Items			
23	Lights	6		
24	Doors	6		
25	Temperature	1		
26	Windows	6		
27	Blinds	6		
28	Entertainment	6		
29	Use of Technology	6		Refuse to use computer/ipad.
30	Cleaning	3		

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75\% or more of the actions with mild physical support

3 - participant performs between 50 and 75\% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50\% of the actions with excessive physical support

1 - participant performs less than 25\% of the actions with maximum physical support

Initial Assessment for Participant G

Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	1		
2	Eating	2		25% to 30%
3	Cooking	N/A		
4	Bathing	1		
5	Dressing Lower Body	N/A		
6	Dressing Upper Body	N/A		
7	Brushing teeth	N/A		
8	Shaving	N/A		
9	Laundry	N/A		
10	Exercise	4		
11	Brushing hair	N/A		
	Mobility Items			
12	Walking	N/A		
13	Stairs	N/A		
14	Car Transfer	N/A		
15	Bed Transfer	N/A		
16	Shower/Tub Transfer	N/A		
17	Toilet Transfer	N/A		
	Communication Items			
18	Reading	5		
19	Writing	3		
20	Speaking	5		
21	Nonverbal	N/A		
	Cognitive Items			
22	Problem Solving	1		
23	Memory	ST 2 LT 1		
24	Attention	3		
25	Orientation	1		
	Environmental Control Items			
26	Lights	1		
27	Doors	N/A		
28	Temperature	—		
29	Windows	—		
30	Blinds	—		
31	Entertainment	1		
32	Use of Technology	N/A		Staff Text + Dial for him
33	Cleaning	N/A		
	Miscellaneous Items			
34				
35				
36				
37				

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75% or more of the actions with mild physical support

3 - participant performs between 50 and 75% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50% of the actions with excessive physical support

1 - participant performs less than 25% of the actions with maximum physical support

Initial Assessment for Participant H

Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	4		
2	Eating	7		
3	Cooking	3		
4	Bathing	3		
5	Dressing Lower Body	3		
6	Dressing Upper Body	3		
7	Brushing teeth	3		
8	Shaving	-		
9	Laundry	5		
10	Exercise	5		
11	Brushing hair	7		
	Mobility Items			
12	Walking	6		
13	Stairs	0		
14	Car Transfer	3		
15	Bed Transfer	3		
16	Shower/Tub Transfer	3		
17	Toilet Transfer	3		
	Communication Items			
18	Reading	0		
19	Writing	3		
20	Speaking	4		
21	Nonverbal	N/A		
	Cognitive Items			
22	Problem Solving	1		
23	Memory	ST 5 LT 1		
24	Attention	0		
25	Orientation	0		
	Environmental Control Items			
26	Lights	7		
27	Doors	7		
28	~~Temperature~~			
29	~~Windows~~			
30	~~Blinds~~			
31	Entertainment	7		
32	Use of Technology	7		
33	Cleaning	5		
	Miscellaneous Items			
34				
35				
36				
37				

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices

6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact

4 - participant performs 75% or more of the actions with mild physical support

3 - participant performs between 50 and 75% of the actions with moderate physical support

Complete Dependence

2 - participant performs between 25 and 50% of the actions with excessive physical support

1 - participant performs less than 25% of the actions with maximum physical support

Initial Assessment for Participant I

Independence Measurement Tool™

	Skill	Score	Time	Notes
	Self Care Items			
1	Toileting/Bowel Movements	2		will attempt on own but is a Safety Risk
2	Eating	4		
3	Cooking	1		
4	Bathing	1		
5	Dressing Lower Body	2		
6	Dressing Upper Body	2		
7	Brushing teeth	6		
8	Shaving	1		
9	Laundry	1		
10	Exercise	1		
	Mobility Items			
11	Stairs	NA		uses wheelchair @ home
12	Car Transfer	1		1:1
13	Bed Transfer	1		1:1
14	Shower/Tub Transfer	1		1:1
15	Toilet Transfer	1		1:1
	Communication Items			
16	Reading	6		Has processing issues though
17	Writing	6		Not always legible
18	Speaking	6		Not always coherent or clear/lu
	Cognitive Items			
19	Problem Solving	3		
20	Memory	3		Selective
21	Attention	3		varies based on task & prgm
22	Orientation	3		
	Environmental Control Items			
23	Lights	2		
24	Doors	2		
25	Temperature	NA		
26	Windows	NA		
27	Blinds	NA		
28	Entertainment	1		
29	Use of Technology	1		Primarily dependent on staff
30	Cleaning	1		

This tool is an adaptation of the FIM® instrument.

Standard scoring is as followed

Independent

7 - Complete Independence - participant performs all actions without use of assistive devices
6 - Modified Independence - participant performs all actions with use of assistive devices

Dependent

5 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact
4 - participant performs 75\% or more of the actions with mild physical support
3 - participant performs between 50 and 75\% of the actions with moderate physical support

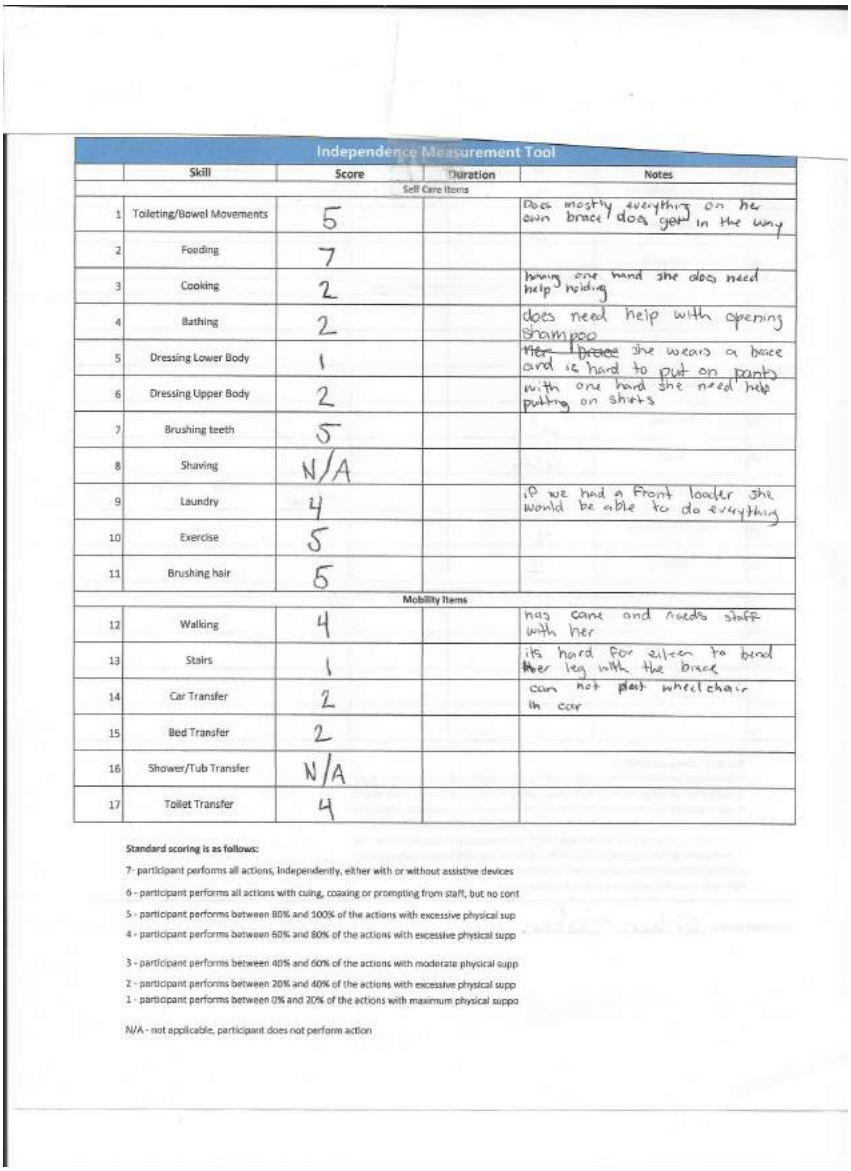
Complete Dependence

2 - participant performs between 25 and 50\% of the actions with excessive physical support
1 - participant performs less than 25\% of the actions with maximum physical support

0 = NA

Initial Assessment for Participant J

Appendix E: Post Implementation Assessments



Independence Measurement Tool

	Skill	Score	Duration	Notes
	Self Care Items			
1	Toileting/Bowel Movements	5		Does mostly everything on her own brace does get in the way
2	Feeding	7		
3	Cooking	2		having one hand she does need help holding
4	Bathing	2		does need help with opening Shampoo
5	Dressing Lower Body	1		~~Her~~ ~~Brace~~ She wears a brace and is hard to put on pants
6	Dressing Upper Body	2		with one hand she need help putting on shirts
7	Brushing teeth	5		
8	Shaving	N/A		
9	Laundry	4		if we had a front loader she would be able to do everything
10	Exercise	5		
11	Brushing hair	5		
	Mobility Items			
12	Walking	4		has cane and needs staff with her
13	Stairs	1		its hard for eileen to bend ~~her~~ leg with the brace
14	Car Transfer	2		can not ~~put~~ wheelchair in car
15	Bed Transfer	2		
16	Shower/Tub Transfer	N/A		
17	Toilet Transfer	4		

Standard scoring is as follows:

7- participant performs all actions, independently, either with or without assistive devices

6 - participant performs all actions with cuing, coaxing or prompting from staff, but no cont

5 - participant performs between 80% and 100% of the actions with excessive physical sup

4 - participant performs between 60% and 80% of the actions with excessive physical supp

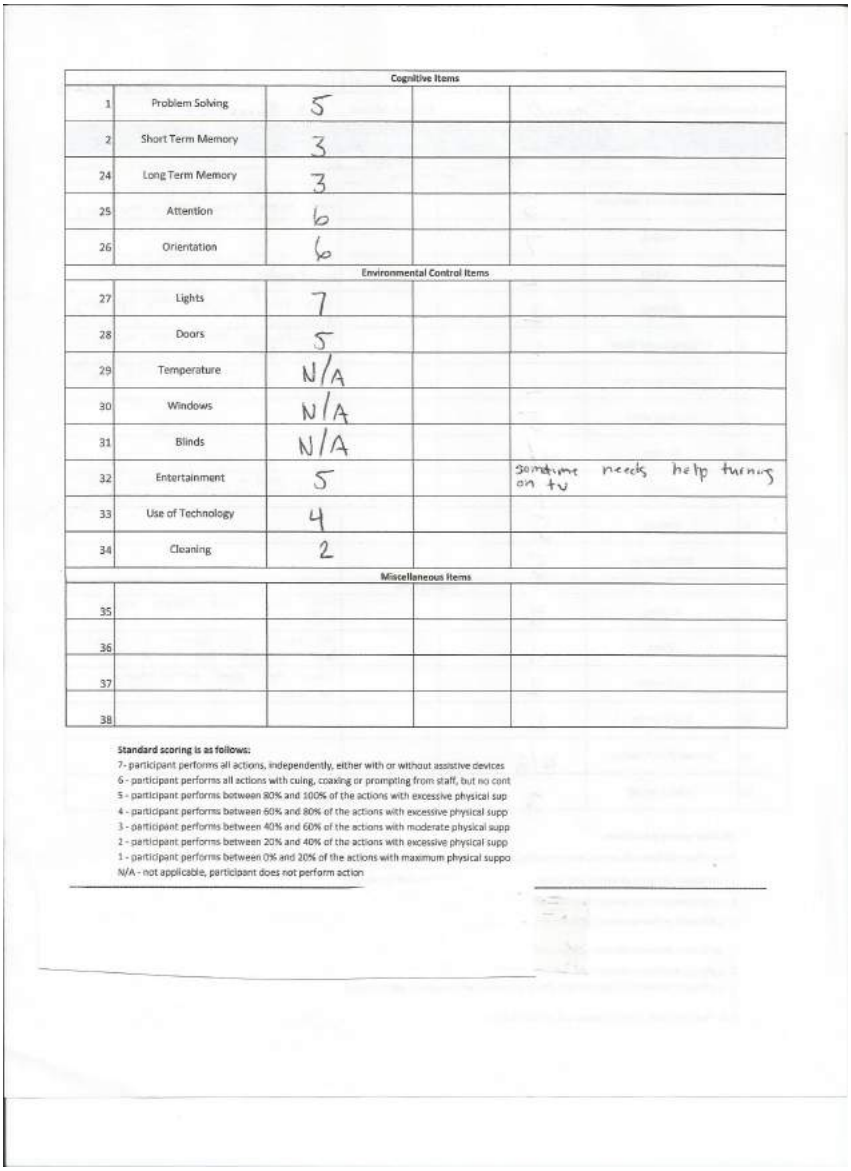
3 - participant performs between 40% and 60% of the actions with moderate physical supp

2 - participant performs between 20% and 40% of the actions with excessive physical supp

1 - participant performs between 0% and 20% of the actions with maximum physical suppo

N/A - not applicable, participant does not perform action

Part one of two of Sally's post assessment scores



	Cognitive Items			
1	Problem Solving	5		
2	Short Term Memory	3		
24	Long Term Memory	3		
25	Attention	6		
26	Orientation	6		
	Environmental Control Items			
27	Lights	7		
28	Doors	5		
29	Temperature	N/A		
30	Windows	N/A		
31	Blinds	N/A		
32	Entertainment	5		sometime needs help turning on tv
33	Use of Technology	4		
34	Cleaning	2		
	Miscellaneous Items			
35				
36				
37				
38				

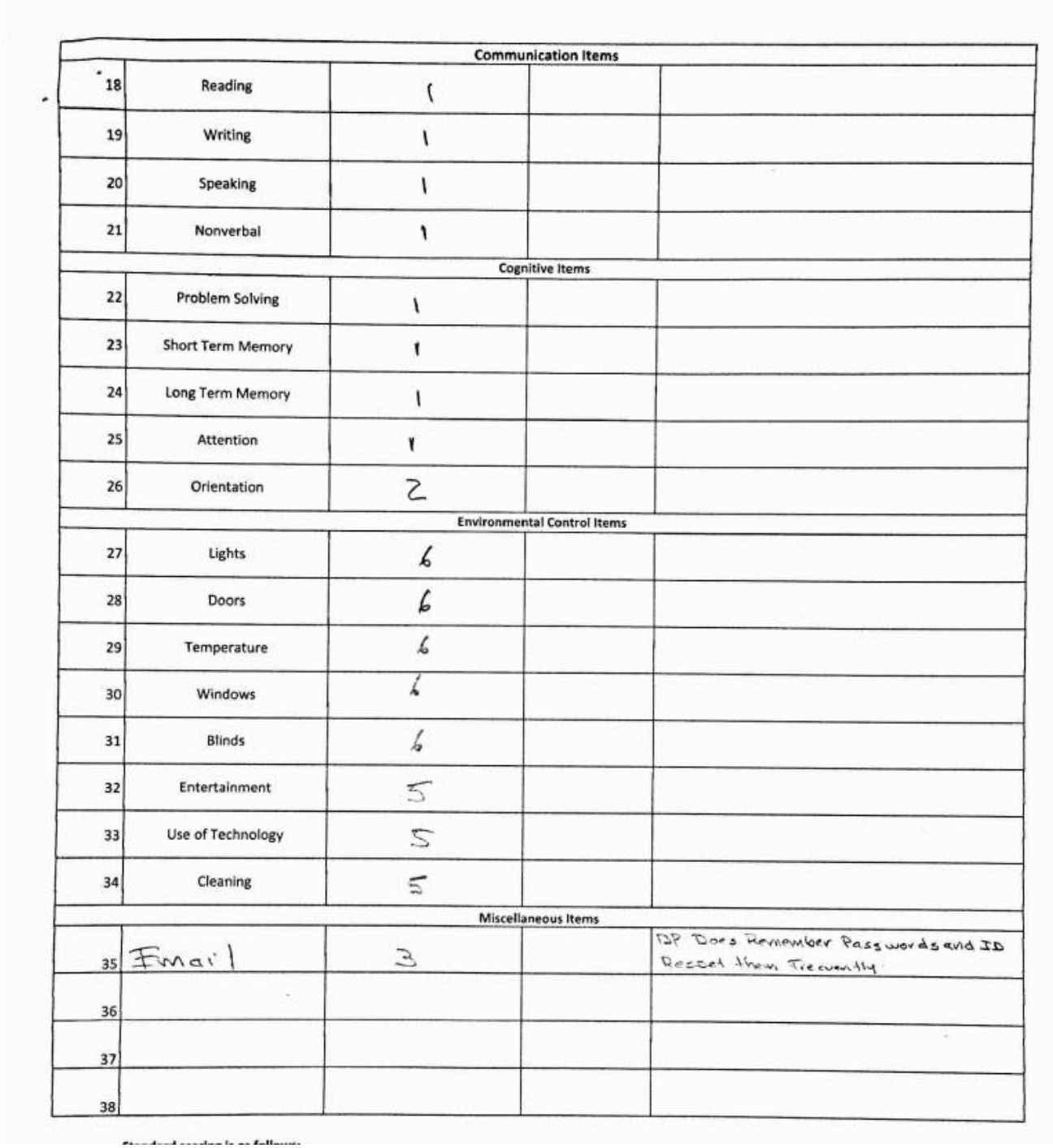
Standard scoring is as follows:

7- participant performs all actions, independently, either with or without assistive devices
6 - participant performs all actions with cuing, coaxing or prompting from staff, but no cont
5 - participant performs between 80% and 100% of the actions with excessive physical sup
4 - participant performs between 60% and 80% of the actions with excessive physical supp
3 - participant performs between 40% and 60% of the actions with moderate physical supp
2 - participant performs between 20% and 40% of the actions with excessive physical supp
1 - participant performs between 0% and 20% of the actions with maximum physical suppo
N/A - not applicable, participant does not perform action

Part two of two of Sally's post assessment scores

	Skill	Score	Duration	Notes
	Self Care Items			
1	Toileting/Bowel Movements	6		
2	Feeding	6		
3	Cooking	5		
4	Bathing	6		
5	Dressing Lower Body	6		
6	Dressing Upper Body	6		
7	Brushing teeth	6		
8	Shaving	6		
9	Laundry	5		
10	Exercise	6		
11	Brushing hair	6		
	Mobility Items			
12	Walking	5		
13	Stairs	5		
14	Car Transfer	5		
15	Bed Transfer	5		
16	Shower/Tub Transfer	6		
17	Toilet Transfer	6		

Part one of two of Joseph's post assessment scores



	Communication Items			
18	Reading	1		
19	Writing	1		
20	Speaking	1		
21	Nonverbal	1		
	Cognitive Items			
22	Problem Solving	1		
23	Short Term Memory	1		
24	Long Term Memory	1		
25	Attention	1		
26	Orientation	2		
	Environmental Control Items			
27	Lights	6		
28	Doors	6		
29	Temperature	6		
30	Windows	6		
31	Blinds	6		
32	Entertainment	5		
33	Use of Technology	5		
34	Cleaning	5		
	Miscellaneous Items			
35	Email	3		DP Does Remember Passwords and ID Recent them Frequently
36				
37				
38				

Part two of two of Joseph's post assessment scores

To whom it may concern,

I, Eileen would like to thank the four students from W.P.I. as they have enlightened me with their high energy and intelligence they brought to my home. But most of all, the passion that your well educated students had while taking the time to demonstrate their products and to answer the questions that I had about the products. The claw has helped me to reach cups in the kitchen cabinet when I need a drink. Also take some stress off of staff where I don't have to call every 5 minutes. I have been able to reach my clothes in the closet that's at a higher level, which has helped me increase my level of independence.

They also helped me to keep my I pad charged more consistently; overnight and during the day as I take my I pad to day program. It's easier for me to charge and I look forward to using it because I know I can do it on my own and don't have to worry about breaking the wire anymore. Finally, they have introduced me to an egg cracker that I have not used yet. I'm still in the process of working it but very excited to help with breakfast and bake for the holidays.

Sincerely,

A letter from a resident to the team

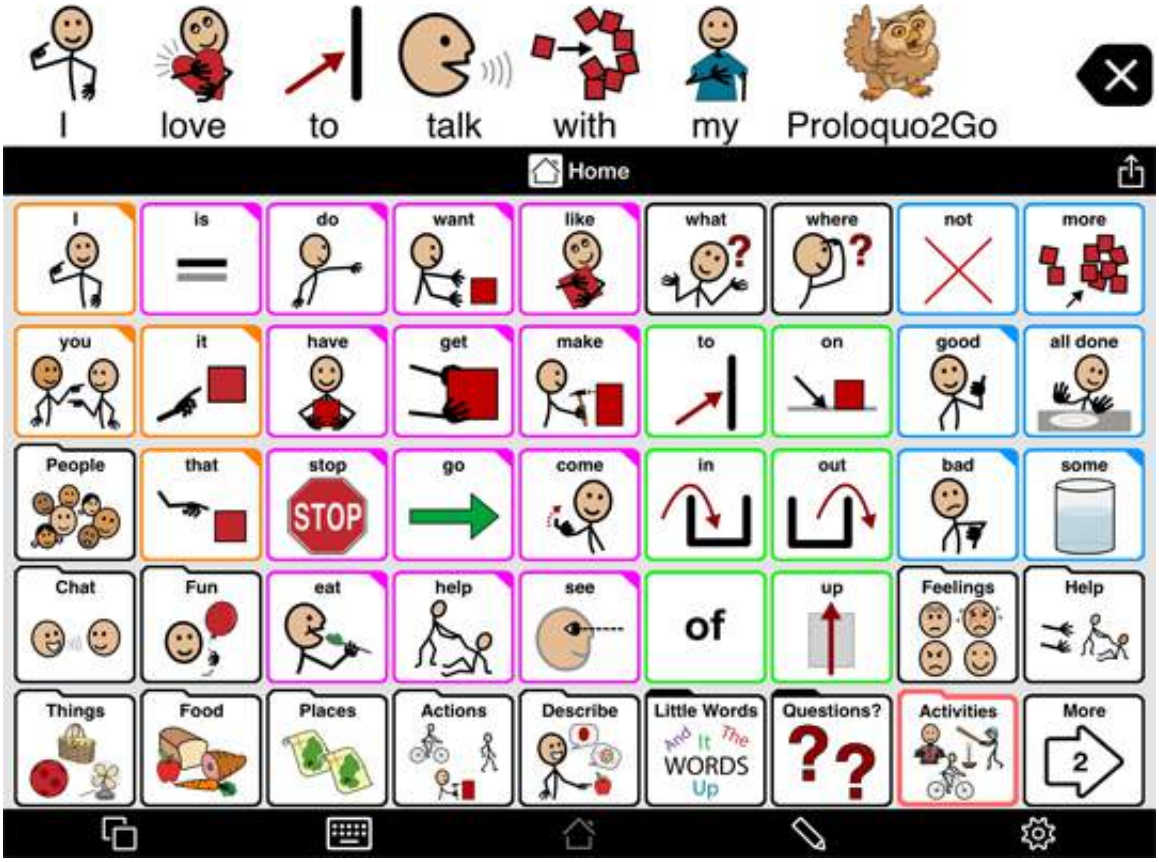
Appendix F: Technology

Qi receiver for an iPad

Qi transmitter

Low-tech grabber

One-handed egg cracker



Screenshot of Proloquo2Go

Screenshot of Phonics Genius

WeMo LED Lighting Starter Kit

WeMo switch and app

Appendix G: Authorship

Section/Chapter	Drafted by	Edited by
Abstract	Jacob Hackett, Joe Fainer	All
Executive Summary	Joe Fainer	All
Introduction	Joe Fainer	Jacob Hackett
Literature Review	All	All
Methodology	All	All
Results	Jahan Dadlani	All
Recommendations	Dave Goodrich	Jacob Hackett
Appendix A	Dave Goodrich	All
Appendix B	Joe Fainer	All
Appendix C	Joe Fainer	All
Appendix D	Joe Fainer	Jacob Hackett
Appendix E	Jacob Hackett	All
Appendix F	Jacob Hackett	All
Appendix G	Joe Fainer	All
Appendix H	Jacob Hackett	All
Appendix I	Jacob Hackett	All

Appendix H: Assistive Technology Catalog

High Tech Assistive Technology Catalog

Jahan Dadlani, Joe Fainer, Dave Goodrich, Jake Hackett

March 4, 2016

Disclaimer: This is in no way a comprehensive catalog and should only serve to direct choices regarding AT. Certain interventions should be made with the recommendations of and under supervision of a physician

Contents

First page of the Assistive Technology Catalog

1 Self Care Items

1.1 Toileting/Bowel Movements

Technology	Description	Price Estimate
iTouchless Touch-Free Sensor Control Automatic Toilet Seat	Hands free toilet seat that automatically raises and lowers	$121.99
Touchless Toilet Flush Kit by Kohler	Automatic flushing build on to toilets	$35.00

1.2 Feeding

Technology	Description	Price Estimate
Eazy Hold*	Soft silicone cuff that attaches to tools, toys and utensils.	$15-50
Liftware	Spoon/utensil that counter acts tremors and shaky hands	$195 with adds on $40

1.3 Cooking

Technology	Description	Price Estimate
iGrill	Grill thermometer that connects to your smart device	$100
iDevices Kitchen Thermometer	A dual probe, wireless Bluetooth® Smart thermometer to tell when food has reached the desired temperature.	$79.95
Crock Pot Smart Slow Cooker with Wemo	Simply add the ingredients, plug in the slow cooker, and program the cooking time and temperature before you go about your day and monitor it from your smart device, no matter where you are.	$129.99
Mr. Coffee Coffeemaker with Wemo	Mr. Coffee Optimal Brew technology heats water up to 205 degrees before releasing it to the filter basket. Users are able adjust brew time and set up reminders all from a smart device.	$149.99
Jar opener*	A device that opens jars for you when you hold the jar to the device.	$25
Eazy Hold*	Soft silicone cuff that attaches to tools, toys and utensils.	$15-50
Wemo Insight Switch	Bluetooth smart outlet controller	$49.99
Roccbox	Portable powerful oven	$543
StirMATE Smart Pot Stirrer	Automatic stirring device	$35.95

1.4 Bathing

Technology	Description	Price Estimate
iHouse Smart Faucet	Turns on bath water to correct temperature when it recognizes your face	
iShower	Waterproof speaker system that can play music and be controlled through the use of an iPad/iPhone	$99.95
Automatic soap dispensers	Touchless solution for dispensing hand soap, shampoo, conditioner and body wash	$30
Automatic Electronic Sensor Touchless Faucet	Touch free faucet	$66.99

1.5 Dressing Lower Body

Technology	Description	Price Estimate

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Long handle shoe horn*	Handle that helps pull the back of the shoe onto the foot	$15
Button hooker and zipper puller combo*	Tool that helps button and zip clothes	$15
Sock aids*	Tool that helps pull socks onto the foot	$20

1.6 Dressing Upper Body

Technology	Description	Price Estimate
Button hooker and zipper puller combo*	Tool that helps button and zip clothes	$15

1.7 Brushing Teeth

Technology	Description	Price Estimate
Automatic Toothpaste Squeezer Dispenser and Toothbrush Holder	Toothpaste dispenser, uses push mechanism	$13.00
Umbra® Otto Sensor Pump in Brushed Nickel	Sense toothpaste dispenser	$29.99
Electric tooth brush	Automatic spinning toothbrush	$35
Eazy Hold*	Soft silicone cuff that attaches to tools, toys and utensils.	$15-50

1.8 Shaving

Technology	Description	Price Estimate
Eazy Hold*	Soft silicone cuff that attaches to tools, toys and utensils.	$15-50
Philips Norelco Razors	Electric razors	$70 - $250

1.9 Laundry

Technology	Description	Price Estimate
Samsung F900 Washing Machine with ecobubble	Control and monitor your washing over WiFi from a smart device	$1299.99
Samsung 7.5 cu. ft. King-Size Capacity, Electric Touch Screen LCD Dryer	Control and monitor drying over WiFi from a smart device	$1499

1.10 Exercise

Technology	Description	Price Estimate
JumpSnap Ropeless Jump Rope	Cordless jump rope	$40

1.11 Brushing Hair

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Technology	Description	Price Estimate
Eazy Hold*	Soft silicone cuff that attaches to tools, toys and utensils.	$15-50
Long handled hair brush*	Hair brush with long handles to make it easier to reach all hair with limited mobility	$20

2 Mobility Items

Note that interventions made to change a person's mobility should be made with the supervision of a physical therapist or other qualified professional.

2.1 Walking

Technology	Description	Price Estimate
Motorized wheelchair	Wheelchair that can be controlled through hand, mouth or eye movements.	$1400

2.2 Stairs

Technology	Description	Price Estimate
Chair lift	Motorized chair lift to assist people in wheelchairs in climbing and descending stairs.	$3000+

2.3 Car Transfer

Technology	Description	Price Estimate
SystemRoMedic™ – EasyGlide*	Flexible three part sliding board	$60-100
Stander HandyBar - Automotive Standing Aid	3 in 1 tool designed to help users tansfer into a car using the car door latch for leverage	$19.99

2.4 Bed Transfer

Technology	Description	Price Estimate
Pressure Mat Sensor Kit for Bed	Mat can be set to alert caretaker's pager if pressure is removed or applied when stepped on.	$69.99
Bed handle*	Handle that assists in getting out of bed by giving participant a place to grab onto and pull themselves up	$32
SystemRoMedic™ – EasyGlide*	Flexible three part sliding board	$60-100

2.5 Shower/Tub Transfer

Technology	Description	Price Estimate
SystemRoMedic™ – EasyGlide*	Flexible three part sliding board	$60-100
Bellavita Auto Bath Lift	Raises and lowers to assist with transferring user into or out of tub.	$500-600

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2.6 Toilet Transfer

Technology	Description	Price Estimate
Toilet safety bars*	Vertical or horizontal bars to help getting on and off the toilet	$30
Elevated Raised Toilet Seat with Removable Padded Arms	Support while transferring from standing to sitting on toilet	$50-100

3 Communication Items

3.1 Reading

Technology	Description	Price Estimate
Audible	Audiobook app that has a large inventory of books.	Free
Various reading softwares	Software to help learn or improve reading skills	$200+

3.2 Writing

Technology	Description	Price Estimate
Penultimate	Digital handwriting app, best used with a stylus (The one the developers recommend is Jot Script Evernote Edition)	Free
Jot Script Evernote Edition	Stylus to be used with penultimate, as well as other handwriting apps	$74.99
Livescribe Smartpen	Syncs to a tablet or phone via bluetooth to convert handwritten notes to digital text. Simultaneously records audio	$100-250
Proloquo 4 Text	Text to speech app with a customizable single layout screen.	$64.99
Dragon Dictation	Voice recognition app that allows users to speak and instantly see their words on the screen.	Free
Merriam Webster speaking dictionary	A handheld dictionary with pronunciation and spelling through audio aid.	$114
Portable word processor (Neo)	A hand held device that allows language composition anywhere.	$30

3.3 Speaking

Technology	Description	Price Estimate
Dragon Dictation	Voice recognition app that allows users to speak and instantly see their words on the screen.	Free
Pictello	App to create visual stories and talking books. Offered recorded speech or text to speech options.	$18.99
Proloquo 4 Text	Text to speech app with a customizable single layout screen.	$64.99
Quick Talk AAC	Comprehensive AAC app that enables real conversation for those who have trouble speaking. Verbally translates text to speech.	Free
Hearing aid	Ear piece that helps increase hearing ability	$400
Verbally	App that assists communication through text to speech with the use of a keyboard and predefined set of words.	Free
Voice4U	AAC app that allows individuals to have a voice through their iPad/iPhone and express their feelings, thoughts, actions and needs.	$59.99
Merriam Webster speaking dictionary	A handheld dictionary with pronunciation and spelling through audio aid.	$114
ChoiceBoard Creator	Communication app that uses pictures to create sentences	Free

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GoTalk Now	Communication app with multiple features for creating messages and bridging communication gaps	$79.99
Proloquo2Go	Communication app that uses pictures to create sentences	$249.99
Avaz	Communication app that uses pictures to create sentences	$199.99

3.4 Nonverbal

Technology	Description	Price Estimate
Answers: YesNo	App that allows individuals to say Yes or No with a simple touch of a button.	$1.99
Communicator (symbols based) and EasyTalk (text based)	A mobile handheld device/program that assist in speaking	$695

4 Cognitive Items

4.1 Problem Solving

Technology	Description	Price Estimate
TextTwist 2	Word game app where you try to find the word that uses all of the letters on the screen.	$1.99
WordWarp	Word game app where you try to find the word that uses all of the letters on the screen.	Free
Lumosity	App that has 3 categories of games to help develop memory, attention and problem solving skills.	Free
Smart Steps	App that uses decision tree format to provide suggestions for problems at work, at home etc.	$0-9.99

4.2 Short Term Memory

Technology	Description	Price Estimate
Awesome Memory	Traditional card game app that encourages remembering where certain cards are in order to get matches.	Free
Flashcards Deluxe	Flashcard app that offers customizable cards to help learn just about anything you want. Has the option to include pictures and sounds.	$3.99
Withings Baby Monitor	Baby monitor that syncs to your smart device	$249.95
MasterTalk Plus	App used to help break down task step by step, with visual and audio assistance	$0.99
iPrompts Pro	App used to help break down task step by step, with visual and audio assistance	$99.99
Stepping Stones	App used to help break down task step by step, with visual and audio assistance	$0.99
Smart Steps	App that uses decision tree format to provide suggestions for problems at work, at home etc.	$0-9.99

4.3 Long Term Memory

Technology	Description	Price Estimate
Awesome Memory	Traditional card game app that encourages remembering where certain cards are in order to get matches.	Free

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Corkulous Pro	Organization app that allows users to share ideas and reminders in the form of a cork board.	$4.99
Cozi Family Organizer	Family life organization app that includes a calender, shopping lists, to do lists and a family journal. The app allows other members of your family to stay in sync with your activities.	Free
Evernote	Note taking app that allows users to write down ideas and reminders on a note.	Free
Flashcards Deluxe	Flashcard app that offers customizable cards to help learn just about anything you want. Has the option to include pictures and sounds.	$3.99
TodayScreen	Scheduler app that allows users to see their activities color coded by day.	$2.99
Visual Schedule Planner	Scheduler app that offers an audio/visual representation of a schedule.	$14.99
Withings Baby Monitor	Baby monitor that syncs to your smart device	$249.95
MasterTalk Plus	App used to help break down task step by step, with visual and audio assistance	$0.99
iPrompts Pro	App used to help break down task step by step, with visual and audio assistance	$99.99
Stepping Stones	App used to help break down task step by step, with visual and audio assistance	$0.99
Smart Steps	App that uses decision tree format to provide suggestions for problems at work, at home etc.	$0-9.99
Quest	App that turns completing tasks and scheduled events into a game	$1.99
To-Do	App that helps with scheduling and completing tasks and events	$1.99
Alarmed	Scheduling app that uses reminders and other settings to remember tasks and events	Free with in-app purchases

4.4 Attention

Technology	Description	Price Estimate
Withings Baby Monitor	Baby monitor that syncs to your smart device	$249.95
MasterTalk Plus	App used to help break down task step by step, with visual and audio assistance	$0.99
iPrompts Pro	App used to help break down task step by step, with visual and audio assistance	$99.99
Stepping Stones	App used to help break down task step by step, with visual and audio assistance	$0.99
Smart Steps	App that uses decision tree format to provide suggestions for problems at work, at home etc.	$0-9.99
Quest	App that turns completing tasks and scheduled events into a game	$1.99
To-Do	App that helps with scheduling and completing tasks and events	$1.99
Alarmed	Scheduling app that uses reminders and other settings to remember tasks and events	Free with in-app purchases

4.5 Orientation

Technology	Description	Price Estimate
Withings Scales	Gives weight and body fat measurements, as well as your Body Mass Index. Pick the right body type to optimize the fat mass measurement. Every weigh-in appears in the Health Mate app on iPad/iPhone, via Wifi or Bluetooth sync.	$149.95

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5 Environmental Control Items

5.1 Lights

Technology	Description	Price Estimate
Insight Switch	Bluetooth smart outlet controller	$49.99
iDevices Switch	Allows power to be controlled to all devices plugged into it through the use of an iPad/iPhone	$59.00 or 3+ for $49.00 each
Philips Hue	Lighting systems that can be controlled through iPad/iPhone	$160
Honeywell Lynx Touch	Control a security system, lights, locks and thermostats, view video from a touchscreen or on mobile devices around the home.	$200-400
iHome iSP5 SmartPlug	Control lights, fans or other home appliance that has been plugged into the smart plug. Then control the device or devices through Apple Homekit or with Siri	$35.00
WeMo LED Lighting Starter Set	The WeMo LED Lighting Starter Set lets you access and control your WeMo Smart LED Bulbs from anywhere, using your existing home Wi-Fi network and mobile internet. Dim lights, turn them on or off, or create a custom schedule that works for your family.The WeMo LED Lighting Starter Set includes two WeMo Smart LED Bulbs and WeMo Link.	$49.99
WeMo Light Switch	Smart, Bluetooth light controlling system	$49.99
Wireless Smart Light Bulb Adapter with Dimming	Smart light bulb adapter that can be controlled from a smartphone through Apple Homekit.	$39.99
Caséta Wireless Smart Lighting	control the lighting of the house through smart device	$59.95

5.2 Doors

Technology	Description	Price Estimate
August Smart Lock	Lock and unlock door using an iPhone or iPad. Give anyone virtual key. Keep track of who comes and goes.	$199
Honeywell Lynx Touch	Control a security system, lights, locks and thermostats, view video from a touchscreen or on mobile devices around the home.	$200-400

5.3 Temperature

Technology	Description	Price Estimate
Ecobee 3	WiFi thermostat with Bluetooth connectivity	$180.00 - $249.99
iDevices Thermostat	Customize the thermostat and control directly from an iPad/iPhone.	$149.00
Honeywell Lynx Touch	Control a security system, lights, locks and thermostats, view video from a touchscreen or on mobile devices around the home.	$200-400
GE Aros Smart Air Conditioner	Air conditioner that is able to be controlled through smart device	$250
Nest Thermostat	Smart thermostat with Bluetooth capabilities	$249

5.4 Windows and Blinds

Technology	Description	Price Estimate
SONTE Film	An overlay for windows that can be toggled to make windows opaque or transparent. An alternative to pulling blinds.	$200

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Lutron Wireless Smart Bridge	control the blind through the use of your iPhone or iPad, or use siri.	$79.95

5.5 Entertainment

Technology	Description	Price Estimate
Playing card shuffler	Device that automatically shuffles a deck of cards	$20

5.6 Use of Technology

Technology	Description	Price Estimate
Unus Tactus	App that allows easier use of a phone. Offers one touch dialing system by showing pictures of who the user may want to call.	$9.99
Wemo Insight Switch	Bluetooth smart outlet controller	$49.99
iDevices Outdoor Switch	Allows power to be controlled to all devices plugged into it through the use of an iPad/iPhone. Outdoor friendly.	$79.00
iHome iSP5 SmartPlug	Control lights, fans or other home appliance that has been plugged into the smart plug. Then control the device or devices through Apple Homekit or with Siri	$35.00
QI Charger	Wireless charger set for iPad	$12.95

5.7 Cleaning

Technology	Description	Price Estimate
iRobot Roomba	Automatic, self controlled vacuum cleaner	$374.99-899.99
simplehuman Sense Can	Hand sensor trash can	$200

*low tech solution

6 Other Sources of AT

Source	Description
REquipment.org	REquipment is a way to obtain free, gently-used, durable medical equipment (DME) for use by individuals and families in Greater Boston and Central Massachusetts.
Mass EDP	Massachusetts residents with a permanent disability that limits their ability to use the telephone effectively may be eligible to receive assistive telephone equipment free of charge or at a reduced rate, depending on income.

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Appendix I: IMT Manual

Independence Measurement Tool Manual

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March 4, 2016

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1 Standard Scoring

Standard scoring is as followed:

7- participant performs all actions, independently, either with or without assistive devices
6 - participant performs all actions with cuing, coaxing or prompting from staff, but no contact
5 - participant performs between 80% and 100% of the actions with excessive physical support
4 - participant performs between 60% and 80% of the actions with excessive physical support
3 - participant performs between 40% and 60% of the actions with moderate physical support
2 - participant performs between 20% and 40% of the actions with excessive physical support
1 - participant performs between 0% and 20% of the actions with maximum physical support
N/A - not applicable, participant does not perform action

Note: When scoring, please fill in the amount of the time it took to complete each task,
as well as notes depicting which parts of each item could be completed, and which items could not be completed

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2 Self Care Items

Toileting/Bowel Movements	This item is assessed by documenting the number of accidents a participant had over the course of an average week. Accidents include any time the participant does not use the toilet properly. Scoring is as followed: 7 - zero accidents with or without use of assistive devices 6 - one bowel or bladder accident within the week 5 - two bowel or bladder accidents within the week 4 - three bowel or bladder accidents within the week 3 - four bowel or bladder accidents within the week 2 - five bowel or bladder accidents within the week 1 - six or more bowel or bladder accidents within the week
Feeding	This item is assessed by how many actions a participant can perform while eating. Actions include lifting utencil, scooping food, bringing hand to mouth, chewing, swallowing, drinking. Scoring is standard scoring. See the first page of this document for standard scoring.
Cooking	This item is assessed by how many actions a participant can perform while cooking. Actions include cutting, pouring, stirring and scooping. Scoring is standard scoring. See the first page of this document for standard scoring.
Bathing	This item is assessed by how many actions a participant can perform while bathing. Actions include opening shampoo, dispensing shampoo, closing shampoo, distributing shampoo through hair, washing out shampoo, distributing soap across body, then washing off soap. Scoring is standard scoring. See the first page of this document for standard scoring.
Dressing Lower Body	This item is assessed by how many actions a participant can perform while dressing their lower body. Actions include putting each leg in underwear or pants, pulling up underwear or pants, zipping the zipper and buttoning the button. Scoring is standard scoring. See the first page of this document for standard scoring.
Dressing Upper Body	This item is assessed by how many actions a participant can perform while dressing their upper body. Actions include threading their right arm, threading their left arm, pulling it over their head, and adjusting it down. Scoring is standard scoring. See the first page of this document for standard scoring.
Brushing Teeth	This item is assessed by how many actions a participant can perform while brushing their teeth. Actions include turning the faucet on, putting toothpaste on brush, brushing teeth and rinsing mouth. Scoring is standard scoring. See the first page of this document for standard scoring.

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Shaving	This item is assessed by how many actions a participant can perform while shaving. Actions include putting shaving cream on, using the razor to shave and rinsing off the area. Scoring is standard scoring. See the first page of this document for standard scoring.
Laundry	The item is assessed by how many actions a participant can perform while doing laundry. Actions include moving laundry into washer, starting washer, transferring clothes from washer to dryer, starting dryer, getting clothes from dryer, folding clothes, and putting clothes away. Scoring is standard scoring. See the first page of this document for standard scoring.
Exercise	This item is assessed by how many times a participant exercises a week. Exercise is followed by normal qualifications. Examples are, but are not limited to, going for walks, running, playing catch, and playing fetch. Scoring is as followed: 7 - participant performs exercise 6 or 7 times a week 6 - participant performs exercise 5 times a week 5 - participant performs exercise 4 times a week 4 - participant performs exercise 3 times a week 3 - participant performs exercise 2 times a week 2 - participant performs exercise 1 times a week 1 - participant performs exercise 0 times a week
Brushing hair	This item is assessed by the participants ability to brush their hair. Scoring is standard scoring. See the first page of this document for standard scoring.

3 Mobility Items

Walking	This item is assess by the participant's ability to walk. Scoring is as followed: 7 - Participant walks independently. 6 - Participant walks with the assistance of one person. 5 - Participant walks independently with the use of a walking aid. 4 - Participant walks with the assistance of one person and a walking aid. 3 - Participant walks independently with the use of a wheelchair. 2 - Participant walks with the assistance of more than one person. 1 - Participant is immobile.
Stairs	This item is assessed by the participant's ability to climb a staircase. Scoring is as followed: 7 - participant can climb 12-14 steps with no helper, without use of assistive devices, no rail and in a timely manner 6 - participant can climb 12-14 steps with no helper or without use of assistive devices 5 - participant can climb 12-14 steps with helper or with use of assistive devices and can put 80-100% of effort 4 - participant can climb 12-14 steps with helper or with use of assistive devices and can put 60-80% or more of effort 3 - participant can climb 12-14 steps with helper or with use of assistive devices and can put 40-60% of effort 2 - participant can climb 4-11 steps with helper or with use of assistive devices and can put 20-40% of effort 1 - participant can climb less than 12 steps with helper or with use of assistive devices and can put 0-20% of effort
Car Transfer	This item is assessed by how many actions a participant can perform. Actions include approaching the car, managing the car door and lock, getting on or off the car seat and managing the seat belt. If a wheelchair is used for mobility, the activity includes loading and unloading the wheelchair. Scoring is standard scoring. See the first page of this document for standard scoring.
Bed Transfer	This item is assessed by the ability of a participant to transfer into or out of a bed. Actions include moving from a bed to a standing position or into a wheelchair, then moving back into the bed. Scoring is standard scoring. See the first page of this document for standard scoring.
Shower/Tub Transfer	This item is assessed by how many actions a participant can perform. Actions include undressing, stepping into the shower and stepping out of the shower. Scoring is standard scoring. See the first page of this document for standard scoring.
Toilet Transfer	This item is assessed by how many actions a participant can perform. Actions include pulling down pants, getting on toilet, getting off toilet and pulling pants back up. Scoring is standard scoring. See the first page of this document for standard scoring.

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4 Communication Items

Reading	This item is assessed by the ability of a participant to understand non-vocal written material. Scoring is as followed: 7 - participant is completely able to read and understand complex, lengthy paragraphs (newspapers, books, etc). 6 - participant is able to read and understand complex sentences or short paragraphs. May demonstrate reduced speed or retention problems. 5 - participant is able to read and understand short, simple sentences but shows increased difficulty with length or complexity. 4 - participant is able to recognize single words and familiar short phrases. 3 - participant is able to recognize letters, objects, forms, etc. Able to match words to pictures (50-75% accuracy). 2 - participant is able to match identical objects, forms, letters (25- 49% accuracy) but may require cues. 1 - participant is unable to consistently match or recognize identical letters, objects or forms (under 25% accuracy).
Writing	This item is assessed by the participant's ability to write. Actions include spelling, grammar, and completeness of written communication. Scoring is as followed: 7 - participant is able to write with complete average accuracy in spelling, grammar, syntax, punctuation, and completeness. 6 - participant is able to accurately write sentences and form short paragraphs. May have occasional spelling or grammatical errors. 5 - participant is able to write phrases or simple sentences. Evidences spelling, grammar, syntax errors. 4 - participant is able to write simple words, occasional phrases to express ideas. Spelling errors and reduced legibility are evident. 3 - participant is able to write name (cuing may be required) and some familiar words. Legibility is poor. 2 - participant is able to write some letters spontaneously. Able to trace or copy letters and numbers. 1 - participant is unable to copy letters or simple shapes.
Speaking	This item is assessed by the participant's ability to speak. Actions include articulation, rate, volume, and quality of vocal communication. Scoring is as followed: 7 - participant is able to converse with well articulated, well modulated articulation and voice. No difficulty understanding what is being said. 6 - participant displays evidence of minor sound distortions but generally adequate intelligibility. Speaking rate may be reduced. 5 - participant's speech intelligibility is always reduced. Articulation is consistently distorted. May attempt self- corrections. 4 - participant is able to intelligibly produce single words and simple phrases. General conversation intelligibility. 3 - participant can produce single syllable words with adequate intelligibility. Listener burden evident for sentences or longer verbalization. 2 - participant can produce vowels, some consonants. Can imitate some single words but productions may require listener guessing. 1 - participant has no intelligible speech.

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Non-Verbal	This item is assesed by the participant's ability to communicate by means of not speaking. Actions include the used of text to speech, writing note/letters, hand gestures, pictures, etc. Scoring is standard scoring. See the first page of this document for standard scoring.

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5 Cognitive Items

Problem Solving	This item is assessed by the participant's ability to solve problems. Actions include recognizing a problem, making appropriate decisions and initiating a sequence to solve the problem. Scoring is as followed: 7 - participant recognizes problems when present, makes appropriate decisions and initiates and carries out a sequence of steps to solve complex problems until the task is completed 6 - participant recognizes a present problem and with only mild difficulty makes appropriate decisions, initiates and carries out a sequence of steps to solve complex problems 5 - participant requires supervision (cuing or coaxing) to solve less routine problems only under stressful or unfamiliar conditions, but no more than 20% of the time 4 - solves routine problems 60-80% of the time 3 - participant solves routine problems 40-60%of the time 2 - solves routine problems 20-40%of the time, needs direction more than half the time to initiate, plan or complete simple daily activities and may need restraint for saftey 1 - solves routine problems less than 20% of the time, needs direction nearly all the time, may not effectively solve problems, or requires constant 1/1 direction to complete simple daily activities
Short Term Memory	This item is assessed by the participant's ability to remember things short term. Actions include naming a sequence of five colors, numbers, names, and/or objects, and having them reiterate them back to you. Scoring is as followed: 7 - participant reiterates all the sequence of five in order 6 - participant reiterates the sequence with the use of cuing or coaxing 5 - participant reiterates four of five items in order 4 - participant reiterates three of five items in order 3 - participant reiterates two of five items in order 2 - participant reiterates one of five items in order 1 - participant reiterates no items in order
Long Term Memory	This is assessed by the participant's ability to remember things long term. Actions include recalling five events that happened through out the past week. Scoring is as followed: 7 - participant remembers five events in the past week 6 - participant remembers five events with the use of cuing or coaxing 5 - participant remembers four of five events 4 - participant remembers three of five events 3 - participant reiterates two of five events 2 - participant reiterates one of five events 1 - participant reiterates no events in the past week

Attention	This item is assessed by the participant's ability to stay attentive. Actions include ability to concentrate on a task, taking into consideration losing attention, level of responsiveness, and the difficulty and length of task. Scoring is as followed: 7 - Participant is able to attend continuously to a task for 60 minutes without assistance in maintaining attention to the task. 6 - Participant is able to attend to a task for 60 minutes without assistance in maintaining attention, but losing attention may delay completion of the task. 5 - Participant is able to attend to a task for 30-59 minutes, but needs supervision to assist in coping with the effects of losing attention.Able to attend more than 80% of the time on the task. 4 - Participant is able to attend to a task for 15- 29 minutes but needs assistance to minimize losing attention. Able to attend more than 60-80% of the time on the task. 3 - Participant is able to attend to a task for 5- 14 minutes, but needs assistance to minimize losing attention. Able to attend 40-60% of the time on the task. 2 - Participant is able to attend to a task for 1-4 minutes, but is frequently distracted. Able to attend 20-40% of the time on the task. 1 - Participant is not able to attend to a task for more than 1 minute and attends less than 20% of the time on the task.
Orientation	This item is assessed by how well the participant knows their orientation in their surroundings. Topics include their name, the date, the time and their location. Scoring is standard scoring. See the first page of this document for standard scoring.

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6 Environmental Control Items

Lights	This item is assessed by how many actions a participant can perform. Actions include navigating to the light and turning off and on the light. Scoring is standard scoring. See the first page of this document for standard scoring.
Doors	This item is assessed by how many actions a participant can perform. Actions include navigating to the door, opening the door, closing the door, locking the door and unlocking the door Scoring is standard scoring. See the first page of this document for standard scoring.
Temperature	This item is assessed by how many actions a participant can perform. Actions include navigating to the thermostat or other heat controlling device, raising the temperature and lowering the temperature. Scoring is standard scoring. See the first page of this document for standard scoring.
Windows	This item is assessed by how many actions a participant can perform. Actions include navigating to the window and the ability to open and close the window. Scoring is standard scoring. See the first page of this document for standard scoring.
Blinds	This item is assessed by how many actions a participant can perform. Actions include navigating to the blinds and the ability to open and close the blinds. Scoring is standard scoring. See the first page of this document for standard scoring.
Entertainment	Examples of entertainment devices include, TV, XBox or Playstation, books, iPad, etc. This is assessed by how many actions a participant can perform. Actions include retrieving entertainment device, ability to use device and putting device away. Scoring is standard scoring. See the first page of this document for standard scoring.
Use of Technology	This item is assessed by how well participants interact with technology in the home. Actions include using telephones, using iPads, charging devices and using a computer. Scoring is standard scoring. See the first page of this document for standard scoring.
Cleaning	This is assessed by how many actions a participant can perform. Actions include doing dishes, vacuuming, organizing and dusting. Scoring is standard scoring. See the first page of this document for standard scoring.

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