EVERYDAY MOBILE / ASSISTIVE TECHNOLOGY SUPPORTING ADULTS WITH INTELLECTUAL &/or DEVELOPMENTAL DISABILITIES IN THE COMMUNITY SETTING

by © Kimberly Maich

A thesis submitted

to the School of Graduate Studies in partial fulfillment of the

requirements for the degree of

Master of Education (Counselling Psychology)

Memorial University of Newfoundland

May 2018

St. John's, Newfoundland & Labrador

ABSTRACT

Twelve pilot project participants with intellectual and/or developmental disabilities used mobile devices (smartwatch and smartphone technology) and individualized apps focused on time management, coping, budgeting, exercise, and safety, to support independence and community engagement. Ten participants with Intellectual and/or Developmental Disabilities (IDD) and five front-line Coordinators participated in post-project focus groups in which common patterns of responses and salient findings were noted, including the emergence of a peer technology expert. Five themes emerged from focus group data, which were then developed into five broad technological, clinical, and methodological recommendations for phase two, that will follow this pilot project. Duration data showed variable change in pre-post duration of supports; related changes were part of these recommendations. The small sample size and current pilot study status suggests cautious interpretation and application of results beyond the immediate context of this project; however, this pilot project has developed a foundation for a more comprehensive intervention.

Keywords: Adults, Intellectual Disability, Technology, Independence

ACKNOWLEDGEMENTS

This research was supported by a Seed Grant from the Ontario Trillium Foundation, and undertaken with support from a collaborative multi-agency team of researchers, including its instigator, Community Living, and its dedicated team; my former colleague at Brock University, its lead researcher, Dr. Camille Rutherford; and our wonderful research assistant, Ms. Courtney Bishop, who developed many of the handouts found in the appendices and who is now a PhD student at Brock University.

Many thanks go to Drs. Lorraine Dicks and Peter Cornish, who willingly took on the task of supervising a life-long learner.

As always, my husband, John, and my grown-up children Robert, Grace (with her husband Mark), and Hannah (with her partner Steven) are a constant inspiration and support. Now my wonderful first grandchild, Quincey, can also be added to this list. Thanks to all of you. Again.

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Chapter 1: Introduction

Persons aged 15 and over with learning-related disabilities make up approximately 2% of the Canadian population; those with developmental disabilities make up approximately 0.6% (Statistics Canada, 2017). Social isolation of people with Intellectual and/or Developmental Disabilities (IDD) has been linked to increased costs in social, economic, and health domains (Wilson, Jaques, Johnson, & Brotherton, 2016). In addition, personal impairments and/or environmental barriers (e.g., built environment) have been identified in the literature within this field; for example, a national survey of Canadians 15 and older noted that "4 in 5 persons with disabilities reported using at least one aid or assistive device. This represents 80% [of that population]. The most common reason for not using aids or assistive devices was the cost" (Statistics Canada, 2017). Barriers include, but are not limited to, areas such as cognitive functioning level, adaptive living skills, transportation barriers, the influence of stigma, and even staff involvement. Although research continues to identify the varied benefits to using technology to support the development of essential skills and to decrease the environmental barriers that create disability, utilization of assistive devices is low in those diagnosed with IDD. For example, one study found that only 41% of adults with intellectual disabilities (ID) accessed computers, and that only 27.7% used cellular phones (Mechling, 2011).

The current pilot project implemented and documented an intervention to assist a specific group of individuals with IDD from one geographic area in Southern Ontario, part of the non-profit Community Living Ontario, a member agency in the West Region of the Ministry of Community and Social Services (Ontario Ministry of Social Services, 2014). Member agencies of Community Living Ontario pay membership fees, believe in its advocacy work, are guided by

its constitution and by-laws, and adopt its branding through membership privileges (A. Papineau, personal communication, 12 January 2018).[1] Community Living initiated this particular project, focused on financial and economic independence through the use of everyday smartphone and smartwatch technology, which are examples of mobile technology, along with specialized apps related to individual needs and goals (Maich, Rutherford, & Bishop, 2017). Mobile technologies are advantageous in a foundational manner as described by Turkish researchers Kuzu, Cavkaytar, Odabasi, Duygu Erişti, and Çankaya (2014):

> Tablet computers are mobile and can be used in every kind of environment. For instance, consider the teaching activity of brushing the teeth. It would be hard to bring a desktop or laptop computer to the bathroom. With the use of a tablet computer, the teaching activity of brushing the teeth can be performed easily in a bathroom. (p. 16)

As Ayres, Mechling, and Sansosti (2013) further emphasized, "opportunities related to practice include better methods for customizing instruction and providing 'just-in-time' supports, which previously may have required constant adult presence (e.g., one-on-one paraprofessionals) (p. 266). This point summarizes well the long term hopes for this pilot project, and its future iterations. Such a project also aligns with calls for social inclusion and community supports for the growing number of adults with IDD (Cobigo, Martin, Lysaght, Lunsky, & Ouelette-Kuntz, 2014; Levy & Perry, 2011; Ton, Drager, & Richardson, 2017) which are typically initiated and provided by coordinators (professionals) or parents (Levy & Perry, 2011). Levy and Perry (ibid) definitively state that: "The major factor affecting social outcomes in adulthood is the adequacy

[1] Please note that specific member agencies' names have been redacted throughout this document to decrease identifiability of participants.

of educational provisions and access to appropriate education for later employment and social and economic independence" (p. 1275).

A range of research-based literature demonstrates that the introduction of mobile devices along with the co-occurring development of related, unique applications designed for specialized needs have supported individuals with IDD in both the development of skills in a range of settings and the development of further independence. It is evident that significant potential for children, adolescents—and adults—with IDD, to gain and sustain increased independence and economic opportunity, exists through the utilization of such technology, as well as increasing social connectedness and decreasing community isolation. With affordable and accessible prompting systems on individual devices, such as hand-held mobile devices, individuals with IDD can be empowered through the use of assistive technology applications to complete home and community-based activities of daily living more safely and independently (Mechling, 2011), while keeping in mind that independence, technology, and safety must be continually balanced (Stock, Davies, Wehmeyer, & Lachapelle, 2011). Assistive technology can be defined to include devices which can enhance the "ability to perform and complete tasks with efficiency and independence" (Sider & Maich, 2014, p. 1) for users with exceptionalities. In turn, this change may likewise result in decreased need for low-ratio, on-site supports (e.g., bus trips). Cummings, Strnadová, Knox, and Parmenter (2014) went so far as to state that "If adults with intellectual disabilities are not provided with the opportunities to learn how to use mobile technology and incorporate it into their lives, the technology could very well become a barrier rather than a support" (ibid, p. 1101).

The Current Project

This research project, supported by a Trillium seed grant (see Appendix A), developed contextual recommendations around best practices for adults with IDD, and how partnerships—primarily mobile devices with assistive technology applications (e.g. time, location, and on-demand prompts)—can collaborate to increase independence and opportunity in a fluent, practical, supportive manner. Using existing smart phone technology (referred to henceforth as a *phone*) and electronic smart watch technology (referred to henceforth as a *watch*), this project focused on researching, developing, and implementing a series of location, time, and on-demand prompts that would reduce or replace the need for individual Coordinators to support workplace success and economic independence for adults with IDD. (See Appendix B for a full description of the Coordinator role.) In brief, Coordinators supports community-based adults with IDD and their front-line, direct-support workers through the orchestration of service provision within a team environment. Coordinators support the work of adults with IDD towards their personal goals, as documented in an Individual Support Plan.

Research-based literature identifies that the introduction of mobile devices and the development of related, unique applications have supported individuals with intellectual disabilities in the development of skills and independence, and that such technology is related to personal empowerment and positive social change. With affordable, accessible prompting systems built into hand-held mobile devices, individuals with IDD can be empowered through assistive technology applications to complete home and community-based activities of daily living more independently, such as finding and/or maintaining work, and succeeding in educational environments, which are elements of increased financial independence and a

decrease in the need for on-site support. Such devices and applications are increasingly widespread, accessible, and ever-changing.

Purpose

The purpose of this project was to research, profile, develop, implement, and evaluate a research-based framework in a pilot project context. In essence, it worked towards measuring the potential socioeconomic outcomes of the application of person-centered assistive technology for persons with IDD. In its proposal phase, it was hoped that this project would help to develop initial profiles of best practices of how adults with IDD and technological partnerships—primarily, mobile devices with assistive technology applications (e.g. time, location, and on-demand prompts)—could function together to increase independence and economic opportunity in a fluent, practical, supportive manner. Using existing phone and watch technology, this project focused on researching, developing, and implementing a series of location, time, and on-demand prompts that would reduce or replace the need for individual Coordinators to support increased workplace success and economic independence for adults with IDD. Like Ciccarelli and Hodges (2016), who shared a randomized control trial study utilizing a personal digital assistant (iPod Touch ®) to support 55 adults with Autism Spectrum Diagnosis (ASD) in work settings, this project questioned if it were possible to decrease human resources while increasing technological supports—in the context of increased skills and independence.

Research Question

The overall research question for this project was: Will the introduction of smartphone and smartwatch technology improve skill development and independent task completion for

adults with IDD living in semi-independent residential settings? And if so, what, if any, will be the socioeconomic impact on the independence of individuals with IDD? To support this research question, a conceptual framework was developed (explained below) as an "interpretative approach to social reality" (Jabareen, 2009, p. 51).

Logic Model

In order to develop a clear and objective plan for this pilot project geared towards the above research questions, a logic model (see Figure 1.1) was collaboratively created with a team of community professionals and researchers. Logic models are systematic framework tools which can help guide conceptual thinking, define projects parameters, and direct potential outcomes (Kneale, Thomas, & Harris, 2015). Figure 1.1 (below) includes the target group for this project, its goal, and its longer-term outcomes, shorter-term objectives, and strategies/components.

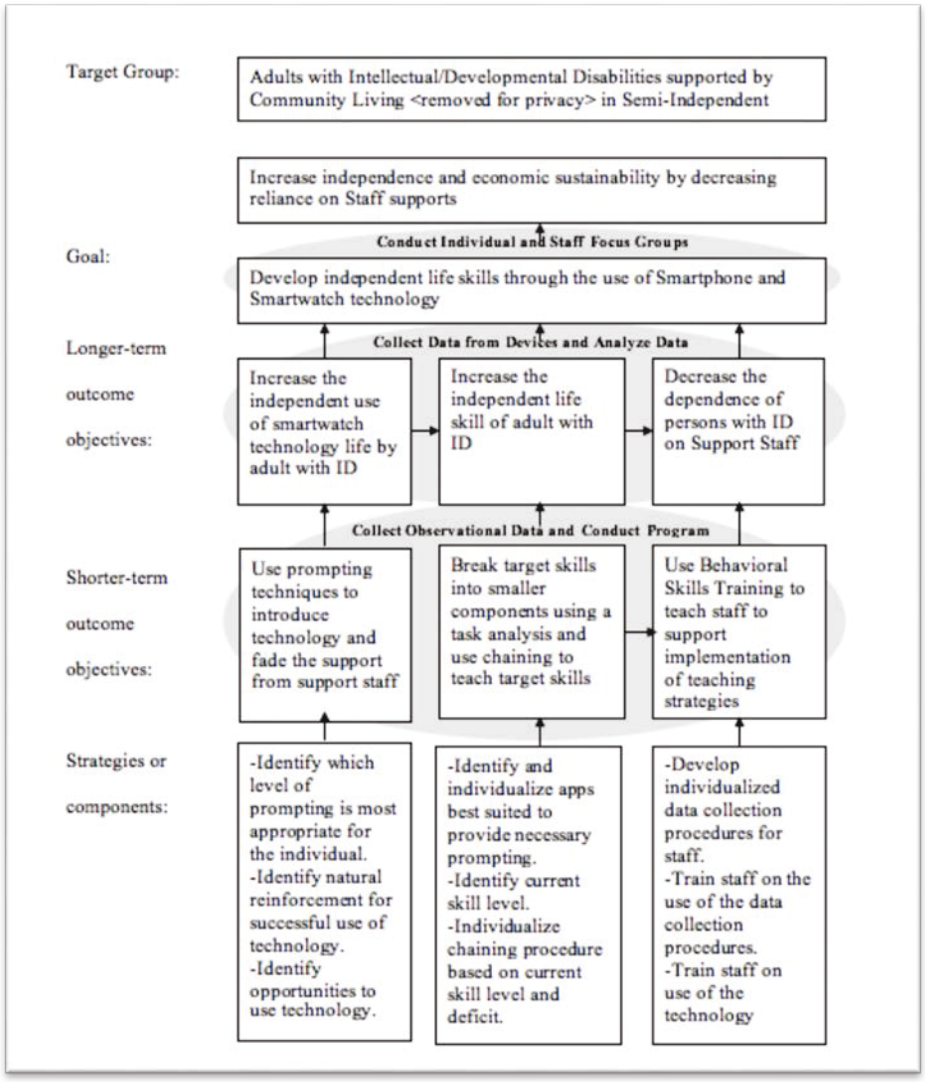


Figure 1.1: **Logic model.**

Conceptual Framework

Jabareen (2009) defines a *conceptual framework* as a:

> network, or 'a plane,' of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena. The concepts that constitute a conceptual framework support one another, articulate their respective phenomena, and establish a framework-specific philosophy. Conceptual frameworks possess ontological, epistemological, and methodological assumptions. (p. 51)

In this current research, the ontological assumptions (or how reality is understood) accept multiple perspectives; the epistemological assumptions, or "what is acceptable as knowledge values subjective evidence from participants; and, the methodological assumptions of the research process accept multiple types of evidence within its specific context" (Creswell, 2018). This research project was framed as an initial pilot study, supported with seed funding, and implemented with a mixed methods tradition. Its main methodological elements attempted to combine (1) quantitative data on device utilization; (2) observational data on the duration of intensive supports; and, most importantly, (3) qualitative data from post-intervention focus groups (both clients with IDD and Coordinators). Element (3) had a clear emic perspective in which "the phenomenon of interest should unfold as the participant views it" (Marshall & Rossman, 2015, p. 142).

Theoretical Framework

Two theories are foundational to this research project: both the applied theory of Applied Behaviour Analysis (ABA) and the Cognitive Apprenticeship Model (also referred to simply as *cognitive apprenticeship*). Both of these approaches intersect with technology, and both of these approaches intersect with one another.

Applied behaviour analysis

Applied behaviour analysis, as indicated by its nomenclature, is an applied science with theoretical and philosophical foundations focused on the relationship between observable behaviour and its environment in a "comprehensive, integrated, and systemic nature" (Fryling,

2013). Overall, “behaviour analysis includes behavior analytic theory and philosophy, the experimental analysis of behavior, applied behavior analysis of socially important problems, and the delivery of behavioral service” which are varied components that are inextricably intertwined (Fryling, 2013, p. 46). Built on the foundations of Watson’s observational learning, it initially flourished through the prolific work of Skinner, who is considered to be the foundational theorist in the field—then and now. Behavioural science is a highly complex and technical field focused on the observable three-term contingency of antecedent, behaviour, and consequence, and its effect on everyday behaviour (Cooper, Heron, & Heward, 2007). Its roots are found in animal modelling, with lengthy and intensive applications to the human population that were first published in the 1950s (Johnson, Carr, & Mellichamp, 2017).

A foundational article published in Baer, Wolf, and Risley (1968), entitled Some Current Dimensions of Applied Behavior Analysis, outlined the seven fundamentals of ABA: applied, behavioural, analytic, technological, conceptually systematic, and effective, and generalizable. Widely well-regarded is the seminal (and first) peer-reviewed journal devoted to the topic, the *Journal of Applied Behavior Analysis*, and similarly regarded is the seminal comprehensive text, Cooper, Heron, and Heward’s *Applied Behavior Analysis*, now in its second edition (2007). Their clinical credentialing body is the US-based Behavior Analysis Certification Board ® which was incorporated in 1998, and has included an ethical code since 2001 (Johnson, Carr, & Mellichamp, 2017).

In the current Ontario context of this research project, ABA is typically utilized and understood to be applicable to the realm of individuals with Autism Spectrum Disorder—although ABA is indeed a science that is applicable to all ages, stages, and the presence of

disability or otherwise. ABA's early, intensive, and therapeutic subtype, called Intensive Behavioural Intervention (IBI), is fraught with a litigious history in Ontario's population of young children with ASD, but currently, the newly developed Ontario Autism Program is being disseminated to provide new regulations and processes around ABA in Ontario (Ontario Ministry of Children and Youth Services, 2018). ABA is also utilized widely in the school system, especially following the dissemination of Policy/Program Memorandum 140, directing schools to utilize ABA for students with ASD (Ontario Ministry of Education, 2007). In terms of the population of adults with ID in community settings (the focus of this project), the applications of ABA are lesser known yet highly applicable. (See Chapter Two for literature related to this topic.)

Important terminology and technical language in ABA are essential to this paper's framework—in particular, an understanding of prompting. Prompting in ABA has a range of distinct approaches, levels, and intricacies important to its use and clinical applications. Decisions around choosing levels of prompting to support learning, and movement towards independence in new tasks, demand careful clinical decision-making. The typically accepted types of prompting include physical (full and partial), verbal, model, gestural, visual, and positional (links to cognitive apprenticeship) (ErinOak Kids, 2012). These methods are typically considered to form a hierarchy from most intrusive to least intrusive: movement along this scale is considered to be movement towards increased independence in a target skill area. In addition, more intrusive levels of prompting are considered to be direct, whereas less intrusive or "lower" levels of prompting are more indirect, allowing the learner to exhibit a particular skill with growing independence. Although Kuzu et al (2014) explain levels of prompting using only a few

of these levels, the process is described as follows:

> In applied behavior analysis, clues are given to the student for a task in a skill, which she/he is not able to perform independently. Clues remind the student of what and how to do. In a teaching activity, three types of clues can be used: physical guidance, modeling and verbal clue [sic]. Physical guidance is performed in a way that the teacher and the student perform the task together. The [sic] teacher helps the student physically by holding his or her hand. In physical guidance, the teacher also explains the task verbally. Modeling is performed in a way that a model performs the whole skill or a task while the student observes and tries to perform it. Also, in modeling, the model explains the task verbally. In verbal clue, the teacher explains the task verbally. It can be done by saying the task sentence directly like "flush the toilet" or by explaining the details of the task like "flush the toilet by pushing the button on the flush tank with your right thumb" (Varol, 2007). (p. 13)

In the context of this current project, new skills centred around the use of mobile technology and its applications (commonly referred to as *apps*). Support for skill areas took the form of instruction and prompting from involved Coordinators towards essential areas for community functioning in adulthood, such as budgeting.

Cognitive apprenticeship

The cognitive apprenticeship model also had applications to the research project, framed in a sociocultural or social constructivist approach to learning: "The theory itself is social - learning is believed to occur through interactions between people" (Tisdale, 2001, p. 53; Bouck, Okolo, Englert, & Heutsche, 2008). It includes practices such as mentoring, scaffolding, and communities of practices. Scaffolding has been emphasized by its well-known proponent Lev Vygotsky (Mooney, 2000) who developed language-mediated Zone of Proximal Development (ZPD) postulates, from which scaffolding emerged:

> What is there in the ZPD concept that is not known to the most uneducated but wise grandmother when she helps her grandson to perform some new action for the first time—to put on his pants, come down the stairs, construct a pyramid, combine letters into a word, count on his fingers, sing a song, or even thread a needle? Clearly, when the child

> is unable to do something on his own he has to be helped: the better he learns to come down the stairs the less help he needs. This grandmother knows nothing about mature and maturing functions, the relationship between natural and cultural developmental factors, actual and potential level of development, the social expectations that determine the social situation of development at each age, or the dramatic problem of readiness for teaching. But she lives with the child in such a way that his development takes place. So it was, so it is, and so it must be: the teacher does not teach what is well within the child's own capacity. The child comes to school not knowing how to do certain things; with the teacher's help he becomes increasingly independent; and, finally, he is able to act without outside assistance.

Scaffolding, then, refers those supports provided within the ZPD, as referred to above. For example: "Scaffolding is the intentional, strategic support that teachers provide that allows children to complete a task they could not accomplish independently" (Ranker, 2009, p. 600). Building on this foundation, Dennen and Burner (2007) define cognitive apprenticeship as simply "a process by which learners learn from a more experienced person by way of cognitive and metacognitive skills and processes" (p. 426). Also included in the concept of cognitive apprenticeship are the instructional practices of mentoring (pairing more experienced with less experienced people to help provide guidance to the latter), and communities of practice (a group with practices in common). In contrast to a more commonly understood mentorship process, cognitive apprenticeship focuses on thought-processes as skill for support. Dennen and Burner (2007) describe this well: "Instead of the physically concrete craft or trade that is the focus of traditional apprenticeships, a thinking skill is the focal activity of a cognitive apprenticeship" (Tisdale, 2001, p. 53). In addition, Tisdale encourages taking ZPD to deeper levels, considering the social, cultural, and historical context of the learner.

Summary

As with ABA, the idea of learning through apprenticeship—rife with strategies such as

modelling and scaffolding—has a long history. Indeed, there is a great deal of intersection between strategies expressed in both ABA and cognitive apprenticeship, though the language of the fields may differ. For example, cognitive apprenticeship is focused authentic tasks; the field of ABA would refer to this aspect as social validity. Similarly, cognitive apprenticeship refers to breaking down tasks into requisite pieces for instructional scaffolding; the field of ABA would refer to this instructional approach as task analysis, chaining, and prompting. In contrast, ABA attends more explicitly to the environment and its observable behaviours; whereas, cognitive apprenticeship attends more to what is "within the skin" (Palmer, 2004)—processes of learning that *may* be observable. As such, they complement one another and assist in the analyses within this similarly multilayered mixed methods research project.

Chapter 2: Literature Review

In the fast-paced field of technology[2] where "most information written about technology is dated the moment it is published" (Ayres, Mechling, & Sansosti, 2013, p. 265) with its growing applications to teaching and learning, little research relates directly to adults, adults with IDD, or adults with IDD using mobile technology as Assistive Technology (AT) for community-based skills—especially beyond school settings. Even in school settings, where AT can be a legal part of individual education plans, its usage can be minimal. Maich, van Rhijn, Woods, and Brochu (2017) shared that:

> In Alkahtani's 2013 study of AT knowledge and skills of 127 teachers, most teachers (93.7%) reported not using/requesting AT and that AT was not considered when developing individual education plans (IEP) for students. Alkahtani also found very low rates of AT availability (low-tech, 8.7%; mid-tech, 7.1%; high-tech, 3.9%).

As noted and defined in Chapter One, the theoretical framework for this project includes both ABA and cognitive apprenticeship. Each of these theories has some related literature that intersects with technology, adults with IDD, and mobile devices in community settings. However, specific and recent research encompassing this full context is scant. Due to this issue, some components of this literature review are more specific, and others are broader. The literature below provides some recent examples, with some related to children, technology as a general construct, and other areas of disability. The following areas are presented: cognitive

[2] Please note that cited literature is based on research projects undertaken within the geo-political boundaries of the United States context unless otherwise indicated.

apprenticeship, IDD, and other disabilities; technology and IDD; mobile technology, technology and ABA.

Cognitive Apprenticeship, IDD, & Other Disabilities

Cognitive apprenticeship itself is a unique package: "An apprenticeship is distinguished from tutoring, mentoring, coaching, and volunteerism because the focus of the interaction is on a specific socially and culturally valued activity that the adult is more skilled at doing" (Tisdale, 2001, p. 52). Its uniqueness means that research literature is rare as related to the specifics of this project. Dennen and Burner (2007), however, described an interesting and unique idea around the notion of *software-based scaffolding*, which has particular and potential relevance to this project. They believe that such scaffolding is multi-purposeful:

> First, it can be used to help provide structure to the learning task, guiding them through the major stages or tasks and prompting them at appropriate times. Second, it can be used to create a problem space in which learners must explore the content. (p. 433)

However, they do note that such software cannot adjust to an ever-changing ZPD the way a live educator can. Then again, another option is *scaffolding and computer-supported collaborative learning* by which the scaffolding is provided by people, but also mediated through the use of computer technology. Tisdale's (2001) discussion underscores this inherent difficulty regarding the sole use of technology without its human partner:

> Within a cognitive apprenticeship, the more-knowledgeable-other is often relied upon to determine the type and amount of scaffolding suitable for the learner. At times, the learner is able to verbalize his or her needs; at other times, the more knowledgeable-other must be intuitive. (p. 56)

Some limited literature in the last 10 years is available on the applications of cognitive apprenticeship to the area of disability, though typically it appears restricted to school-based practice and subject-specific strategies, rather than interventions in adulthood (Bouck, Okolo, Englert, & Heutshce, 2008). For example, Bouck et al (ibid) examined cognitive apprenticeship within an online instructional setting (a Virtual History Museum). Thirteen children with high-incidence disabilities (e.g., learning disabilities) participated in co-taught classes; they appeared to benefit from the cognitive apprenticeship and teacher scaffolding available, in addition to web-based instruction, but the authors also noted that "apprenticeship into the discipline of history is a slow, emerging process" (p. 35).

In another school-based example, Englert, Berry, and Dunsmore (2001) conducted a multi-phase qualitative case study of writing acquisition from the perspective of a peer dyad's social interactions. The context was a multi-age (Kindergarten to Grade 2), inclusive classroom which was co-taught. Overall, the authors concluded that "children with disabilities can be enabled in classrooms where there is an emphasis on apprenticeship models for learning" (p. 167)—and that such partnership models are unique and enabling. More recently, Nicholas (2011) taught reading to an 11-year-old student diagnosed with a mild intellectual disability (ID) using cognitive apprenticeship. Within this model, Nicholas used modelling, guiding, problem-solving, and systematic reduction of support an experienced success, noting she would "recommend the use of a *cognitive apprenticeship* teaching approach" (p. 17).

One more piece of literature deserves mention around cognitive apprenticeship in childhood. Though Tisdale's (2001) publication on cognitive apprenticeship is not a recent publication, it deserves inclusion, however, due to its unique approach delving into the examination of a

qualitative case study from a more critical point of view. Though this current project does not take a critical stance, all perspectives are relevant in background literature—especially seminal publications that provide a varied outlook. Unlike most publications noted so far, Tisdale's study explores an example of a failed cognitive apprenticeship utilizing language like "foundering," "unfriendly," "unhappy," "hostile" (p. 51), and "chaotic" (p. 56); like most publications noted, it does focus on a child-as-learner. Tisdale looks at what happens when underlying relationship assumptions like benevolence are not present, such as the cognitive apprenticeship dyad not getting along, or when the relationship is not characterized by a "friendly adult and a cooperative child" (p. 73). Tisdale noted that we need to attend to complex issues within interpersonal relationships such as power, communication, and trust, in order to make cognitive apprenticeships successful.

In terms of adult learners, Siew, Mazzucchelli, Rooney, and Girdle (2017) reported a pilot study around an individualized university-based peer mentoring program for ten post-secondary students with ASD enrolled in various faculties, 80% of whom were 18 or 19 years of age. Using both qualitative measures (interviews) and quantitative measures (standardized questionnaires) in a single-group pre-test/post-test design, they evaluated the provided program. Participants shared that they found three features of the program especially helpful, and were highly satisfied with the program overall: "(a) provision of constant, stable support; (b) comfort of peer-to-peer support; and (c) flexible and individualized support" (p. 8). Quantitatively, the authors found that the greatest score change (a decrease) was in the area of "general communication apprehension" (p. 12)—a positive change for the participants.

Technology and IDD

Assistive technology. For those with disabilities, the term assistive technology (AT) is typically utilized to reference technology that supports functionality for those with disabilities. Its use has also been explored widely, including for researchers with ID (Cummings, Knox, & Parmenter, 2014). Ayres, Mechling, & Sansosti (2013) stated that technology is a tool like other tools, that its power emerges from its usage rather than its form. Maich, Jahnke, and Rutherford (2018) defined the boundaries of *assistive technology* in detail from multiple sources; however, it must be kept in mind that many research projects will still utilize the term *technology* with or without additional descriptors:

> "AT is any piece of equipment, software program or product system that increases, maintains or improves academic capabilities" (Malcolm & Roll, 2017). There are three broad groups of AT general use (e.g. word processing), assistive computer technologies (e.g. Braille printers) and adaptable technologies (e.g. dictation software) (Fichten, Asuncion, & Scapin, 2014). Additionally, AT falls under the "following functional domains: a) communication, b) mobility, c) environmental control, d) activities of daily living and community inclusion e) education f) employment and g) recreation and leisure" (Wehmeyer, Smith, Palmer, & Davies, 2004, p. 13). The most common AT is computers. A recent survey found that 49.7% of families had at least one family member use computers in some form (Palmer, Wehmeyer, Davies, & Stock, 2012). (p. 4)

As noted by Maich, Jahnke, and Rutherford (2018), "Most research on AT to date has focused on students with learning disabilities rather than an intellectual disability" (p. 6); however, more research attention has, of late, been focused on these topics—still in its early phases with a great deal remaining to accomplish in the field (Mechling, 2011; Wehmeyer, Tassé, Davies, & Stock, 2012). In 2015, Weaver examined 23 studies in a systematic review of interventions for people with ASD; 18 of these related either to work or activities of daily living. Results included support for mobile and tablet technology use for vocational needs, but another outcome noted that technology for instrumental activities of daily living (e.g., budgeting) is still

limited.

From a wider lens, it appears evident that "technology can improve functional abilities to support greater independence in activities of daily living, control over one's environment, and—in the end—to enhance community integration" (Wehmeyer, Tassé, Davies, and Stock, 2012, p. 18), but it is also important to attend to how such instruction is accomplished. Kelley, Rivera, and Kellems (2016), for example, in a study involving teaching the use of Google Glass to adult participants with ID, it was emphasized that attending to the teaching procedures and their individualization was essential "to constantly evaluate best practices for teaching students to actually operate technological devices to increase independence" (p. 215). Bouck and Flanagan (2015), in their correlational study of AT of 129 842 participants within and beyond school environments, found that AT use was lower following school leaving for almost all diagnoses.

Mechling (2011) reviewed 21 research studies from 2000 to 2010, including the application of audio media players, smart phones, and handheld devices, for people with diagnoses ID and/or Autism Spectrum Disorder (ASD). While some of the participants in the reviewed studies were adults, as in the current study, others included adolescents and children. Mechling concluded that:

> …while it is important to realize these portable electronic devices may not be appropriate for everyone…it is also possible that these innovations will create opportunities for living, work, and recreational environments that are currently not available to persons with more significant disabilities." (p. 496)

Wehmeyer, Tasseeé, Davies, and Stock (2012) agreed that "technology is an important part in achieving these goals" (p. 11) for those with ID, citing similar outcomes to Mechling, such as

community participation and social inclusion. In an examination of support intensity needs, the authors found that teaching and learning needed and demanded a high level of intensity, and a fitness for technology use. A comment especially salient to this particular research project is that the "ubiquitousness of cell phones" (ibid, p. 18) for many ages and populations is a strong example of using everyday mobile technology for social and community goals.

Along similar lines, Davies, Stock, King, Brown, Wehmeyer, and Shrogren (2015) examined an everyday social media tool—Facebook—and how it could be accessed with ease by people with ID as a way of "enhancing social capital" (p. 30) and decreasing exclusion, an oft-cited area of goal-setting for this population, along with their family members. This pilot study, like the current project, included 12 adults with ID who were, in this case, not current Facebook users. These participants were training on five Facebook-specific tasks using a specific accessible interface designed and developed with the needs of adults with ID foremost (e.g., speech-to-text posting). This project was deemed effective, and linked back to wider issues underlying the disability field:

> Technology-mediated social networking through sites like Facebook is clearly becoming a part of day-to-day life for the majority of people in society. Promoting access to such opportunities is necessary to ensure the full participation of people with disabilities in all aspects of society, congruent with their preferences, interests, and desires. (p. 39)

Mobile technology. An online literature search of scholarly, peer-reviewed full text journal articles using keywords like "mobile technology," "adults," and "intellectual disability OR autism" revealed minimal results—and not all were relevant studies. Existing research notes the underutilization of technology specific to such populations (Bouch & Flanagan, 2015; Palmer,

Wehmeyer, Davies, and Stock; Wehmeyer, Tassé, Davies, & Stock, 2012) even in the context of an apparent "proliferation of advanced mobile technologies" again specific to these populations (Ayres, Mechling, & Sansosti, 2013). Although augmentative and alternative communication devices ("unaided systems such as signing and gesture, as well as aided techniques ranging from picture charts to the most sophisticated computer technology" (Ontario Ministry of Health and Long Term Care, 2011, p. 19) are perhaps more conspicuous, or are well-known technology supports for receptive and expressive communication needs, this project focuses on participants whose goals are focused in other skill areas related to independent community-based functioning, such as time management.

Palmer, Wehmeyer, Davies, and Stock (2012) surveyed 1617 family members of people with IDD (including adults) around technology—including mobile technology—and domains of development. The authors provided descriptive statistics in five areas of results: mobility; hearing/vision; communication; independent living; and computer use. Overall, they note positive trends, that "more people with intellectual and developmental disabilities appear to have access to technology and there are fewer people who could potentially benefit from such technology but who do not have access to it" (p. 412) but that calls for future improvement are yet warranted. Palmer, Wehmeyer, Davies, and Stock (2012) note that ease of use and training are two areas for future attention specific to the disabled population.

Moving to the international context, Haveman, Tillmann, Stöppler, Kvas, and Monninger, (2013) carried out a multi-year large-scale study of public transportation in one city in Germany, within a social-ecological model and a quantitative research tradition. They supported skill development in what they termed wayfinding:

> those skills necessary to navigate from one place to another via the public domain, whether as a pedestrian or user of public transport, all of which is done by oneself and involves route recognition and mastery, dealing with problems posed by physical and technical barriers proffered by the public domain or transport, and arriving safely at one's destination. (p. 289)

The definition provided by Haveman et al (ibid) underscores the obvious complexity of this target skill, which the authors note is rarely addressed for people with ID. Though the 124 participants (adults of 18 years of age to children as young as 7 years old) were supplied with mobile devices for safety, communication, and "incident management" (p. 292) following training, a trip companion was the first point of support during wayfinding exercises. From pre-intervention to post-intervention, those who could use public transportation successfully progressed from 0.8% to 65.3%. It is important to note, however, that mobile devices were not the focus of this project, but a helpful (and perhaps essential) secondary tool.

Specific to the Ontario context of this project, Maich, Jahnke, and Rutherford (2018) found that teaching a group of Ontario college students with ID to utilize AT for academic work—including mobile technology—had a number of perceived positive outcomes, including greater efficiency, effectiveness, and productivity. Also in Canada, Stock, Davies, Wehmeyer, and Lachapelle (2011), carried out a Québec-based case study of an adult with Down Syndrome, with one focus on solving problems and making decisions with the use of technology, including a smart phone and appropriate apps for travel within the community. Qualitative results indicated positive emotional outcomes such as happiness, excitement, and confidence—as well as effective skills related to technology use and growth in independence.

Technology and ABA. Technology for adults with IDD is also an approach in ABA literature, typically evaluated through quantitative experimental research in Single Case Research Design (Gast & Ledford, 2014). Foundationally important to this specific field, Odom (2013) and Wong et al (2014) referred to technology-aided instruction emerging as a newly minted evidence-based intervention for both preschool-aged children (aged 3-5) and those in young adulthood (aged 19-22) with ASD. Maich and Hall (2016), within a Canadian resource focused on ASD in Ontario, provided a succinct overview of this area:

> Technology and computers have also been successful in teaching "social, communication, behavior, joint attention, cognitive, school-readiness, academic, motor, adaptive, and vocational skills" (Odom, 2013, para. 4). For instance, computer software, where individuals independently interacted to learn how to differentiate between faces, was successful in enhancing facial recognition (Faja, Aylward, Bernier, & Dawson, 2007). In another study, watching an animated children's TV series demonstrated that emotional understanding and emotion recognition could increase in a group of children with ASD (Golan, Ashwin, Granader, McClintock, Day, Leggett, & Baron-Cohen, 2010). In addition, the independent completion of tasks and routines has increased, utilizing digital assistants, computer programming, and iPads (Hall, Maich, & Hatt, 2014; Mechling, Gast, & Cronin, 2006; Mechling, Gast, & Seid, 2009; Mechling & Savidge, 2011). The field of utilizing technology to teach skills continues to build for individuals with ASD, with support appearing regularly in the literature. (p. 134-135)

On a macro level, Barton, Pustejovsky, Maggin, and Reichow (2017) completed a meta-analysis of 23 such publications as follow-up to Wong et al (2015). An in-depth discussion around its methodology is not necessary; it is sufficient to state that a creative approach was used with the between-case standardized mean difference to examine average effect size for interventions involving students with ASD. Overall, the authors agreed that computer-aided instruction, specifically, should indeed be categorized as an evidence-based practice for students with ASD, consistent with Wong et al, and that the use of technology-aided instruction and intervention is also supported. However, it is it a much greater challenge to find ABA research

related to mobile devices—the topic of this research. In a very recent study, Esposito et al (2017) underscored a similar experience:

> To date, search engines allow us to find different typologies of tablet and smartphone applications for people with ASD, choosing them by category, price, and specific programs. Some of these applications seek to recover cognitive and social ability and daily living skills … even though the efficacy of most of these has not been validated by research designs. (p. 200)

Specific to mobile devices, McMahon, Smith, Cihak, Wright, and Gibbons (2015) compared three varied mobile technologies (also termed *digital aids*) to support community navigation, focused on six young adults with intellectual disability. In the context of this study, participants were supported in learning to navigate post-secondary environments on foot through an adapted alternating treatment design. The mobile technologies or digital aids used included a printed map (via Google.com), the Google Maps app on phone or tablet devices, and an augmented reality navigation app (including options layering navigational information onto the live view ahead). Results showed greater success with the latter treatment option, as well as a strong preference for its use for day-to-day navigational needs.

Less common in the field of ABA research, Marcus et al (2017), based in Italy, carried out a blinded randomized group design intervention within ABA-based instruction for 15 children with ASD (experimental group). The research used three tablet applications in what is termed *serious game design*—meeting educational goals with specifically designed game mechanics. In this specialized field, "evidence-based game mechanics" (p. 201) are combined with evidence-based ABA strategies (e.g., task analysis, token economy, immediate feedback,

prompting, fading, reinforcement) and considering the needs of students with ASD (e.g., attention, motor skills). Results were based on both descriptive and inferential statistics and indicated "better learning" (p. 205) for participants who received the four-week games-based training intervention on mobile devices. Results, however, were not statistically significant. In Turkey, Kuzu et al (2014) implemented a mediator model of software training, but through teaching parents and other relatives (ages 24-60) how to utilize mobile applications to teach "daily life skills" (p. 11) to nine adults and one adolescent with ID, aged 16 to 32. The authors described their methodology as "design-based" (p. 11) with nine specific steps that focused on developing new applications, including educational software. Like Marus et al. 2017), above, software was developed and piloted with ABA-based strategies (e.g., task analysis, prompting, reinforcement, video modelling) and used to teach varied skills, including what the authors termed "domestic skills" (p. 17) (e.g., making buttermilk). Kuzu et al, however, used observation and interview data for analysis. The latter were analyzed with qualitative methodologies; results were used to further refine software apps for subsequent stages of the research project. Overall, "participants indicated that all the pages of the software
were user-friendly, easy to use and well-designed" (p. 23). Parents and relatives (the mediators) also described it as useful and had positive attitudes about its use.

Chapter 3: Methodology

The overall research question for this project was: Will the introduction of smartphone and smartwatch technology improve skill development and independent task completion for adults with IDD living in semi-independent residential settings? If so, what is the socioeconomic impact on the independence of individuals with IDD? The overall methodological framework was a mixed methods pilot project. The project was focused on participants with IDD supported by one Community Living Ontario affiliate in Southern Ontario, Canada. As noted in Chapter One, its main methodological elements, as well as an embedded one-group pre-test/post-test design, included a combination of: (1) qualitative data from post-intervention focus groups (both Coordinators and clients with IDD); (2) quantitative data on device utilization; and (3) observational data on the duration of intensive supports. According to Creswell (2012), these procedures represent an embedded design, with qualitative data as the primary form of data collection, and quantitative data as the secondary form in a "supporting role" (p. 544) denoted as: QUAL + quan (Creswell, 2015).

Participants

Recruitment and consent. Following clearance from the Social Sciences Research Ethics Board at Brock University as part of a delegated application process (December 19th, 2016) (see Appendix C) participants were recruited though one Community Living affiliate in Ontario, Canada. The main participants in this project were a group of clients of this Community Living Ontario member agency for adults with IDD in the West Region of Southern Ontario. These adults with IDD were recruited from the Supported Independent Living (SIL) program. SIL is a

specific program targeted to adults (i.e. those 18 and older) with IDD, where supports and training are given for daily living (e.g., budgeting) in person or by phone, also termed *life skills*. The goal of the SIL program is "to provide community accommodation services and supports to adults with a developmental disability that promotes social inclusion, individual choice, independence and rights" (Developmental Services, 2016). In more detail, SIL is defined to include the following:

- Personal support to adults with a developmental disability in community based individual living settings;
- Individuals live independently or semi-independently in the community, and receive periodic guidance and support with instrumental activities of daily living (activities related to independent living, including preparing meals, managing money, shopping for groceries or personal items, performing light or heavy housework, and using a telephone);
- Individual skill development is provided based on assessed needs and the persons [sic] individual support plan. The agency is responsible for individualized staff support with identified activities of daily living that is less than 24 hours per day as per the persons support plan; and
- Supports for persons residing alone or living independently in a family or caregiver housing (Community Living, 2013, para. 9).

During planning, it was anticipated that six to12 SIL clients would volunteer to participate in this research, including a post-intervention focus group, and it was also anticipated that six to 12

Coordinators implementing the program would likely consent to participate in a post-intervention focus group.

Adults with IDD. A Research Assistant (RA), with no prior relationship with potential clients, distributed recruitment posters (see Appendix D) to clients of the SIL program. Recruitment posters included basic information about the project, as well as contact information for in-person, phone, and/or email contacts for potential participants to express interest in project participation. Recruitment posters were posted in public locations across the community organization (e.g., day programs, main offices, etc.). A copy of the recruitment poster and information letter was sent to each of the 43 individuals living in SIL. Sixteen out of 43 potential participants chose to meet with the RA and participate in the information and consent process. Of these16 potential participants, 15 consented.

Participants with IDD were asked to participate in an individual consent process, whereby they met with the RA and a support person of their choosing (if they wished to have the support). During this interview, participants were provided with information about the project, and an outline of the ethical responsibilities of the research team. Due to concerns associated with working with vulnerable persons, and concerns regarding informed consent, participants with IDD were asked a number of questions related to the information provided, and a witness was present to ensure that the participants were not coerced into participating, and that they displayed competence in their responses, supporting the supposition that the consent from the participants was indeed informed. Potential participants were provided with a combined letter of invitation/consent. Some examples of this process may be noted. Participants were provided with the opportunity to have a staff person of their own choosing to join them; given the opportunity

to choose the location, time and date of the consent process; reminded of the volunteer nature of research; and asked to identify a staff person to support their learning and use of the apps (see Appendix E for a full copy of the process).

Due to the limited funding alongside a high level of interest in participating, a random selection process was utilized to ensure representation across each of the profiles, and to provide equal opportunity for participation. Participants were made aware of this procedure prior to consenting (i.e., they knew they might not be selected to participate in this project, but would be placed on a waitlist if not selected). This level of selection of participants with IDD involved two levels. First, to obtain a maximum-variation sample (Creswell, 2013), four profiles were developed focused on quartiles of annual support hours (A to D; see Table 3.1, below). All 43 potential participant volunteers were categorized into one of these four profile areas. Within these profiles, where necessary, participants were randomly selected with the True Random Number Generator (TRNG) (random.org, 2018). Both participants from profile A were chosen (n = 2); TRNG was used to choose three participants from profiles B, C, and D (n = 9); then, the remaining participants from groups B, C and D were utilized in the selection of the final participating using TRNG (n = 1). The remaining participants who were not selected for this project are on a waiting list for future research opportunities (e.g., phase two) involving the use of assistive technology. All 12 selected participants participated in this research project.

Overall, 12 participants with IDD participated in this research project (n = 12). Five participants with IDD were female (n = 5; 41.7%) and seven were male (n = 7; 58.3%). The average age of participants with IDD was 43.

Table 3.1

Participant Selection Profiles

Profile	Annual Support Hours	Volunteers Potential Participant Pool
A	128-192	14
B	193-416	8
C	417-676	11
D	677-8760	10

Two target skill areas were chosen for each participant for the purposes of this project, which were derived from goal areas on each Individual Support Plan, which are legislated to include needs, preferences, and goals for those with developmental disabilities in Ontario (Ontario e-laws, 2011). Participants with IDD and Coordinators supported this process by identifying: *What are you (participant with IDD) really good at (e.g., able to read, good at communicating)? What are some things you can do on your own (without support)? What are some things you would like to learn to do on your own (without support)?* and *What is the best way to support you in learning a new skill (i.e., how do you learn best)?* This information was also used to assist in matching technology, apps, and level of prompting (e.g., textual versus visual).

Table 3.2

Participant Demographics

Name*	Gender	Age	Annual Hours of Support	Target Skill Areas[3]
Alan	M	58	371-2550	Time Management, Budgeting
Jeremiah	M	32	2551-8760	Time Management, Budgeting

[3] Listed in order of importance for individual participants.

Matthew	M	42	2551-8760	Time Management, Budgeting
Max	M	19	2551-8760	Time Management, Budgeting
Micah	M	50	228-370	Coping, Exercise
Stefan	M	35	371-2550	Time Management, Budgeting
Terry	M	42	228-370	Safety, Budgeting
Daisy	F	29	128-227	Time Management, Budgeting
Grace	F	51	128-227	Time Management, Budgeting
Jane	F	43	228-370	Budgeting, Time Management
Lu-Ann	F	62	2551-8760	Budgeting, Time Management
Tracey	F	52	371-2550	Budgeting, Time Management

*pseudonyms

Coordinators. Coordinators were similarly provided with a combined letter of invitation/consent, the details of the project, and their role in the research. This letter was provided to the Coordinators identified by the individuals with IDD who had already chosen to take part in the study. In turn, participants provided their Coordinators (or RAs) with the relevant paperwork. If Coordinators wished to participate in all or part of the project, they contacted the RA in person, by phone, or by email. (See Appendix F for a copy of the letter of invitation/consent.) Coordinators participated in the project as part of their day-to-day work role, but also participated as research participants in a post-intervention focus group. (Please see **"**Post-intervention focus groups," below.) Overall, six Coordinators participated in this research project (n = 6, see Table 3.3); all of whom were female (n = 6; 100%). One Coordinator supported one participant with IDD; four Coordinators each supported two participants with IDD; one supported three.

Table 3.3

Participants with IDD & Assigned Coordinators

Participant with IDD*	Coordinator*
Alan	Kerry
Jeremiah	Darlene
Matthew	Lacey
Max	Darlene
Micah	Bonnie
Stefan	Lacey
Terry	Bonnie
Daisy	Kerry
Grace	Darlene
Jane	Elaine
Tracey	Samantha
Lu-Ann	Samantha

*pseudonyms

Materials

The two main devices for this research were smart phones and smart watches (labelled with initials and identification numbers), cords, and carrying cases. The phones utilized for participants with IDD were Motorola's moto g^3 (or third generation) phones. The moto g^3 is an Android platform with a five-inch HD screen, a 13 MP / 5 MP integrated camera, a 24-hour (all day) battery, and a "fast, reliable quad-core processor" (Motorola Mobility LLC, 2017). The moto g^3 phones were paired with Pebble Time smart watches. The Pebble Time Steel synchs with Android phones, has a lengthy battery life, operates through four buttons, and vibrates during notifications (Pebble, 2016). Scott Stein describes this electronic device as "low-key" and provides this review as part of a comprehensive examination posted to the CNET site:

> The Pebble Time vibrates when it gets messages, shows upcoming events, and can run a number of apps: fitness ones, utilities, games, novelty watch faces. It's more of a wrist-

> pager than a full-blown gadget. But, it can run a lot of its basic functions, like time, alarms, and basic utility apps, without a phone being connected. Still, like most smartwatches, it's meant to stay connected via Bluetooth to your smartphone most of the time. (Stein, 2015, para. 8)

The full hardware inventory list included 12 phones for participants with IDD), 6 phones for Coordinators, 12 watches for participants with IDD, and 2 extra watches in case of breakage or loss.

Software. Varied apps were considered (see Table 3.4) selected, purchased, and matched to align with identified skills collaboratively decided as those needing support through this project. Each participant with IDD utilized two apps (see Table 3.5), with the exception of those with a budgeting focus, which included two apps for this target area.

Table 3.4

Potential Apps

Task	Purpose	Functionality	App
Yes and no gestures	Communication	Picture -> Audio	JABtalk, AAC Speech Communicator (AACSC)
Indicate choice	Communication	Picture -> Audio	JABtalk, AACSC
Express emotions	Communication	Picture -> Audio	JABtalk, AACSC
Express thoughts in a more simplistic way	Communication	Picture -> Audio	JABtalk, AACSC
Identify who is coming next on shift	Communication	TBA	
Story telling (i.e., pictures, videos, what I did today)	Communication	TBA	
indicating a need	Communication	Picture -> Audio	JABtalk, AACSC
The ability to communicate quicker and more clearly	Communication	Picture -> Audio	JABtalk, AACSC
Use pictures to express thoughts	Communication	Picture -> Audio	JABtalk, AACSC
Reminders of what might help with calming (i.e., listening to music, important items)	Emotional Support	Shortcut to calming music or pre-recorded calming message	Music, Mp3; Self-help Anxiety Management
Songs	Emotional Support	TBA	Music, Mp3
Links, chat lines to connect, facetime	Emotional Support	TBA	

Quick links to resources (i.e., suicide chat line, AA member)	Emotional Support	TBA	
Medication reminders	Medical	Notification - text confirmation	Calendar - notification; Med Helper Pill Reminder; AiHealth Med Reminders
Blood sugar testing, safe glucose numbers	Medical		Calendar - notification; Med Helper Pill Reminder; AiHealth Med Reminders
Access to emergency services	Medical	Short cut help buttons	911 Help sms Help me!
Emergency service to be able to access emergency information (i.e., list of medications, contact)	Medical	TBA	Health
Scheduling	Memory Retention	Calendar -> notification -> confirmation	Calendar - notification
Reminders of events, appointments, days of week, time	Memory Retention	Calendar -> notification -> confirmation	Calendar - notification
Is today a work day or not work day?	Memory Retention	Calendar -> notification -> confirmation	Calendar - notification
Indicate completion of task (i.e., time to go home, break time, laundry is done)	Memory Retention	To Do List -> notification -> confirmation	To Do List - notification
When it's safe to cross	Safety	Predetermined map route	Map, GPS location,
Safest route to take	Safety	Predetermined map route	Map, GPS location,
Directions / maps	Safety	Predetermined map route	Map, GPS location,
Accessing help (i.e., support staff, 911)	Safety	Short cut help buttons	911 Help sms Help me!
Reporting an incident	Safety	Short cut help buttons	
Wandering prevention (i.e., identify when this occurs, remind them of safe boundaries, notify supports, guide individual)	Safety		Map, GPS location, Bluetooth beacon; Geofence; GPS tracker
Clarifying tasks required	Work	To Do List -> notification -> confirmation	To Do List – notification
Timing (i.e., when it's break time)	Work	Calendar -> notification -> confirmation	Calendar – notification
Task analysis (i.e., break down of tasks)	Work	TBA	
Identify time	Work	TBA	
Transportation (i.e., call taxi, arrange how to get there)	Work		Uber, Taxi app
Calendar, Schedule	Work	Calendar -> notification -> confirmation	Calendar - notification

Table 3.5

Final Selection of Apps

Purpose	App Name	Company Name	Google Play Link
Budgeting	Simple Budget	Jimmy Winters	https://play.google.com/store/apps/details?id=com.buyingyourfreedom.cashflow&hl=en
	Canadian Activity	BloomingKids Software	https://play.google.com/store/apps/details?id=air.com.bloomingkids.ActivityCanadaMoney&hl=en

	Coins & Bills		
Time Management	Google Calendar	Google LLC	https://play.google.com/store/apps/details?id=com.google.android.calendar&hl=en
Exercise	Google Fit	Google LLC	https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&hl=en
Coping	Breathe	Jatra	https://play.google.com/store/apps/details?id=uk.co.jatra.inout&hl=en
Safety	Magnus Cards	Magnusmode	https://play.google.com/store/apps/details?id=com.magnusmode&hl=en

Procedure

The project plan was developed with a multidisciplinary team from Brock University and Community Living (November 2016). The planning phase began with the development and submission of an Ontario Trillium Seed Grant application and the submission of a research ethics application to the Social Sciences Research Ethics Board (SREB) at Brock University. The Trillium Seed Grant was approved in April 2016, and the SREB provided clearance, following modifications, for the project (December 2016). Smart watches and smart phones were purchased and distributed following a contract finalized between Brock University and Community Living. Interventions with the phones, watches, and apps focused within four areas: time management, coping, budgeting, exercise, and safety. Most participants were matched with two related apps according to their focus skill areas under development, with the exception of budgeting, as it included two complementary apps for each participant. To promote objectivity and focus, each of these intervention areas was operationally defined, including examples (see Table 3.6).

Table 3.6

Adapted Operational Definitions

Area of Intervention	Definition	Examples
Time Management	Support related to any aspect of daily living, such as ongoing commitments (e.g., work), appointments, medications, bank visits, laundry days, and/or special events.	-Planning activities in advance (e.g., daily / weekly / monthly schedules) -Reminders of upcoming activities (e.g., specialist appointments) -Initiating activities (e.g., checking in see if a task or activity was begun).
Coping	Support related to de-escalation as a result of anxiety or agitation.	-Reminders to engage in an activity that has assisted with prior calming (e.g., listening to music, going for a walk) -Reminders to help with perspective-taking -Reminders to engage in deep breathing
Budgeting	Support related to decisions around money.	-Planning related to paying bills, saving money, or spending money -Activities such as banking and spending money (e.g., making change). -Discussions regarding money values (e.g., "What does a ten-dollar bill look like?") -Assistance with spending money (e.g., making change).
Exercise	Support related to improving physical health.	-Set goals related to exercise -Reminders to engage in exercise (i.e., support and maintenance for goals already in place) -Co-engaging in exercise (e.g., going for a walk with the purpose of encouraging the walking partner to move)
Safety	Decreasing risk in higher-risk activities of daily living	-Creating task analyses for locking a front door

Recruitment posters were shared in late December 2016. Interviews with potential participants with IDD took place throughout January 2017. In late January, participants with IDD were selected by the research team. In late January, participants with IDD and Coordinators were also notified. Letters of information / consent forms were distributed and completed in early to mid-January (see Appendices D & E). In late January 2017, Coordinators supporting participants with IDD in this project had an opportunity to familiarize themselves by utilizing hardware and practicing apps. Throughout the process, the multi-project team collaborated. During one meeting, for example, the team identified skills, chose apps, set up and assigned phones, downloaded relevant apps, and removed / locked out unnecessary ones, assembled cords, phones, and watches in their carrying cases and labelled the devices, and developed a training plan. Following two days of training on baseline data collection and the related apps, baseline duration data were collected from January 21 to February 7 (i.e., over approximately two weeks) using the Stopwatch Deluxe app. In early February, watches and phones were updated with apps appropriate for each participant with IDD. A full-day training session for participants and staff facilitated by the research team took place at Community Living in early February 2017 (see Table 3.7), and included handouts and device distribution. The total length of post-training intervention was three weeks. At the end of March 2016 (March 3-22), post-intervention duration data were collected. Throughout the process of data collection, the interagency research and intervention team met monthly.

Table 3.7

Training Day Schedule

Time	Audience	Focus	Further Detail
9:00-9:15	Coordinators	Using phones	Appendix G
9:15-9:30	Coordinators	Using watches	Appendix H
9:30-10:15	Coordinators	Using apps	Appendix I
10:15-11:00	Coordinators	ABA basics	Appendix J
11:00-12:00	Coordinators	Break time, practice, additional apps	n/a
12:00-4:00	Participants with IDD	Repeat of above topics with Coordinators assisting; small group work as needed	n/a

Data Collection & Analysis

Qualitative Methods

Post-intervention focus groups.

Participants with IDD. Post-intervention focus groups consisted of 10 participants with IDD, and the meeting lasted one hour and 35 minutes. Focus areas: overall experience with the technology and apps; whether they would continue using apps; if they felt this type of support was helpful; and whether they felt this project increased their independence. The choice to have smaller focus groups was made based on research conducted by Kroll (2011), which suggested that smaller focus groups were best for individuals with cognitive disabilities, to allow additional time for processing questions and forming responses. (See Table 3.8 for a full list of questions.)

Table 3.8

Post-Intervention Semi-Structured Focus Group Questions (Participants with IDD)

1. Was your participation a positive experience? Why or why not?
2. Will you continue using the a. watch b. phone c. apps?
3. If the equipment and apps helped you, how did they help?
4. Would you like to have more apps added to help you with other activities? Which ones?
5. Do you think others should have the chance to the use the: a) watch b) phone c) apps Why or why not?
6. Do you feel the project has helped to increase your independence? How?
7. Do you feel the project has helped to increase your financial independence? How?

Coordinators. This focus group meeting consisted of five Coordinators, and lasted for one hour and 43 minutes. Planned questions closely mirrored those of the individual participants with IDD, allowing a cross-case analysis. Focus areas included: overall experience with supporting the use of the technology and the apps; whether they felt this type of assistance was helpful for the persons they support; and whether the technology and apps increased the independence of the persons they supported. (See Table 3.9 for a full list of questions.)

Table 3.9

Post-Intervention Semi-Structured Focus Group Questions (Coordinators)

1. Did you feel the use of the equipment and apps provided an opportunity for the participant to complete tasks with less support?
2. What do you think the value of this is to people we support?
3. Do you see how this support method could be used more broadly in supporting people with intellectual disabilities?
4. What challenges did you encounter in providing supports using the equipment and apps?
5. Did you find the data collection process requirements too onerous for practical application in the support process?
6. How would this electronic app-based support be incorporated into support plans for people with Intellectual Disabilities?
7. Do you feel the use of the equipment and apps has improved the participant's financial independence?

Analysis. Thematic analysis, as described by Braun and Clarke (2006), was used identify emergent themes and patterns within and between the two data sets. *Dedoose* software (SocioCultural Research Consultants, 2013) was utilized for organization, coding, and visual figures of this collected and analyzed data.

Quantitative Methods

Device Data Recordings. App Usage, designed for Android devices, was trialled to collect data on the daily usage of a range of individualized apps provided to each participant. App Usage tracks application usage history when devices such as smart phones are used. According to its developer, it gathers key data such as the length of use of an app, and frequency of phone use; these data can then be downloaded through varied quantitative means, such as bar charts. For purposes of this study, collected data was downloaded throughout the duration of the

project to examine usage over time. However, it was evident that these data were unreliable (i.e., at times, app usage was tracked when the apps were in use; at other times, app usage was tracked even though the apps were simply running in the background as participants had not "closed" them) so its use was discontinued, and any such data were not analyzed for the purpose of this project. For future projects, utilizing such electronic data could still be a "strong point" in terms of reliability and "lower margin of error" (Esposito, 2017, p. 206) and should continue to be explored. In the meantime, Ayres, Mechling, & Sansosti (2013) have emphasized evaluation and monitoring in the development of novel interventions, including technology, and that "documenting failures, as well as successes, and conducting rigorous research are important for ensuring that sound practices are applied" (p. 270).

Duration data. Pre- and post-intervention duration data were collected by the staff members who were supporting each of the participants. Duration data were collected regarding the amount of time Coordinators were supporting participants in tasks of daily living, including the number of sessions (dates) of direct service, and the calculated percentages of direct services. Data collection was individualized to each of the participants (i.e., reflecting two target skills, such as skills to complete banking independently), and was collected with the assistance of the *StopWatch Deluxe* app. This app was chosen, in particular, for ease of use and the ability to export data into an Excel file, as well as its use with Android devices.

Appendices K and L outlines the specific instructions provided to Coordinators collecting data. In summary, duration data were collected for the amounts of time participants were individually supported in four specific activities: time management, coping, budgeting, or exercise. Each of these constructs were defined for Coordinators, along with examples.

Coordinators were asked to collect at least one pre-intervention duration data point by starting the time at the beginning of the initiation of support, and stopping it at the end. In addition, supported workers were asked to stop, and restart the timer if the support focus deviated from the topic being measured. Twelve participants completed pre-post data for at least one skill area. For ease of visual presentation, measurement of time in minutes was utilized, averaged for each participant, sorted by skill area, and pre-post changes were calculated and graphed. Paired t-tests were utilized to explore the possibility of statistical significance in this project.

Chapter 4: Results

This chapter includes both qualitative (focus groups) and quantitative (duration data) research findings for the project's everyday mobile / assistive technology supporting adults with IDD in the community setting.

Qualitative Results

Post-intervention focus groups were facilitated by a research assistant for both Coordinators and participants with IDD. The results of the analysis (describe in Chapter 3) follow.

Focus groups. The focus group for Coordinators was 103 minutes long; for participants, it was 95 minutes in length. Emergent coding began with the analysis of the Coordinators' focus group; this code book (as applicable) was duplicated and applied to the focus group of participants with IDD as well, allowing for cross-case comparison between Coordinators and participants with IDD (see Table 4.1). See Tables 4.2 and 4.3 for an overview of quantified codes and their excerpts and applications.

Table 4.1

Code Book

Independence	Missed Independence*
Opportunity	Effort* Missed Opportunity
Match^	Fit Form Function
Technical^*	Data Collection* Tech Support

Training

*codes not used/necessary in focus group for participants with IDD
^code names used solely as organization tool

Table 4.2

Code Occurrences (Coordinators)

Data Type	Occurrence
Codes	13
Coded Excerpts of Text	87
Code Applications to Text	109

Table 4.3

Code Occurrences (Participants with IDD)

Data Type	Occurrence
Codes	10
Coded Excerpts of Text	83
Code Applications to Text	111

Figures 4.1 and 4.2 (below) are visual representations of the codes applied to both Coordinators (Figure 4.1) and participants with IDD (Figure 4.2). Larger fonts represent more robust codes, from a quantitative perspective.

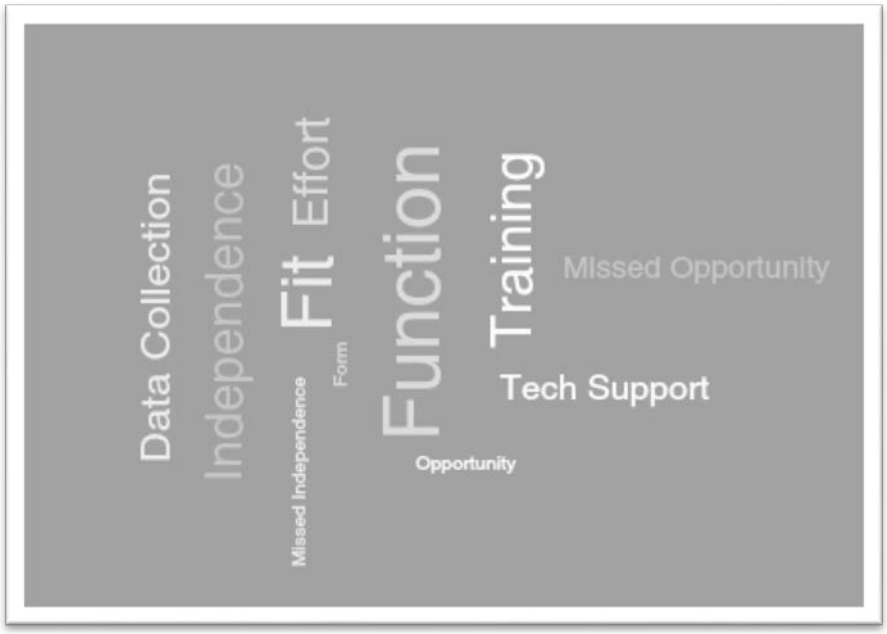


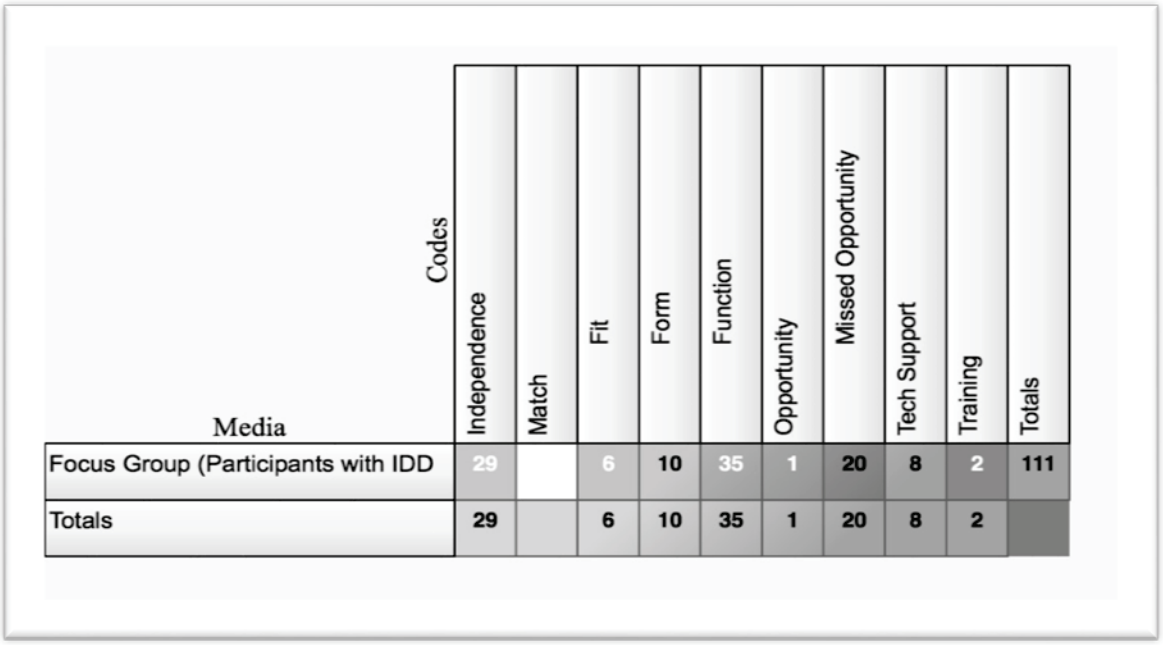
Figure 4.1. **Word cloud (Coordinators).**

Figure 4.2. **Word cloud (participants with IDD).**

Figures 4.3 and 4.4 (below) are quantified code applications depicting the number of transcript excerpts for each applied code. Please note that some codes (i.e., match, technical) are used as organizational tools to compile related codes.

Media \ Codes	Independence	Missed Independence	Match	Fit	Form	Function	Opportunity	Effort	Missed Opportunity	Technical	Data Collection	Tech Support	Training	Totals
Focus Group (STAFF)	12	4		17	4	19	4	11	7		10	8	13	109
Totals	12	4		17	4	19	4	11	7		10	8	13	

Figure 4.3. **Code applications (coordinators).**



Media \ Codes	Independence	Match	Fit	Form	Function	Opportunity	Missed Opportunity	Tech Support	Training	Totals
Focus Group (Participants with IDD	29		6	10	35	1	20	8	2	111
Totals	29		6	10	35	1	20	8	2	

Figure 4.4. **Code applications (participants with IDD).**

Themes. The below four themes were developed from repeated patterns provided by either the involved Coordinators and/or the participants with IDD. Salient messages without a strong, repeated pattern of coding were also included. All names throughout are pseudonyms.

***Fit, form, and function are essential for success*.** Inter-related codes named "fit," "form," and "function" were all coded under the placeholder "match." Fit had 17 coded excerpts, form had four coded excerpts, and function had 19 for Coordinators. For participants with IDD, fit had six, form had 10, and function had 35.

Participants did not experience similar levels of reported success with the technology in this project. A Coordinator noted that, for one person, the use of the devices and apps was "very easy. Doing it on his own as I said, trying to input his schedule and stuff. The other person didn't

want anything to do with that, [which] meant me putting it in, putting in his schedule and sitting with me to do it. And then he was more into the watch" (Darlene). In similar fashion to the latter anecdote: "The individual that I support that used his own phone; he did not want me exporting anything out of it, or setting up anything in his phone" (Bonnie).

The specific fit with an individual and certain technology appeared to be a precursor for success, though the Coordinators focused more on this area than the participants with IDD. Even so, one participant with IDD reflected that:

> I think one thing it starts with your attitude. Whether you want to do something or you doesn't want to do it [sic] … if you want to do something, you want to change things in your life, you'll do it you know with whatever it may be, the app or whatever it is, you know?" (Daisy)

A supported worker reflected on this project:

> "I just think [the technology use] was a complete bonus for her. She was excited, she's young, she's real technical, technological, whatever … she's just eager to put more things on it, to want to try more, which is just amazing … it fits the personality" (Kerry).

One Coordinator, and the focus group facilitator, succinctly summarized (respectively): "Going back to the individuals … some don't want a watch; some just want a phone. Different apps. Specific apps for them" (Samantha); and, "So that's kind of the whole package, right? That's the watch, the phone and the apps. It wouldn't be one of the three; you think it needed to be all three."

Participants with IDD were quite clear that either the fit worked—or didn't. One noted that, "I do the breathe one … press the thing and breathe … it helped me more than anything" (Jeremiah). On the other hand, (Stefan) noted about one app: "Get rid of it … I never use it."

Even the physical form of the devices appeared to have impact, such as a protective case: "I found they wouldn't use the case. I couldn't work [it] with the phone in it. It was frustrating 'cause they would drop the phone. And it was too risky for them to be breaking the phone, so they just didn't use it … we had to carry it around. It was ginormous" (Kerry). More detail is presented:

> I had the one gentleman complain that the phone was too big and awkward for him. Because he had to keep tucking it on his belt 'cause it kept bugging him 'cause he's not used to a phone. Whereas a female could stick it in their purse or something like that. So that's when I found he started to kind of leave it at home. (Kerry)

Or, regarding the device keys: "Being able to manipulate the buttons on there, like the key pad … especially I know men have more difficultly doing that, with larger fingers" (Darlene). Another support worker added a related comment: "size wise … some people with their coordination were having a hard time. They wanted to input information on their own but they can't because of the coordination" (Elaine). A participant with IDD added a similar remark: "I was in my room half an hour and I tried and failed trying to put the lid on this phone" (Jeremiah). Even the watches—a Coordinator suggested "mak[ing] the watch a little bit more individualized, different straps … or maybe a necklace" (Samantha). Or, the hardware—"Having settings on it where it can be more accessible. Larger print. brighter screen. Different screens. For people who have visual issues." Or even varied modality options: "I think that if they phone spoke to them,

they'd probably be a little bit more responsive like if it was sitting on a night stand and it said to you, 'Dentist in 15 minutes.'" A participant with IDD concurred: "I'm going to change the case … there was nothing wrong with it; I just want my own case for instance" (Stefan) and another suggested that changing the bands, cases, and stickers would help—and maybe even make the technology more accessible: "I would change the case colour because it's black and that's black and the phone is black, right? So, people might have trouble seeing it 'cause it's all black" (Lu-Ann).

Function appeared to be as important as fit—and more robust than form. This was especially so for participants with IDD. Here is a reaction to the budgeting app:

> It's helped me to really learn about budgeting, like if I want to do something and I find out how much it costs and how much I have to save up to do it. It's really helped me learn how to budget the money for it. So I know how much, my bills and everything, so I have enough money for everything. (Lu-Ann)

Even though individualization is clearly beneficial, there is some potential for apps that can be fairly universally beneficial, such as evening safety routines:

> [I] think there are great reminders with it. And it's stuff we say to them; we do safety checks at night. You know, send home people that have stopped by, make sure the doors are locked, and all this other stuff. It was set up for things that we actually did each day. (Bonnie)

Along the same lines, "the same people need reminders that come up … I thought they were great … it would be the same thing that I would say, you know. Like 'Lock your door before you go to bed'" (Bonnie). A participant with IDD noted the same positive reaction: "can get to work

on time. I can get my field trip, I can get my pills on Thursdays, 'cause it helps me pretty good, on the phone" (Alan). Another emphasized that:

> The timing thing it's good because then it saves me time. Really, it saves me time. I don't have to constantly check something you know. I have that timer on there so I can go do something else and spend time doing other things, and getting other things done. (Daisy)

The same participant expanded with further examples:

> "[I] can just put the timer on so then I know how long, when laundry is done so I don't have a couple hours later and forgot to put it in and then go get it. Or just cooking so I can just time it and I don't have to keep on checking on it. I can just time it for a certain amount of time, check it, then you know if it needs a little bit more put another timer on it and do it again. (Daisy)

Task analysis could also be integrated alongside such reminders:

> Apps wise, I could see like almost like how a Social Story would go. Like even for like doing the laundry. Steps for like push a button once and it'll tell you turn the water on, next it'll put the laundry soap in, and just, interactive with them and it gives them the instructions as well. Even to use to the microwave. Instructions for any little social life skills really. (Darlene)

Other safety skills could be integrated:

> Even for fire safety. And stuff like that. You know. Hooked up to the fire alarm. So that "Okay. The fire alarm is going off". Someone might hear a fire alarm and just think "It's kind of smoky in here." Right? But having the watch or whatever say. "You gotta get out, now!" Right? Like things like that, verbal cues that normally would be a staff cue … it

would be very cool if it could to talk them to an exit too. Like if they're in an unfamiliar building. (Lacey)

Functions beyond the participants' specific goal areas in this study could also add a layer of life enrichment—such as creating and/or enhancing social connections. One Coordinator specified that "for some of the people I support, just like being able to get in touch with their friends and stuff like that … because they don't have access maybe to a computer so once they do [to] be able to go on Facebook, and other places and make more friends and … get in touch with people that are long distance" (Lacey). Similarly:

> Well I can see it being used to connect with friends as we had said earlier. You know, some people have, like, they miss their contact with their friends, and if their friends have texts of Facebook or Snapchat or whatever all those apps, technology out there. They can communicate, with their friends if it happens to be one of their goal. (Darlene)

Success and level of effort are related. The "effort" code accounted for 11 excerpts in this support staff focus group transcript; however, this code was not relevant to the focus group for participants with IDD. If an action was easier (e.g., phone versus watch) where there was duplication of a function, the easier route was taken. For example, one Coordinator mentioned that both the phone and the watch had an alarm, but participants tended to take the more familiar or less complicated route: "I think the watch wasn't worn to, or used to its potential," and:

> Well for one person [since he] cannot be bothered with them like putting on socks, cleaning up shoes, he's not going to take the time to put any the energy into using a phone or watch. Just can't be bothered with things. (Kerry)

Extra steps could decrease movement toward success, such as an app measuring steps: "they had to have it with them" (Bonnie) or the phone/watch pairing again: "one would never really use the watch. In fact, [he] didn't pair the watch with the phone. And never used the phone. Like I said, [he] couldn't be bothered" (Kerry). Another similar example was the calendar app. A participant explained in more detail that:

> the two ladies that I have, they were actually [in]putting their calendars themselves. They started in the beginning when they were interested, but yeah that part I would always have to correct. And so I think that was frustrating for them. They may have even continued on after, if they could just pick a time. would have been easier. (Samantha)

In addition:

> It was just hard to get them to use the app, compared to what they've always used. I would be the one inputting the stuff on the schedule in the calendar because they've always physically written it on their calendar. So that continued, they continued to just write it on their calendar … so I think it was just getting them out of what they're used to and trying something new when they've done that their whole life. (Samantha)

This aspect contrasted with the app that helped with calming: "You watch it and you just go along with it, you don't even have to think about it" (Bonnie). She added: "I thought the safety app was great myself, and the breathing one. Because even, I used it a few times, and it does, it makes you breathe with it just by watching it … it's very, very easy to use. Just one button and it's there, in one step to follow" (Bonnie).

Technical issues are impactful. Two types of technically related issues arose in the staff focus group. One was related to technical support needs, and the other related to data

collection—the latter was only relevant for Coordinators. Eight excerpts of text related to technical support needs for both Coordinators and participants with IDD. One Coordinator (Kerry) mentioned that technical issues were immediate: "Well it didn't start off good, we had a phone that didn't work … it wouldn't hold a charge." Another shared that "I got good at that right at the beginning. First week!" Another wondered if a lack of exposure related to technology (i.e., generational history) was impactful: "like the older gentlemen that I have. You know he's in his late 50s, he doesn't really have the technology or interest; didn't grow up with cell phones, computers and stuff" (Kerry). In addition, this Coordinator explained: "When he went to charge the phone, he was all proud when I came in the room, like 'I charged my phone all weekend' when I came in the room I'm like 'Well, that's great!' Well [he put the] the cord in the wall but didn't hook it to the phone, or vice versa and just let it hang down. [He] thought he was charging but didn't have the concept" (Kerry). Another report related that recharging the watches was an issue: "A few times people would unplug the plug and hook it in and think it was charging. 'Why is it not working?' [and] 'The plug's not in.' So then we had to make sure; then it took a little bit longer 'cause then they'd be charging it, they think [it was charging all night], and then" (Elaine). "… charging took up the majority of staff support time" (Lacey). She reflected that, "I just gave a lot of verbal [prompts]; I didn't have to give a lot of support of actually plugging it in, they were good that way, it was more verbally just to reminding to 'Make sure you plug in your watch in every night.' It was more of a verbal cue" (Lacey).

Teaching how phones and watches worked and synched together was another challenge: "Knowing that the two of them are paired together and you need both. That was a little bit [hard]. 'Cause 'But I have the watch on,' [and] 'Oh, but I know that you need the phone with you.' So

they talk to each other" (Elaine). One Coordinator mentioned that unexpected technical glitches were off-putting. For example:

> Two that did something to their watches and it went right to factory reset … I had to contact and go with back and forth with [name] via email to try to set them back up. Then I had to just go onto google and look for the instructions myself to try the factory like reset these right back so they were synced with the phone … I know with like the phone if you try to unlock it so many times, right? It takes that picture and doesn't let you do anything. But if there's the same thing for the watch, like if you pushed these buttons so many times, does it lock out for like your iPhone for a minute and then you try a code … and I'm thankful I was kind of was able to like email back and forth with me to try to get it started and you know, luckily I have also the knowledge to just write into google how to do something, right? And it gives [it] right, step by step on the website as well. (Darlene)

Participants with IDD did not share detailed reflections related to technology issues, but those that were shared related to difficulties with synching (e.g., time/wifi), resetting/charging, settings (e.g., off/on), buttons (e.g., function), and sounds: "The beeping sound … it beeps all the time. Beep beep beep" (Grace). Daisy, however, mentioned no such difficulties: "It's really easy that way. I really loved it … I [will] do another study if you want. I'll do another one." It is important to note that this participant in the research study was pleased to be nominated informally as a "resident techie" when the Coordinators were busy: "She asked me [if one needed some help] and I said 'Yeah, if your Coordinator can't help you then, yeah, sure'" (Daisy).

Eight excerpts of text related to data collection technology needs for the Coordinators are outlined herein. One Coordinator participant reflected that collecting the data for this project was "fine" but others struggled with minor details, primarily with the "glitchy" processes around submitting data that seemed unnecessary: "It was an extra step that I really didn't have to [do], not like it took very long" (Elaine). Another mentioned that the process "wasn't too bad. When it

would work. I just had issues. The phone, it gave me a hard time. I don't know if I had a bad phone or what" (Darlene). Another added, "It wouldn't send anything … it wouldn't record the stuff" (Kerry). A third continued this moderate level of positivity with, "It's part of the job, right? We have to record stuff. And you're helping somebody. You have to do it. It doesn't matter who's doing it" (Lacey).

However, balancing the tasks of support work with data collection was also challenging at times. One supported worker mused that:

> I found I was bouncing back and forth … when I was having a conversation with someone. Someone would be pulling in information about the other app while we were trying to do the one. So I would have to kind of stop it and kind of think, *Okay, this is how much time with that one* and then later on do it manually when I wasn't even looking … it was a little bit tricky. So I had to [think], *Okay, what's what's the time*, mark down what [happened and] they add[ed] it in later. (Darlene)

A similar reflection included "I'd forget to take the phone up with me when I'm doing my planning, so I'm like, 'Okay, I was up there for 15 minutes of discussing week of planning,' so I'd have to come back down to the desk and push it, sit there and wait 15 minutes" (Bonnie).

Independence is (somewhat) a function of motivation. Twelve excerpts of text were coded related to both independence (12) and missed independence (4) for Coordinators. The latter code was not relevant for participants with IDD.

It appears that if the project engagement does not meet what is perhaps an unstated goal or expectation, motivation might be low to engage in mobile technology. One participant explained this intersection of independence and motivation that was unsuccessful: "She thought

it was going to be something else. That she was going to get full access of everything again, and that's just not what it was for" (Elaine). Another Coordinator called this intersection *inspiring*.

> They're still at a neutral level; they still have all control access of their money. Maybe it would definitely be beneficial down the road if they wanted to participate, but … do they want to be able to save money? Did they want, like I think sometimes you have to have that goal of wanting to, they may say they want to, but it may not be what works in their life right at this time frame … I think when they get it into their head "Okay," like I have one of the individuals is going to college in September. So now that this is all done, now he knows, "I have to start budgeting to go to school in September", so, this could be the time frame that maybe, "I need to use this app and this phone," right? And maybe it'll come afterwards, maybe he'll use it while he's at college. (Elaine)

And when it did come together during this project, the difference was clear: "She's knowledgeable and she wants to learn … and she's up for a challenge … I think she wants to be more independent" (Kerry). And this independence in turn made a difference moving forward : "And then she's proud when she's accomplished something and she can go show somebody else and they can use it. She's good; she's got a purpose" (Kerry). Similar outcomes include: "She's just very happy. Things that I used to go in and do with her or prompt her to do, she's got it programmed in, and she's done it, she's recorded stuff … she's just very proud of herself, and she's even come out of her shell even more" (Kerry). In more detail:

> She's just more confident in herself. One of her things was to work on decluttering, right? Well, I used to always pick her up, she had to get items gathered up, but she never had them ready, then she'd get them ready, and then we'd have to go take them and drop them off, and stuff. Well now it's programmed in her phone, that she knows, *Okay I got to have this done, and this*. She lists articles that she's going to take, you know? And she'd have them ready. She'd be ready and waiting for me … it just really kept her going.
>
> She talked about that; having this [app] on last week. And I didn't know that she had that [app] on her phone but I heard her telling people, "[…] is going to be proud [that] I did this on my own. I just follow[ed] the steps and I did it on my own." (Kerry)

Another participant was motivated to utilize these new tools by their intersection with his job responsibilities: "His job really relied on being given certain guidelines for appropriateness.

You do have to come in, you have to be showered, you have to be clean you … it's important for him to keep that job. And he loves it. He wants it. But he needed to do those things, that he might forget to do, or needed reminders for that" (Lacey). Similarly, "It was like a reminder, 'Oh yeah, that's the day I had said I would do it.' Because it would have been, 'Oh, I forgot about it … but I need the clothes; I need clean clothes for work. So.'" (Lacey)

> One of the people that I support, one of their rules was to maintain their job and part of the job was to make sure that they were like freshly showered for the day, had clean clothes … so, I had put that into the scheduling first thing in the morning, so it would run off: *Oh, today is your day for work; reminder to have a shower*. We did notice that those days, yes, he was like …. coming through, he had showered. He had gotten ready, had clean clothes on, was ready to go for the day. So that was that was a good thing, that would have taken many steps for staff to come in a prompt and for, but we didn't have to… and in some sense, it is giving him a bit of a task analysis, because we're saying we're going do this and then we're going to do this and then we're going to do this, so … it kind of flowed through his day. So that he knew like right when he got up in the morning that's probably a good time to do that [have a shower], so he'd be ready. (Lacey)

Missed opportunities are future potential. Four excerpts of code related to missed independence for Coordinators; however, missed opportunity was quite relevant for participants with IDD: 20 coded excerpts of text were found.

During the course of the project, one Coordinator noted frustration around attempts to use a new app, as the need for that app lay in the future; however, the participant with IDD did not yet understand its necessity:

> There wasn't a huge difference, just because she still is doing it the old way. But maybe in time she'll go over to there. The money app one, we didn't end up using it at all 'cause it just didn't make sense for her which was very frustrating for her, because her concept of the money one was that all her monies were going to change, and she was going to have full access to her account. And so, she was a little confused on that. And, upset that

> we weren't using it. But I tried explaining that that is not what it's for. It wasn't going to change how things happen. It was just going to change her independence of doing it. (Elaine)

Another Coordinator suggested that some areas of change remained "flat" but that future potential remained beyond the boundaries of this research. She noted that "I did not see any financial independence, they were, financially independent, like done their own money before then, and they're still the same. Nothing has increased or decreased." A little later, it was reported: "But the one individual that is using it, her family controls all of her money. So, they just give so much a week, and she budgets for the week. Which she does very well, independently, which she did before. So, nothing has really changed, I didn't see any change" (Darlene).

Another Coordinator reflected on independence in general, as an area of future potential. She shared that she had three clients who already had fairly high levels of independence, with a caveat:

> But they rely on staff support to give the verbal cues, of like, "Okay, we're leaving at such such time for your appointment." We thought maybe adding this [reminder] app would definitely alleviate you know staff giving the reminders, and it didn't … I don't know if they wanted the change; maybe they don't; maybe they enjoy having the staff checking with them, giving them reminders. I think maybe they enjoy [it]. They need that. I don't know. It's difficult too. 'Cause they were really all gung ho on doing this research project. And then. There was no activity. (Darlene)

Yet, there is hope with potential for the future:

> I know that someone that I support that wasn't involved in this. He would love to have more employment, wants to do this one his own, but has a like a hard time communicating with people he doesn't know … he has his own business but being able to put forth his own business using that technology would for sure help. (Lacey)

Participants with IDD also look at the future—even if a skill, item, or an app did not help as much within the introductory context of this project. Participants talked about budgeting, trips, time management, writing, reading, social media, social communication, games, music, photography, with an interest in not only letting apps help them, but with an expression of the desire to keep learning skills beyond the apps:

> It would be good eventually to find something to maybe help learn to time stuff. I don't know, I obsess and that's why I rely on [the app] right now. Which is good, you know, it helps me a lot. But … I know how to learn; I know how to tell time. It's just timing things. I don't know how to time things, so. How long it takes [to do] things. (Daisy)

Quantitative Results

Duration data. As noted in Chapter 1, the quantitative data for this project were of secondary importance to the qualitative data, were analyzed separately, and were part of the methodological and technical exploration for the second stage of research following this pilot project.

Tables 4.5 and 4.6 summarize collected duration data for all participants with IDD (n = 12). Table 4.4 summarizes each specific skill areas that the participants with IDD and their teams chose as focus areas throughout this project; Table 4.6 includes summaries of all skill areas for all participants.

Table 4.4

Pre-Post Duration Measures (Specific Skills)

Participant with IDD	**Skill**	**Pre-Intervention** (min.)	**Post-Intervention** (min.)	**Mean Change** (min.)
Alan	Time Mgmt.^	1.6	8.3	+6.7
	Budget	2.4	9.0	+6.6
Jeremiah*	Time Mgmt.	0.1	12.9	+12.8
Matthew	Time Mgmt.	4.9	1.6	-3.3
	Budget	1.2	1.1	-0.1
Max*	Time Mgmt.	2.5	7.0	+4.5
Micah*	Exercise	2.4	4.1	+1.7
Stefan	Time Mgmt.	1.0	0.7	-0.3
	Budget	0.8	0.7	-0.1
Terry*	Safety	1.6	1.5	-0.1
Daisy	Time Mgmt.	3.1	5.1	+2.0
	Budget	0.3	3.5	+3.2
Grace*	Time Mgmt.	0.9	3.4	+2.5
Jane*	Time Mgmt.	1.6	1.9	+0.3
Lu-Ann	Time Mgmt.	17.7	10.7	-7.0
	Budget	6.6	1.1	-5.5
Tracey*	Budget	12.3	3.8	-8.5

*pre- and/or post-intervention data points limited to one skill area

(adapted from Bishop, Maich, & Rutherford, 2017)

Table 4.5

Pre-Post Duration Measures (All Skills)

Participant with IDD	**Pre-Intervention** (min.)	**Post-Intervention** (min.)	**Mean Change** (min.)
Alan*	1.6	8.3	+6.7
Jeremiah	0.1	12.9	+12.8
Matthew*	4.9	1.6	-3.3
Max	2.5	7.0	+4.5
Micah	2.4	4.1	+1.7
Stefan*	1.0	0.7	-0.3
Terry	1.6	1.5	-0.1
Daisy*	3.1	5.1	+2.0

Grace	0.9	3.4	+2.5
Jane	1.6	1.9	+0.3
Lu-Ann*	17.7	10.7	-7.0
Tracey	12.3	3.8	-8.5

*for participants with more than one set of data, the first listed skill area was utilized for paired t-tests

Below are visual depictions of the two most commonly targeted skill areas. Pre-post intervention data for mean duration change specific to time management and budgeting (the most common skill areas under development) are presented below in Figures 4.7, 4.8 and 4.9.

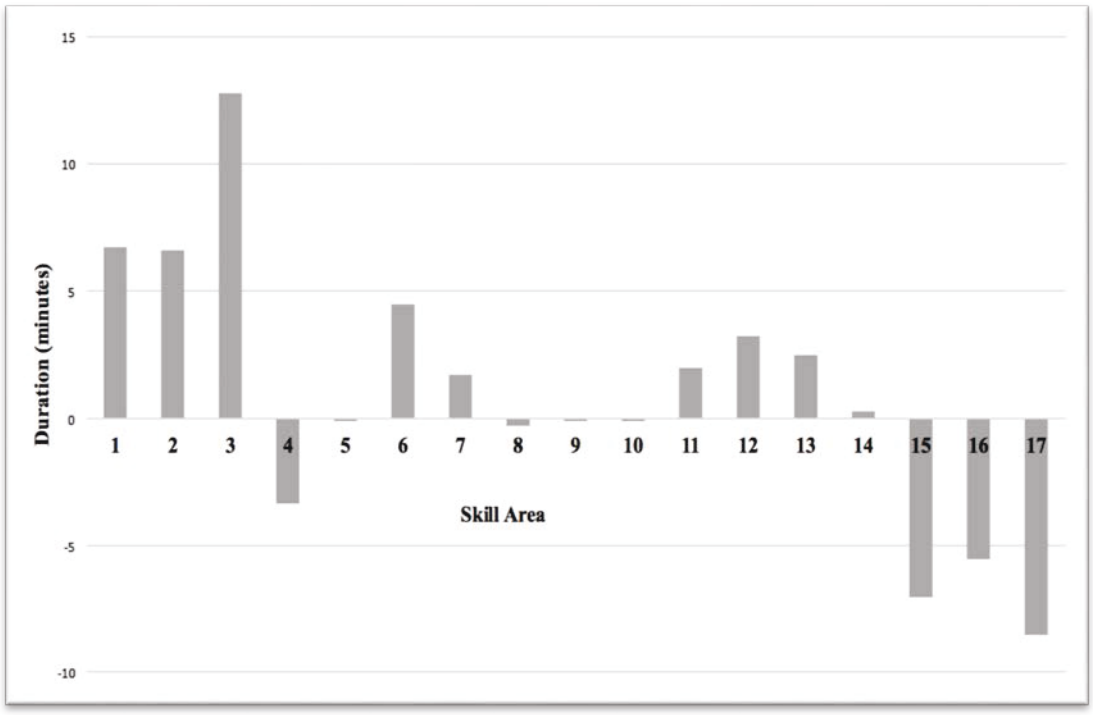


Figure 4.7

Pre-post duration change.

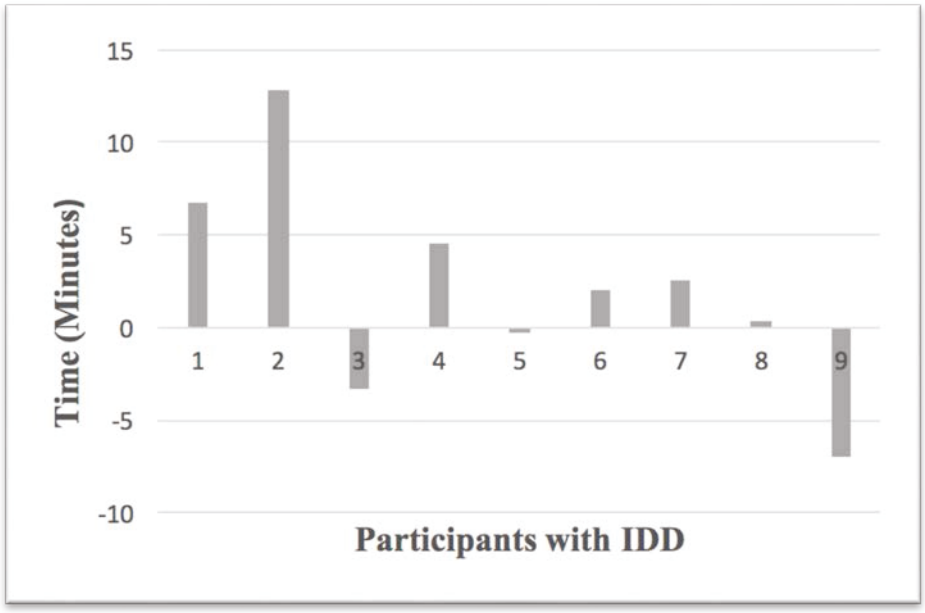


Figure 4.8

Pre-post duration change (time management).

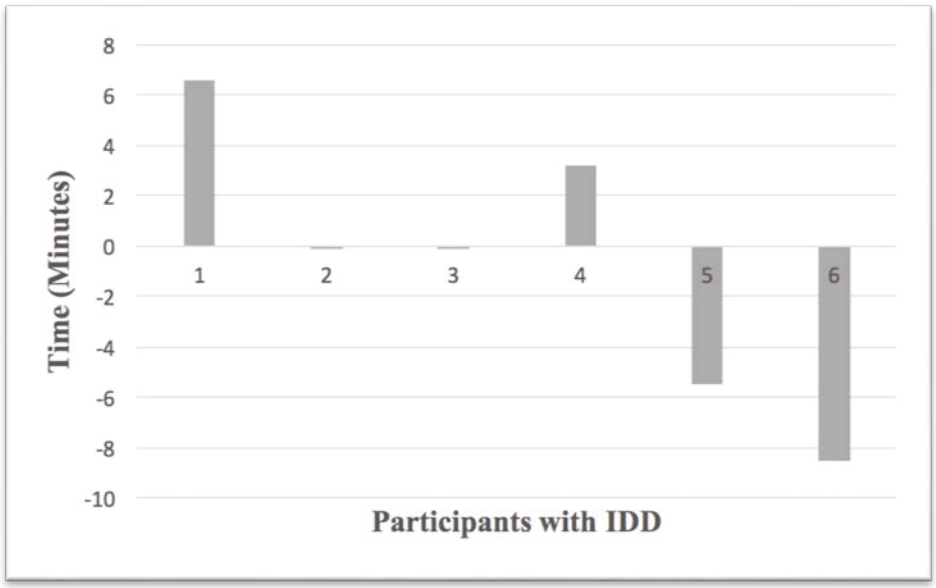


Figure 4.9

Pre-post duration change (budgeting).

Paired t-tests. A paired-sample t-test was conducted to compare pre- and post-intervention duration data within the conditions of "budgeting" (n = 9) "time management" (n = 6). There were no significant differences in the area of time management for pre-intervention (M = 3.71; SD = 5.43) and post-intervention (M = 5.73; SD = 4.29) conditions; t(8) = -1.06; p = 0.320. Similarly, there were no significant differences in the area of time budgeting for pre-intervention (M = 3.93; SD = 4.69) and post-intervention (M = 3.20; SD = 3.13) conditions; t(5) = 0.325; p = 0.759. A paired-samples t-test was also conducted to compare pre- and post-intervention duration data in all conditions (n = 12). There were no significant differences in overall duration data for pre-intervention (M = 4.14; SD = 5.34) and post-intervention (M = 5.08; SD = 3.89) conditions; t(11) = -0.567; p = 0.582.

Chapter 5: Discussion

The overall research question for this project was: Will the introduction of smartphone and smartwatch technology improve skill development and independent task completion for adults with IDD living in semi-independent residential settings? If so, what is the socioeconomic impact on the independence of individuals with IDD? As noted in Chapter Four, the following four themes emerged from the qualitative focus group data: that fit, form, and function are essential for success; that technical issues are impactful; that independence is (somewhat) a function of motivation; and that missed opportunities are future potential. Discussions of some particularly salient elements of these areas, as well as commentary around the results of quantitative data, are provided below.

Everyday Task Completion

Ayres, Mechling, and Sansosti (2013) stated that:

> Realizing that most adults engage with mobile technology on a daily basis to complete essential daily living tasks (i.e., use of recipes on an iPad cooking application; setting an alarm clock on a smartphone; looking at maps on an iPhone for navigation), there already exists a general awareness concerning the capabilities of technology. It now becomes a matter of seeing how that technology can assist with instruction or provide aid with daily supports" (p. 269).

This research project examined use of specific technology beyond what was perhaps typical in the above-noted everyday engagement. Yet, overall, their comments did still hold true for this group of participants with IDD. They certainly "engage[d] with mobile technology on a daily

basis to complete essential daily living tasks" but this mobile technology was often a novel experience. It could also be true that the significance of accessing such technology, for what others may seem as an *everyday* task, could make a important difference in the independent functioning of the adults with disabilities within the context of this research project.

Preferences & Choice

Ayres, Mechling, and Sansosti (2013) further stated that technology is a tool like other tools, that its power emerges from its usage rather than its form. Similarly, Leer and Ivanov (2013) also stated that it is the utilization of technology that contributes to success—and not its presence. However, this author's research group might disagree with Ayres et al, since this current analysis indicated that fit, form, and function are essential for success, much like Johnson (2014) emphasized the convenience of iPads. In other words, this author's group had specific preferences regarding technology use for what seemed to be a "love/hate" binary approach—and these preferences appeared evident to the Coordinators, as well. Since the needs of this study's population of participant adults with IDD were complex, devices and programs may have needed to be more of an immediate best-fit to provide equally immediate positive feedback, and to include choice, or to provide an exploratory period for choice-making. For example, varied modalities, settings, or even stylistic elements such as watch bands were clearly important to the participants. On the other hand, time management options, such as timers and reminders seemed particularly useful, could be embedded in ABA-based teaching and learning strategies, such as task analysis, and perhaps should be a primary future consideration as an option for all adult tech learners with IDD. In an iPad study on children with "cognitive differences," Johnson (2014) provided similar musings and conclusions around children with IDD, hardware, and software:

> Two respondents suggested that children with cognitive limitations did not respond as favourably to iPad use in school as children with other types of special needs. It may be that the specific applications used in the Education Support Centre or features of the actual device (e.g., small screen and touch screen) are not equally appropriate for all types of students. Indeed, individuals with developmental disabilities have been excluded from the benefits of the digital revolution (Ignagni & Abbas, 2008). Subsequent research and practice may identify the most effective use of specific hardware (e.g., devices) and software (e.g., iPad applications) for children with various differences in development. (p. 8).

Prerequisites & Binaries

Another individualized consideration was the prerequisite experiences of assistive / technology users. In the case of the present study's participants, a discussion around digital natives versus digital immigrants is warranted. Digital natives can be described as a homogenous, age-defined group born (Smith, 2013); however, "little work fully considers the impact of digital immigrant discourse within the fields of adult learning" (p. 1). With an average age of 43, the present study group sample, overall, is considered to be a group of digital immigrants: those who came to the digital world following their early or formative years. Digital immigrants know (or knew) the pre-digital world, also termed the "analogue world" (Smith, 2013, p. 3).

Again, a binary scenario emerges. Smith has stated that "in relation to technology, aspects of language, literacy, and communication are often used as important distinguishers between natives who purportedly possess fluency and immigrants who are learning something

foreign" (p. 5). If these assumptions are in any way valid, perhaps less variable outcomes might be obtaining from narrowing the age range of participants, and/or group digital natives apart from digital immigrants, and providing different training suited to their assumed needs in the literature. Palmer et al (2012), in a nationwide US survey of 1617 households with an individual with ID, found that between 5% and 6%, overall, used technology for independent living—a low number with a very narrow range that varied little between age groups. However, it is also important to consider assessing and addressing any prerequisite skills to any new technology learning (Maich, Sider, Hall, & Henning, 2017) which in turn is likely to create a more homogeneous set of skills to build on during a research project. In an Australian school-based study around iPads, Johnson (2014) noted that "Clearly, teachers/assistants who are less technologically capable may have very different perceptions". This observation could be true, as well, not only for these participants with IDD, but also for the Coordinators. And attitudes, beliefs, and dispositions all relate to the successful movement from technology use to technology teaching (Courduff, Szapkiw, & Wendt, 2016; Maich, Hall, van Rhijn, & Henning, 2017).

Independence / Leadership

One of the most interesting salient findings of the focus group was the obvious in-house nomination of a *resident tech expert*—one individual of the group of participants with IDD. Related to the topic of social participation for adults with ASD, Tobin, Drager, and Richardson (2014) emphasized that "informal social support was shown to be an important contributor to both social functioning and QoL [Quality of Life]" (p. 228). The resident tech expert is a strong example of such an informal social support that arose organically, and authentically, and internally from an externally imposed research project. Furthermore, in a discussion of iPad use

in inclusive school settings, Maich, Hall, van Rhijn, and Henning (2017) stated that educators engaged in pilot roll-out of teaching and learning would likely take on a unique role as "future 'showcasing' educators, encouraging novelty in their school community with their own expertise and on-site social capital (Li & Choi, 2013), moving from a 'horizontal' mode of transferring knowledge to a given context, to a 'vertical' mode, developing collective, on-site knowledge (Webb, 2011)" (p. 19). Perhaps such a group-nominated tech expert would also move through this role of supporting others in a "horizontal" way to a "vertical" role.

Motivation

If participants with IDD are having or expressing evident difficulty engaging with offered technology, it would be beneficial to consider if such difficulty is a related to a lack of *skill,* or a challenge related to the *performance* of a skill (Bellini, Peters, Benner, & Hopf, 2007). For a missing skill, additional teaching needs to be done; for an issue with performance, other changes would need to be the focus (e.g., environment, motivation). Wright (2015) noted that benefits must be perceived as outweighing efforts in order to persist with the adoption of technology. Palmer et al (2012) positively reported only 4% of surveyed families with a family member with an IDD diagnosis rated the possibility of successful technology use *without* hope, as in: "independent living device was too difficult for their family member to use" (p. 410). It appears that ease of use is part of the form, fit, and function that leads to successful use of mobile / assistive technology for our group. Wehmeyer et al. (2006) would seem to agree; in their meta-analysis, these authors differentiated between avoiding devices that were overly complex, and choosing devices that were simple, intuitive, multimodal, and flexible:

The presence of universal design features and those that did not illustrates the critical

> importance of ensuring that technology is designed to meet the unique needs of people with intellectual and developmental disabilities. When devices are designed taking into account all aspects of universal design, people with intellectual disabilities will benefit. There are, however, several such features that might be particularly important for this population. First, devices that abide by the Flexibility in Use principle inherently accommodate for use by a wider range of individual preferences and abilities. This includes providing options that accommodate for users' accuracy and precision, and adapt to a user's pace. (p. 85).

An additional option involves referring such problem-solving for scaffolding through the ZPD to a more skilled peer: the above-noted resident tech expert. Cognitive apprenticeship is intended to bring others into a community—a discipline—in this case, the use of mobile technology as assistive devices for independent community life, to be a technology user (Tisdale, 2001). Although many participants clearly need systematic, support instruction for success (Kelley, 2014) followed by generalization to the community setting, others like the resident tech expert may be able to engage in what Bouck et al (2008) explain as best practice to develop cognitive apprenticeships, when "learning is embedded within authentic problem-solving activities" (p. 22).

Time Management

It appears that the time management app was not only a particular area of need for many participants with IDD in this project, but also that the use of an external tool for time management had a particularly robust impact. Participants mentioned its prompting in the areas of social relationship, in the area of self-care (e.g., laundry), and in the area of employment (e.g.,

getting ready for work), but also that it appeared to make them more efficient with their time rather than over- or under-monitoring the flow of time in their environments. However, as noticed in Chapter Four, neither the "time management" nor the "budgeting" conditions exhibited statistically significant quantitative differences from pre-intervention to post-intervention. This facet could be due to any of a number of reasons. First of all, the sample size for these particular conditions was quite small (n = 9 and n = 6, respectively). Secondly, as was evident throughout these pre-post data, and not only within these two conditions, a fair bit of variability existed along with some outliers (e.g., Figure 4.8). These data suggest, then, that it is unclear, at this point, if teaching participants with IDD how to utilize mobile / assistive technology supports has an impact upon the necessary duration of support and thus, independence. In the future, additional pre-post data points could be collected for the averages used for pre-post comparisons. Other options would include having additional participants. As well, the methodology could be expanded to include a Single Case Research Design such as Multiple Baseline Across Participants (Gast & Ledford, 2014).

Prompting, Scaffolding, & the ZPD

Prompting (from ABA) and scaffolding (within the Cognitive Apprenticeship Model) are closely related. If the two perspectives are merged, prompting could be described as a type of scaffolding that would occur at the apex of the ZPD for any given skill. The level of prompting of provided supports by Coordinators could be included in future research as a way to examine change in levels of independence and socioeconomic impact. A change in the level of prompting can also indicate an increase in the level of independence.

In Maich, Hall, and Hatt (2014), for example, all levels of prompting (full physical, partial physical, shadowing, gestural, proximity, and verbal prompts) were measured when examining the change in latency of a female student with ASD in completing school tasks. When the mean of the more intrusive prompt times (full and partial physical prompts) was graphed, the change in intrusive prompting levels to less intrusive prompting levels clearly demonstrated growing independence. When Kelley et al (2016) noted the scarcity of instructional literature, they focused instruction on the use of prompting: "despite the fact that some students with ID may acquire skills through observation, many require direct systematic forms of instruction. Determining how these forms of instruction can be applied to learn the necessary skills to specifically operate wearable/mobile technologies is relatively scant" (p. 209). The potential utility of proving most-to-least prompting should also be examined, as per Kelley et al's finding that when teaching Google glass use, they underlined the "effectiveness of using response prompting procedures, specifically MLT, to directly teach new technology skills to students with ID" (2014, p. 214).

Duration of Supports

It is possible that greater duration levels, in some participants with IDD, post-intervention, demonstrated more *engagement* with the skill areas—thus a higher duration of support time. It is particularly interesting that for *all* participants with IDD who had pre-post data for two skills areas ($n = 4$), both skill areas **either** consistently increased **or** decreased, demonstrating a pattern to watch in future iterations of such research. Dennen and Burnder (2007) put forth the idea of software-based scaffolding (see Chapter Two). Ten years later, Esposito et al (2017) shared that "researchers, along with technicians, have been developing

software and hardware to support and/or replace the standard method of teaching, including computer-based intervention, electronic tablets, robots, and virtual reality in order to boost the learning skills of people with autism" (p. 199) which appear to be showing benefit.

However, the human responsiveness noted by Dennen and Burner (2007) remains an essential construct within cognitive apprenticeship. While it is evident from limited literature that software-based scaffolding is persisting as a potential area to transfer support and build independence, it also appears to be evident that human support is necessary. That human support might change form (i.e., direct to indirect support), or change in intensity (i.e., time) and directedness (i.e., prompting levels) but is likely to continue in some role. Prompting—whether provided by people or by technology—is still prompting. It is unlikely that human supports will be replaced, *in totality*, by electronic ones; rather, it is likely that smart hardware and related apps will find a potentially independence- and socioeconomic-enhancing place within the context of helping professions and professionals.

Limitations

As with any research with a small sample size, this research is context-bound and not intended to be widely generalizable as per its focus on qualitative data within a mixed methodology approach (Creswell, 2018). In addition, this project's status as a pilot project involved initial trialling not only of hardware and software, but also of methodologies. In future, follow-up studies, an alternate, reliable method of recording app usage data that successfully differentiates between *open* and *active* use when it comes to adults with IDD utilizing apps, would be helpful. As above-mentioned, collecting *level of prompting* data around Coordinator support for adults with IDD could add another layer of understanding around the development of

independent skills during pre- and post-intervention duration data (see Maich, Hall, & Hatt, 2014 for an example). Another future possibility, of course, would be to increase the number of participants for inferential statistics, or the use of an intervention-delayed control group. Other possibilities would include data collection around generalization and maintenance of learned skills.

The overall research question for this project was: Will the introduction of smartphone and smartwatch technology improve the skill development and independent task completion for adults with IDD living in semi-independent residential settings? The answer is that, from the overall perspectives of the involved adults with IDD and the Coordinators, it does and it can—at times—and depending on the individual. If so, what is the socioeconomic impact on the independence of individuals with IDD? While it is clear that the introduction of mobile / assistive technology can have potentially socioeconomic-enhancing effects—and we see highlights of such individual change within this research project with individuals who have gained skills, supports, and self-confidence—more research is needed.

Recommendations

While this project is not generalizable for adults with IDD, some best practices have emerged in the context of this group of adults with IDD utilizing Supervised Independent Living services that may help to inform future projects beyond this initial pilot project, such as a planned second phase follow-up research project. Ten recommendations follow, from the above discussion, and are related to both methodology and clinical decision-making; important phrases are bolded. They are:

1. Administer assistive / mobile / technology / pre-requisite **assessments** prior to the provision of hardware and software, including assessment of attitudes, as well as technology skills in general.
2. Teach and practice any missing and/or necessary **prerequisite skills** to fluency, either prior to being trained to use mobile / assistive technology, or at the onset of mobile / assistive technology training.
3. Explore, discover, or develop **single function** apps which are straightforward to access, navigate, and use, providing ease-of-use.
4. Provide the option of a **time management app** for each adult with IDD who is being trained to use mobile / assistive technology.
5. Provide some **choice in individualized apps**, where possible. For example, provide two choices of apps for a given goal area, and allow the adult with IDD to choose which one to utilize for day-to-day community functioning.
6. Provide choice not only in terms of individualized apps but some **choice in hardware, design** (e.g., colour)**, and/or accessories** (e.g., size), if possible and/or necessary.
7. Add a period of **transition time** to explore and trial choices in apps, hardware, and/or accessories before making final decisions with respect to individual preferences, skills, and usability.
8. Consider using **most-to-least prompting** before other possible types of prompting, while teaching skills of using mobile / assistive technology.

9. Consider providing two approaches to instruction. These could be either **systematic teaching with response generalization** to the community setting, or **teaching loosely with stimulus generalization** within the community environment, depending on individual capabilities.
10. Consider the possibility of nominating a **peer-to-peer leader**, trainer, or helper within a group of participants with IDD, or support such a role if a local tech leader emerges.

Finally, the best answer to the utilization of mobile technology for these adults with IDD is *it depends*. What *it* depends on—with *it* being success—are individual strengths, needs, goals, preferences, and motivations. This pattern is not unique to adults with IDD, but pervades humanity. Pairing humanity with technology, and technology with disability, will continue to be a unique set of experiences on an ever-changing playing field. Let's continue to make it count.

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Appendix A

Trillium Seed Grant

Trillium Seed Grant Awarded

$67,100 over 5 months

Delivering a project at the idea or conceptual stage with a $67,100 grant over 5 months to research the application of assistive technology to increase economic opportunities for persons with intellectual disabilities. Enhancing people's economic wellbeing, this initiative is helping people have the skills and knowledge to achieve greater financial independence, and has an impact on the lives of 12 people in the community.

Appendix B

Community Living Coordinator Position Summary

PURPOSE:

It is the responsibility of the Coordinator to effectively support people, as part of a Support Network*, to achieve their personal goals by coordinating the services/individualized supports for the person.

* Support Network is defined as the staff team, family, friends, advocates, community members and other service providers.

RESPONSIBILITIES & DUTIES:

A) Facilitating Supports and Well Being of People:

- demonstrates a working knowledge and commitment to person centered planning;
- utilizes variety of methods to develop and coordinate personal support plans by identifying and understand the goals, priorities, and preferences of people supported;
- provides the individualized supports needed to achieve personal goals and ensures they are put into place and followed through in a timely and reasonable manner as determined by the person and their support network, in keeping with person centred planning approach;
- engages people on a continual basis through conversation and daily life experiences and interaction exploring and identifying priorities, likes and dislikes and what is important to people;
- supports people to develop decision-making skills, exercise choices, assume responsibility and reasonable risk by involving the individual and their advocates in the process;
- demonstrates a respectful relationship with each person, recognizing their rights as a citizen and promotes their dignity and well-being;
- learns about and is aware of people's strengths, gifts, needs, and dreams as it relates to people's desires for the future and continually keeps team updated on information;

- encourages team members by setting a positive example of participation and the implementation of people's individual plan of support;

- identifies and advocates for change of any barriers which inhibit or impede the outcome potential by working through support teams and organizational supports;

- assists the person supported in expressing their dreams and life goals in a format as desired by the person;

- ensures the completion of required documentation including personal plans, portions of the individual service agreement (ISA), monthly updates, action plans, etc. in relation to the achievement of personal outcomes;

- supports people to participate in the cultural, spiritual, recreational, leisure, educational, and employment activities and opportunities in the community typically engaged in by all citizens;

- supports people to effectively interact with people in their community to promote, encourage and support social and interpersonal skills that will create and expand the value of social roles, natural supports and meaningful work within their community;

- identifies and addresses any restrictive measures or practices that infringe upon a person's personal freedoms or rights;

- completes and presents all information necessary for the review of the restrictions or limitations by the Rights Committee;

- assists people with the maintenance of their personal finances and budgeting as requested and where responsible, maintains accurate records;

- provides transportation for people supported using agency vehicles or personal vehicle;

- orders, dispenses, and records for the prescription and non-prescription medication to people as necessary;

- facilitates and/or accompanies people to all doctor, specialist, dental, and other professional appointments for regular check-ups or emergencies as required. Reports all required information to the appropriate people;

- supports people with all elements of personal care as required and maintains assistive devices and any specialized equipment;

- promotes and maintains safe and enhancing environments for people which supports their emotional and physical well-being;

- ensures intervention used for people in crisis situations is non-violent crisis intervention.

B) Professionalism and Community Liaison

- demonstrates a positive and professional relationship with individuals receiving support and their support network;

- recognizes and respects each person who contributes support to people within the identified support network;

- advocates and liaises with community groups, employers and others in the community to promote the participation of people supported in the life of the community;

- promotes agency's values and is a positive role model while interacting in community;

- acts as a collaborator between all members of the support network to ensure effective, ongoing communication and maintaining positive relationships.

C) Organizational Policies and Procedures

- demonstrates understanding of agency's mission and value statements of agency;

- demonstrates a good working knowledge of and abides by the policies, procedures and practices of the agency;

- ensures own health and safety, the health and safety of people supported and staff by adhering to related legislation and agency policies and procedures;

- reports all unsafe conditions, hazards, practices or accidents as required.

D) Staff Development and Teamwork

- attends mandatory agency training, in-services and job-related conferences (i.e. NVCI, First-aid/CPR, Health and Safety);

- attends and actively participates in staff meetings, retreats, planning meetings, committees as required;

- assists with training and orientation to new staff, transferred staff, students, and volunteers as required;

Skills:

- tolerance for uncertainty including the ability to withhold action in absence of important information, deal with unresolved situations, frequent change, and delays or unexpected events;
- able to make decisions quickly on available information and take action, make commitments, and deal with emergencies as necessary;
- able to clearly present information verbally, influence others through positive oral presentation in both positive and challenging situations, able to interpret verbal and non-verbal cues given by people supported;
- able to make decisions and take action while exhibiting judgement and a realistic understanding of issues, able to use reason even when dealing with emotional topics;
- demonstrate commitment to responsibilities by being able to start and persist with specific courses of action while exhibiting high motivation and a sense of urgency;
- able to complete reports and records as required through agency policies and procedures or MCSS guidelines;
- ability to performs administrative tasks as assigned by the supervisor or as required in the delivery of services and supports (report writing, completion of forms, minute taking, petty cash reconciliation, etc.);
- ability to operate household appliances, basic outdoor equipment, and office equipment;
- lifting of lightweight to heavy materials of varying weights;
- ability to lift and transfer people in and out of wheelchairs to complete daily tasks and re-positioning of people;
- reliable and punctual for shifts as scheduled.

Working Conditions:

- required to meet multiple demands of meeting daily requirements from people supported, supervisor, and other staff;
- exposure to hazards including; dust, dirt, cleaning supplies, noise, feces, urine and other human body fluids (blood), possible exposure to Hepatitis B or other infectious diseases, and possible exposure to weather elements;
- flexibility in working hours to accommodate support requirements and respond to emergency situations;
- physical risk when supporting situations that present challenging behaviours;
- requires working in a variety of locations based on the support requirements;

Appendix C

Certificate of Research Ethics Clearance for Human Participation Research[4]

Brock University
Research Ethics Office
Tel: 905-688-5550 ext. 3035
Email: reb@brocku.ca

Social Science Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE: 12/19/2016

PRINCIPAL INVESTIGATOR: RUTHERFORD, Camille - Teacher Education

CO-INVESTIGATOR(S): Kimberly Maich (kmaich@brocku.ca)

FILE: 16-115 - RUTHERFORD

TYPE: Faculty Research STUDENT:
SUPERVISOR:

TITLE: Creating Independent Community Engagement through Mobile Assistive Technology

ETHICS CLEARANCE GRANTED

Type of Clearance: NEW Expiry Date: 12/29/2017

The Brock University Social Science Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from 12/19/2016 to 12/29/2017.

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before 12/29/2017. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Research Ethics web page at http://www.brocku.ca/research/policies-and-forms/research-forms.

In addition, throughout your research, you must report promptly to the REB:

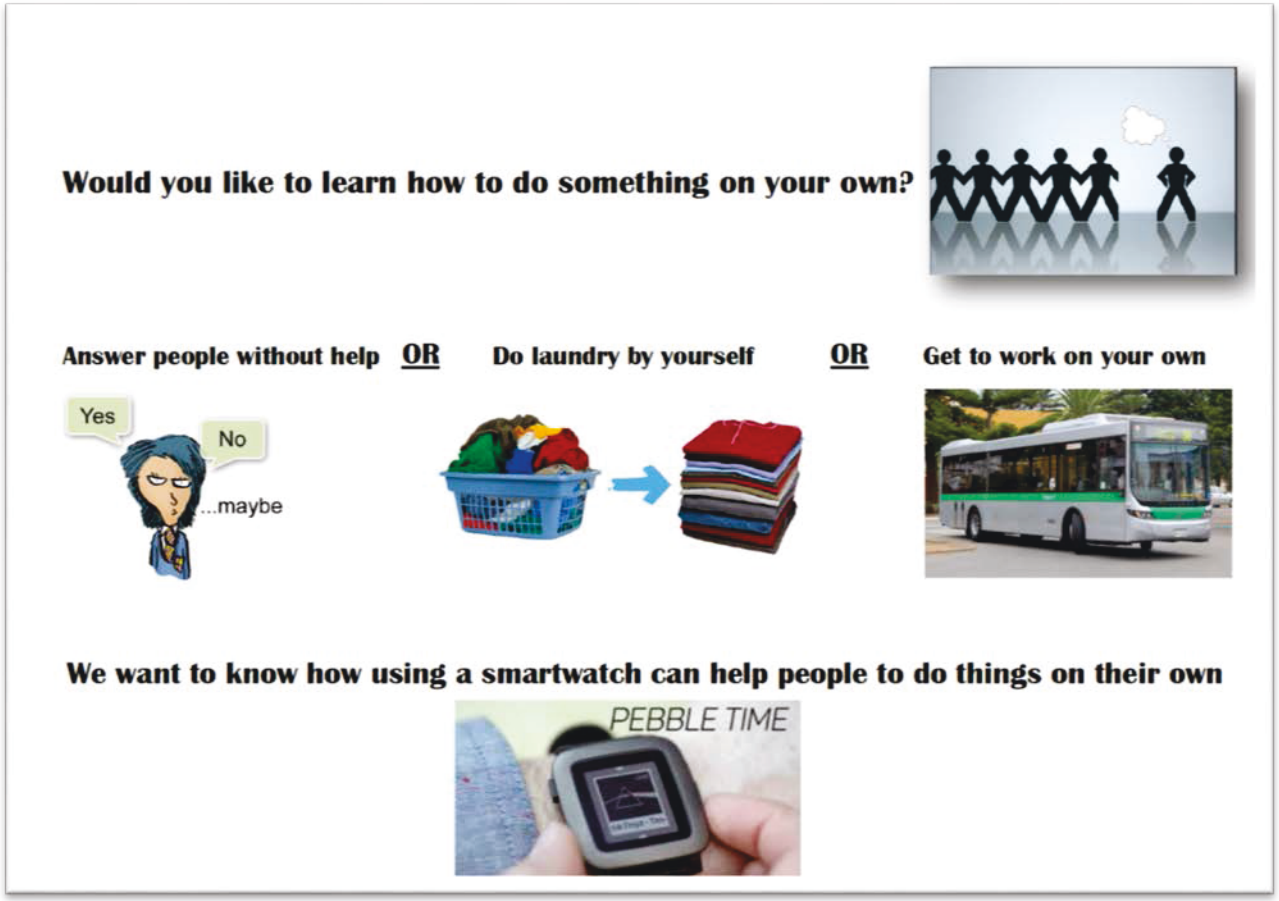
a) Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
c) New information that may adversely affect the safety of the participants or the conduct of the study;
d) Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

[4] Signature not included as per MUN's thesis guidelines.

Appendix D

Recruitment Poster for Individuals with IDD



Appendix E

Letter of Information/Consent Form for Participants with IDD

Name of Participant: (Please print) _____

Witness Question: Would you like to have a staff member of your choosing stay with you while we tell you about the project?

Yes_____No_____

We are doing a research project to learn about how we can help people to do things on their own, how to teach someone to learn a new skill by themselves. Before we can teach you though, we will

1. We want to ask you some questions about what you are able to do on your own now (without help from a staff member) and what you would like to do on your own (without the help from a staff member).

Once we have talked about the new skills you want to learn we will then

2. Teach you how to use a smartwatch to help you with your new skill

While you are learning about the watch and your new skill, we will ask

3. Staff to collect information for us, on how you are doing with your watch and with your new skill

After you have learnt your new skill, we will ask you to

4. Come and meet with us and some other people who are also learning to use the watch.

During this time, we may

5. ask you questions about what you liked about the watch and what you didn't like about the watch, things like "was it was easy to use" and we may ask about whether or not the watch helped you to learn a new skill.

Q1: If you agree to meet with us, what might we ask you about?_____

_____

We want to help you learn a new skill using a_____

Will we be asking staff to collect information for us on how you are doing? Y/N

We may need to meet 2 or 3 times to talk about what you want to learn, how things are going and at the end with the other people that are also learning to use the smartwatch. When we meet, we will usually meet for about an hour to an hour and a half.

Q2: How many times are we going to meet?

Whenever we meet-you do not have to answer any questions you don't want to answer. You can also stop meeting with me, or answering my questions at any time and nothing bad will happen.

Q3: What can you say if you do not want to answer a question ?_____

What can you say if you do not want to meet with me anymore?

When we meet as a group (with the other people that have learned about the smartwatch)—you will be audiotaped. A researcher will also write the information down on some forms. This will help us to remember what you told us.

Q5: Is the information going to be audiotaped?

You will receive a $5 Tim Horton's gift certificate as a thank you for taking the time to be part of the interview. You still get the Tim Horton's card even if you decide you don't want to answer my questions, if you stop answering the questions before it is over or if you decide you do not want to meet with me anymore.

Q10: Will you receive a gift certificate if you stop answering the questions?

Only people from the research team, including those listed on this form, will see the information you give to us during the interview.

Q11: Will people from the research team share your information with anybody else?

During the interview if you tell someone from the research team that you or someone else has been abused we will tell the police about this so you can get help. If you say you have abused someone else, or if you say you are going to hurt yourself or someone else, then we will have to tell your Executive Director, Susan Wavell or the person who is filling in for her if she is not available to be sure that everyone involved is helped. Also, your personal information will have to be given to the courts if the law requires it.

Q12: If you talk to us about abuse, who do we have to tell?

General information from the interview will be shared with other people. When people from the project team share this information they will never use your full name. The research team will give you a summary of the results of the study after it is over if you tell us you want one.

Q13: Will your full name ever be said or written when people from the project team share your information?

Sometimes we have a chance to do other studies. If you agree we can put your name on a list so we can invite you to be in another study if we get to do one. You can say no now and you can also say no if we invite you to another study.

Q14: Do you want us to invite you to other studies if we have any like this in the future?

Yes_____ No____

Q15: Is it OK with you if we use what you tell us not just in this study that we are doing now but also in other studies like this one? Just like this study, we will not use your name in the other studies.

Yes____ No_____

This study has been reviewed by and received ethics clearance from the Brock Research Ethics Board (File#16-116). If I have any questions or concerns about my participation in the study, I may contact <redacted for privacy>. You may also contact the Brock University Research Ethics Officer in the Office of Research Services at 905-688-5550 ext. 3035, email: reb@brocku.ca.

I agree:	**YES**	**NO**
• To be a part of a research project that is learning about smartwatches can help people to become more independent	❑	❑
• That the researchers can ask me questions about how I am doing with the skill I want to learn	❑	❑
• That the researchers can ask my staff members about how I am doing	❑	❑
• That staff who know me can see a copy of this signed consent form.	❑	❑

- That the information from the research can be used in different ways in other research projects to help people to understand how smartwatches can be used to help people do things on their own. ❑ ❑
- To be contacted about participating in other studies like this one. ❑ ❑

Participant Signature: _____

Participant Name: (please print) _____

Date: _____

Witness Statement:

I have witnessed the presentation of information and the request for consent for participation in this study and I believe that _____ fully understands the nature of his/her involvement in this study and was not coerced in any manner. By signing as a witness, I also take an oath of secrecy not to divulge any confidential information regarding the participant.

Witness Signature: _____

Witness Name: (please print) _____

Relationship to Participant: _____

Date: _____

Thank you for your help! Please take one copy of this form with you for further reference.

I have fully explained the procedures of this study to the above volunteer.

Research Assistant Signature: _____

Research Assistant Name: (Please print) _____

Date: _____

Individual Consent to Gather Information from Front Line Coordinators

We would like to talk to the Coordinator who spends the most time with you. We would like to ask them about what you are really good at, what you sometimes need help with and how you like to be supported. We also want to talk to your Coordinators about how you are doing with your smartwatch and with your new skill. We will only invite the Coordinators that if you tell us it is okay to talk with them. You can tell us that you do not want us to talk to them and nothing bad will happen.

I agree to allow you to talk to my Coordinator: _____

NAME of Coordinator

and to ask them about what I am good at, what I sometimes need help with and how I like to be supported. You can also ask about how I did with my smartwatch and my new skill.

Q1: What kind of questions will we ask your Coordinator?

The purpose of these questions is to help us to find out what skills we can help you with, how to help you learn how to use the smartwatch and your new skill and if the smartwatch has made it easier for do things on your own.

Q2: What will the questions tell the researchers about you?

General information from the information that your Coordinator gives to the researchers will be shared with other people. When people from the research project team share this information they will never use your full name.

Q3: Will we tell people your whole name when we talk about or write about the study?

I agree:	**YES**	**NO**
• To invite my Coordinator to be a part of the research project that is learning about how smartwatches can help people to become more independent.	❑	❑

- To let you ask my Coordinator about what I am really good at, what I sometimes need help with and how I like to be supported. ❑ ❑
- That the researchers can ask my Foundations Coordinator and/or job coach(es) questions about how I liked the smartwatch, whether and whether or not it helped me to do things on my own ❑ ❑
- That staff who know me can see a copy of this signed consent form. ❑ ❑
- That the information from the research can be used in different ways in other research projects to help people to understand how a smartwatch can be used to help people do things on their own ❑ ❑
- To be contacted about participating in other studies like this one. ❑ ❑

Participant Signature: _____

Participant Name: (please print) _____

Date: _____

Witness Statement:

I have witnessed the presentation of information and the request for consent for participation in this study and I believe that _____ fully understands the nature of his/her involvement in this study and was not coerced in any manner. By signing as a witness, I also take an oath of secrecy not to divulge any confidential information regarding the participant.

Witness Signature: _____

Witness Name: (please print) _____

Relationship to Participant: _____

Date: _____

Appendix F

Letter of Information/Consent Form for Coordinators

You have been identified by the person you support, to participate in the Trillium Seed Project. The Trillium Seed Project is examining how technology (in the form of a pebble watch and smartphone) can be used to increase independence. Your participation will involve meeting with a research assistant to gather information about the current skill level of the individual you support (involving tasks of daily living and adaptive functioning), the areas in which they require some support, and about how the individual learns best. You will be asked to work with the research assistant to identify a specific skill where they could be more independent, to learn about how to teach the use of the smartwatch, how to learn to use a smartphone to assist the individual, how to use the smartwatch to teach a new skill and to learn how to collect data/information about how often and for how long the smartwatch is being used. At the end of the project, you will also be asked to participate in a 1 to 1.5 hour focus group where we will ask questions about, how well the smartwatch worked for the individual, and how you think this technology has or has not improved the independence of the person you support. We hope that this information will be helpful to others who may want to increase people's independence with the use of technology, such as the smartwatch. In addition, we hope that it will contribute to the literature on the use of technological devices to increase independence for adults with intellectual/developmental disabilities.

The name of this research project is: Creating Community Engagement through Technology

The nature and purpose of the research is:

- To evaluate the use and ease of introducing technology to increase independence
- To understand the impact that introducing technology can have on the skill sets of persons with Developmental Disabilities, on their sense of self-worth and the impact this may have on their economic sustainability.
- The results of this evaluation will be discussed
- The findings of this research may be published in book form for academic and general audiences, in refereed journals, as fact sheets and electronically through the agency website.
- Your part in the research, if you agree, is to participate in: the initial assessment meeting, training on the implementation of the smartwatch and use of the smart phone, ongoing data collection, providing on-going support and on-site training with the individual, and to participate in a focus group.
- We are contacting you because one or more individuals, supported by Community Living <deleted for privacy>, has (have) given us permission to do so.

What we will do protect your privacy and confidentiality:

- All information will be confidential to protect the identity of participants and minimize any potential risk. Only the primary investigator—Camille Rutherford, the Co-investigator—Kimberly Maich and Research Assistant—Courtney Bishop, will have access to any information you provide, that is associated with your name. < >are also

research partners; they will know who participates, but will only have access to aggregate interview data and to data from which participant identifiers have been removed.

- Data will be placed in a secure location at Brock University in St. Catharines, Ontario for two years after the end of the project, and then destroyed.
- Individual participants' identities will remain confidential in any presentations of the findings. Personal identifiers will not be attached to the report of research findings and data that may appear any presentations and publications.

Potential limitations in our ability to guarantee anonymity are:

- Confidentiality will be maintained except where the law requires disclosure, such as subpoena of records, or if issues related to abuse or threat of harm to self or others are disclosed.

Potential benefits, which you might derive from participating, are:

- The study will you with the opportunity to learn about different behavioral strategies that may aid you in your work at Community Living <deleted for privacy>,
- The study will you with the opportunity to gain new skill sets, involving data collection and different types of technology
- The study will provide the individual you support with the opportunity to become more independent

- The study will provide Community Living <deleted for privacy>, and others who may be interested, information regarding best practices when introducing technology to increase independence

Potential harm if any is:

- No harm is anticipated.

Compensation:

- You will be provided with additional wages for work completed outside of your typical duties (i.e., assessment meeting, training, on-site data collection and focus group).

If you wish to participate in this study please contact <redacted for privacy>. An in-person or phone meeting will can be arranged at this time to discuss any concerns or questions you may have regarding the project. The time and location of this meeting will be arranged based on your availability and in a location of your choosing.

This study has been reviewed by and received clearance from the Brock Research Ethics Board (File# 16-115). If I have any questions or concerns about my participation in the study, you may contact <redacted for privacy>. You may also contact the Brock University Research Ethics Officer in the Office of Research Services at 905-688-5550 ext. 3035, email: reb@brocku.ca.

Interview Consent: This section will be added to the recruitment notice above for interview participants to sign upon the initial assessment meeting.

To be completed by Interview Participants

I have read through this description of the study and I understand what is required for participation. I understand the nature and limitations of the research. I agree to participate in the ways described. If I am making any exceptions or stipulations, these are:

I understand that I am free to withdraw my participation at any time and there will be no implications as a result of my non-participation.

Name: Signature:

Date:

Secondary Use of Data

Are you willing to allow the researchers to include the information you provide in this study with data collected in future studies of a similar nature? As in the present study, information identifying you would be removed from the data.

Yes_____ No_____

Name:

Date:

Contact for Future Studies

Are you willing to be contacted to participate in future studies of a similar or related nature?

Yes_____No_____

Name:

Date:

This study has been reviewed by and received clearance from the Brock Research Ethics Board (File#16-115). If I have any questions or concerns about my participation in the study, you may contact Camille Rutherford at 905-688-5550 ext. 5344. You may also contact the Brock University Research Ethics Officer in the Office of Research Services at 905-688-5550 ext. 3035, email: reb@brocku.ca.

Appendix G

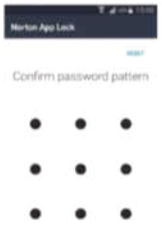
Smart Phone Training

Moto g3
To turn on the phone push the **Power** button

To unlock the phone put your finger on the **LOCK** symbol and swipe down.

Norton App Lock is used to lock the phone's settings menu and most of the apps on the device.

To unlock the settings and any of the locked apps you must know the pass pattern to unlock the settings.



Appendix H

Pebble Watch Training

Pebble Buttons

Pebble Time has **four** buttons.
The left button is called the **'Back'** button, which is initially used to Power on your watch (press and hold it for 3 - 5 seconds), and subsequently used for returning to the previous screen or entering your watchface app from the main menu.
On the right side, the top and bottom (**'Up'** and **'Down'**) buttons generally are used for scrolling through lists. With the new timeline interface, they can be used to scroll through the past and future, respectively. The center button is used to **'Select'** an item in a list or start an app on Pebble. It can also be used to get to the main menu from a watchface.
The Main Menu is where you can scroll through to select which app you would like to use or setting you would like to manage.

Settings

In Pebble Time's main menu, the Settings icon will let you know at a glance what your battery life percentage is (bottom left) and whether your smartwatch is paired to your smartphone (bottom right). Within the settings you will be able to customize the display of your Pebble Time.

Steps to see if the Pebble is connected (paired) to your smartphone

1. Push the **Select** button
2. Push the **Down** button until Settings is in the middle of the screen
3. Push the **Select** button until Bluetooth in the middle of the screen
4. Push the **Select** button
   It should show the Pebble that it is connected to

The Pebble will stay connected to the smartphone if it is within 20 feet.

Message Notifications
You will be able to receive notifications right to your wrist. If the content of the message is more than can be displayed at once on the Pebble screen, you can scroll through the message using the Up and Down buttons.

If multiple messages come in short succession, they will be stacked so that you can easily scroll through them.

If you miss a message or want to review past messages, they can be viewed from the main menu on Pebble by selecting Notifications.

To exit the app or dismiss the message, press the **Back** button.

Activity
The Activity feature will display how many steps you have taken.
Press the **up button** to see how many steps you have take

Charging Your Pebble

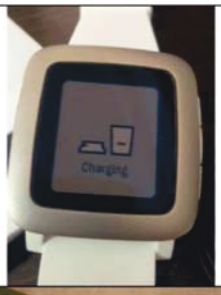
The battery life symbol will indicate how full your battery is: 80%

You must charge your Pebble smartwatch every night.

You will also receive a notification reminding you to charge your Pebble Time when your battery is at 20%, and again when it reaches 10%.

Charging Directions

Insert the charging cable into a USB charger.	
Turn the Pebble over.	
The **charger** connects magnetically with the **charging port** on the back of the watch. Put charging cable on the charging holes on the back of the Pebble.	

The screen will show that it is **Charging** if the cable in on correctly.	
It can take up to 3 hours for the Pebble to be fully charged. The screen will show when it is **Fully Charged.**	

Appendix I

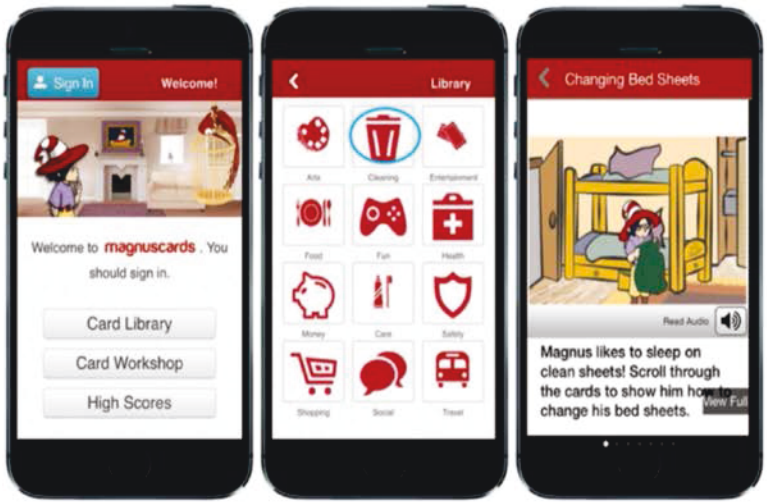
Sample App Training

http://magnusmode.com/

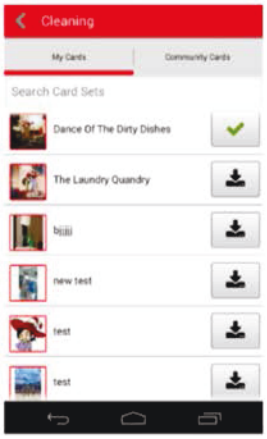
https://play.google.com/store/apps/details?id=com.magnusmode&hl=en

Training video: https://www.youtube.com/watch?v=i25gZGGCNwo&t=1014s

Select a category from the card library



Download the cards associated with the desired task



Simple Calendar

Select the "+" icon

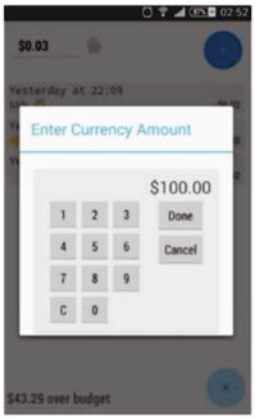
1. Insert title – i.e., Take a bath (ignore description)
2. Select a start date by touching the date -> ok
3. Select a time by touching the time (hour and then minutes) -> ok
4. Select a reminder time (At start is the default)
5. Select the checkmark in the top right corner to complete the process

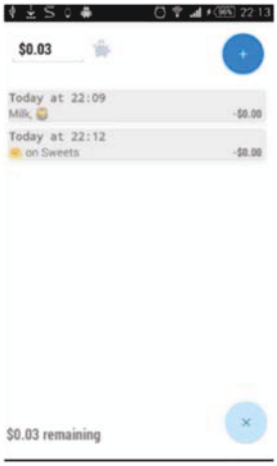
A notification will be sent to the Pebble at the time of the reminder.

Simple budget

1. Enter budget amount (i.e. $1000 -> DONE
2. Enter an expense or income by selecting the "+" icon
3. Enter currency amount ($9.00) -> select DONE
4. (Expense is the default. Select INCOME is needed
5. Tap DESCRIBE INCOME/OUTCOME (i.e. movie ticket) -> CONFIRM

The new budget total will appear in the bottom left corner

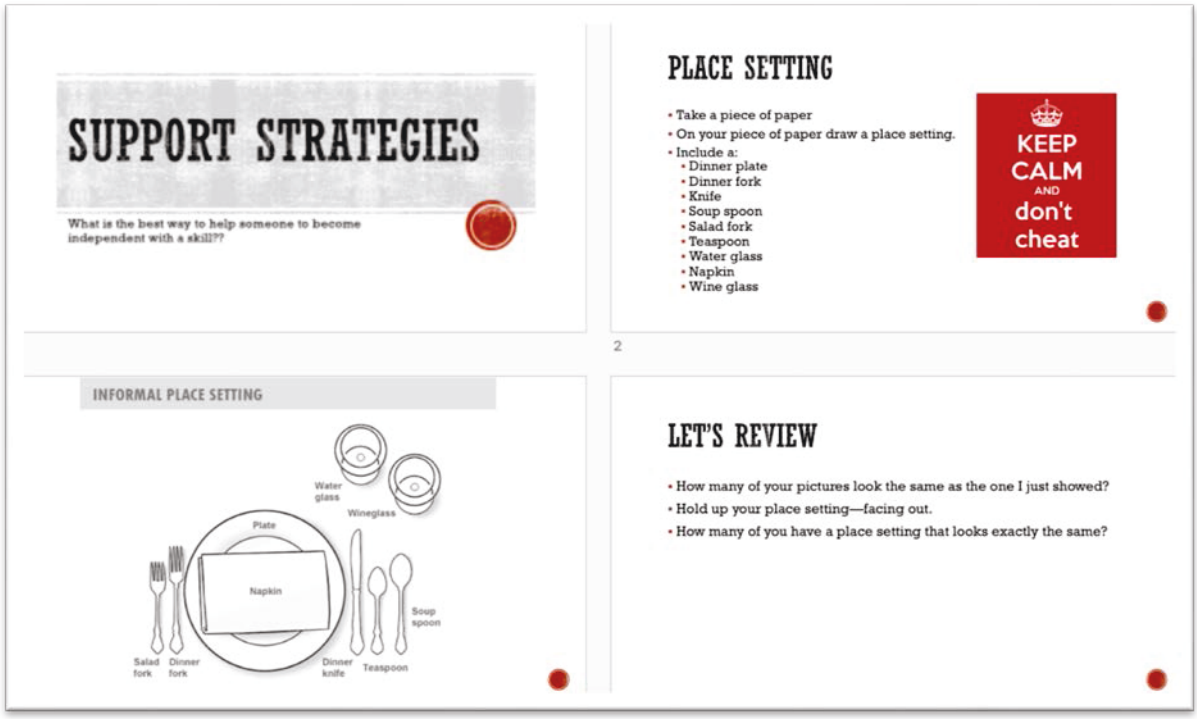




Do NOT select the "X" unless you want to clear all expenses

Appendix J

ABA Training



LET'S REVIEW

- Why do you think I made you do this?
  - Everyone sees things differently, does things differently. If you are trying to teach someone and they are being taught 10 different ways, how is this person every supposed to learn? What level of frustration would you feel if you were being taught something differently every time it was presented to you?
- A task analysis can help you to identify the steps in a task so that you are able to teach that task with consistency—this helps to reduce frustration and increase the likeness that someone will be successful with a task

TASK ANALYSIS

- Get into pairs
- Using your phone, follow these steps…

1. Person A—create an event in your calendar. The event is "hanging with Courtney " at 2:00 pm on Friday, February 3rd. Do this slowly.
   Person B—watch person A . Write down how they are doing it (make sure you get each step).
2. Person A- take the list of steps written by Person B.
   Person B- Follow the steps—BUT only do what is read to you. BE VERY LITERAL.
   Person A- If there are steps or details missing. Fill them in now.

6

LET'S REVIEW

- Quickly take a look at how the people beside you broke up the task
- Were there differences in the way that each of you wrote up the task?
  - There may be variations in how the task was performed based on your own personal traits (left handed vs. right handed) and the platform being used.
- How did you find this task? Was it easier than you thought it would be or more difficult, did you find that you were missing information when you read the instructions to your partner?

https://www.youtube.com/watch?v=mIAJ8SKLkGY

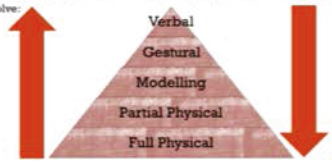
PROMPTING

- Now that we know how to break up a task, we need to start thinking about the best way to teach someone to perform that task.
- When teaching a new skill, we all use prompting—you just don't know it!
- So what is prompting?

https://www.youtube.com/watch?v=9xFEOM4CG-8

PROMPTING

- Prompting:
  - Adding additional supports to assist in the development of a skill
  - Least to most prompting and most to least prompting (to assist in independence)
  - These involve:



9

VERBAL

- Verbal prompts are the most commonly used prompts
- They are also the most likely type of prompt to lead to prompt dependency
- Verbal prompts are concerned the least intrusive type of prompt
- What is a verbal prompt?
  - The use of your own words to direct the actions of others
  - "pick up your pen".
- There is also a least to most hierarchy within verbal prompts—but we will get to that later ☺

10

GESTURAL

- Gestural prompts are considered by some, to be less intrusive than verbal prompts—however, they are not very successful on their own (until the skill is established)
- Gestural prompts are often paired with verbal prompts
- Gestural prompts, are easier to fade (get rid of) than verbal prompt
- So what is a gestural prompt?
  - The use of your body to point out or convey an action.

MODELLING

- Modelling prompts—identified by the individuals in this agency—as the best way to be supported
- Really effective for people that are able to copy/mimic others behaviors
- So what are modelling prompts?
  - "show me how to do it"
  - Perform the task for the person
  - This can be done 1:1 in real time, or be done using videos

PARTIAL PHYSICAL

- Partial Physical
  - Considered more intrusive than the other prompts mentioned up to this point
  - Is NOT good for people who do not like to be touched
- So what is a partial physical prompt?
  - Physically guiding a person's body by putting light pressure near the part of the body that is to perform the task.
  - For instance, if you want someone to pick something up. A partial physical prompt would involve touching the person's elbow.

3

FULL PHYSICAL PROMPT

- Considered the most intrusive in the prompt hierarchy
- Also considered to be the most effective…for some…
  - In my experience, full physical prompts are not effective with this population
  - Has been found to be very effective with children and lower functioning adults
- So what is a full physical prompt?
  - Support of the skill by manually manipulating a person's actions (e.g., Hand over hand)

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SO WHY IS THIS IMPORTANT?

- I don' t have to tell you this, but it is important to know the Individual
  - Where are they currently at?
    - Which of the steps (from the task analysis) can the individual already do on their own?
    - How do they like to be supported?
    - What is currently controlling their behavior?
  - The answer to these questions can help you to teach the Individual a new skill AND help them to become more independent

LET'S START BY TALKING ABOUT FADING

- Fading is a procedure that is used to slowly remove prompts until the individual is performing a task independently
- Fading is done by:
  - Moving up or down the prompt hierarchy
  - Which direction you choose to move, is based on the individual's preference/skill level
  - We will focus on moving up (least to most)— follow the steps until the person is able to perform the skill successfully.
    1. Provide verbal prompt/instruction
    2. Provide verbal prompt/instruction and gesture
    3. Provide verbal prompt/instruction, gesture and model

  Once the skill is mastered (meaning they are successful with the current level of prompting). Start moving down

FADING

- Once the skill is mastered (meaning they are successful with the current level of prompting). Start moving down

~~3. Verbal prompt/instruction, gesture, modelling~~

2. Verbal prompt/instruction and gesture
1. Verbal prompt/instruction

- Continue to move down, until the individual is successfully completing the task with only a VERBAL prompt/instruction

7

FADING

- Now it's time to fade the verbal prompt.
- Remember, verbal prompts are the most difficult to get rid of—so this step needs to be done quite quickly
- Start by:

1. Providing a 5 second time delay, to see if they will engage with the task independently
2. Then begin to state your verbal instruction (leaving off the last word)
3. Wait 5 seconds
4. If the individual performs the task independently—provide praise

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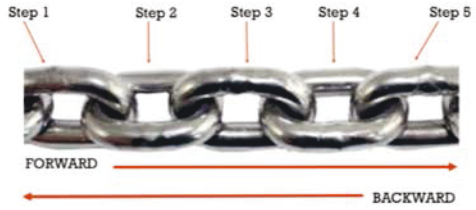
FADING

- If they do not perform the task independently
  - Re-state the verbal instruction and leave off the last syllable of the last word
  - Wait 5 seconds
  - Provide praise if they complete the task on their own OR
- Re-state the verbal instruction and leave off the first word
  - You want to modify the verbal prompt enough that they have to making the connection between what they need to do and how they need to go about doing it.
- Continue to remove words from your prompt/instruction until the individual is completing the task independently

SHAPING

- Sometimes we need more than just prompts
- Shaping involves:
  - Reinforcing successive approximations to the behavior we are teaching
  - This is a fancy way of saying—teach one step at a time
- All shaping procedures use task analyses
- The most common shaping procedure is known as Chaining

CHAINING



1

FORWARD CHAINING

- You focus on teaching the first step in the chain—
  - using your most to least or least to most prompting and fading procedures (discussed above)
- Then provide full support for the remainder of the chain
- When they have mastered the first step (without any prompting)
- Move onto the next step in the chain
- And so on, and so on and so on

22

BACKWARDS CHAINING

- Provide full support for each of the first steps in the chain
- You focus on teaching the last step in the chain
  - Use your most to least strategies to teach this step
- When the last step is mastered (meaning the person is doing it independently),
  - begin to work on the second last step
  - and so on and so on and so on…

TOTAL TASK WITH JUMP AHEADS

- Identify which steps in the task, the individual is already able to complete on their own. Do not support these steps
- Focus on teaching one step on either side of a mastered step (either the step before or afterwards)
- Support the steps in which they are not independent (using prompting)
- Once that step is mastered
- Move on to the next step in the chain (that is not mastered).
- Skip or jump over the steps that are already mastered, focus
- Continue until the entire chain has been trained

Appendix K

Duration Data Collection: Operational Definitions & Instructions

Time Management: You will start taking data on the duration (the amount of time) that you support an individual with allocating time to an activity, this may include:

- Planning for an activity or activities in advance (e.g., daily/weekly/monthly schedules)
- Reminding an individual of an upcoming activity (e.g., specialist appointments, reminders to take medication)
- Initiating activities (e.g., checking in to make sure that someone has started a specific task/activity).

Activities may be any aspect of a person's daily living, such as appointments, standing items (such as work), medications reminders, bank days, laundry days, special events. This list is not exhaustive but is meant to provide you with some examples.

Coping: You will start taking data on the duration (amount of time) that you are supporting an individual with a de-escalation that is a result of anxiety or agitation. This may include:

- Verbal prompts/reminders to engage in an activity that has assisted this person with calming in the past, such as: listening to music, going for a walk, drawing picture, squeezing a ball, taking space for themselves
- Verbal supports to help with rationalize or putting a problem in perspective
- Reminders to engage in deep breathing

You may also start taking data on the duration (amount of time) that you are supporting an individual with practicing coping skills, outside of an episode of anxiety or agitation. In these

cases, the supports are pre-existing (already present before this study) (e.g., the individual is already receiving supports such as mindfulness training or programming such as the Zones of Regulation).

Budgeting: You will start taking data on the duration (amount of time) you are supporting someone with any activity that involves decision making regarding money. This may include:

- Activities such as banking
- Planning related to paying bills, saving money or spending money (i.e., discussions or assistance focused on the input and/or output of money).
- Discussions regarding money values (e.g., "what does a ten dollar bill look like")
- Assistance with spending money (e.g., making change, or ensuring that someone is getting the appropriate amount of change back from a purchase).

Exercise: You will start taking data on the duration (amount of time) that you are supporting an individual with activities related to bettering someone's physical health. This may include:

- Goal setting—working with someone to set goals, as they pertain to exercise
- Verbally prompting someone to engage in exercise (a goal is already in plan and you are supporting the initiation and maintenance of that plan).
- Engaging in exercise with someone, with the purpose of bettering someone's physical health (e.g., going for a walk with an individual with the intention to get them moving).

Safety: Decreasing risk in higher-risk activities of daily living such as a task analysis for locking a front door).

When and how to collect your baseline data:

In the next two weeks, we ask that you get a minimum of one data point for each of the tasks that have been assigned to the individual that you are supporting (i.e., capture one instance in which you have supported the specified goal).

You may wish to arrange a specific time to meet with the individual with the intention of collecting data on that specific task. If this is the case, you will have to meet on two separate occasions (to ensure you are getting data on both of the assigned tasks) or you will have to split your time during that interaction, to ensure that both of the skills are being recorded. When arranging this meeting, ensure that you are scheduling the meeting around a time when the specified task is more likely to occur, and is occurring naturally (i.e., the individual would be engaging with the skills regardless of whether this project is happening). This may require that meet with an individual about a specific task, earlier than you usually would (example, in cases where you would meet with someone to go over their budget, but this doesn't usually happen until the beginning of the month—you may need to schedule it earlier to collect this information in the next two week). This is okay too, just make sure that the time you spend with them is a good representation of what it would look like typically.

If you are calling an individual to check in with them on a specific issue (that relates to the identified skill, such as scheduling), ensure that you are prepared to take the data on the duration of time that you are supporting with that task (e.g., if you are calling with the purpose to remind

them of an upcoming appointment). As soon as you initiate the support, start the timer. When you are done supporting that specific skill, stop the timer. You may have to start and stop the timer several times (if either of you begin discussing something that is outside of the specified skill).

If an individual calls you, ask them to wait a moment. Open the app and be prepared to start the timer, if the individual is initiating or requesting assistance that is related to a specific skill. This is only necessary if you are able to get access to the phone quickly (i.e., it is already on your person, or you are in the office and the phone is easily accessible). If it is not easily accessible, please do not worry about this.

The stopwatch deluxe app will show you the files that you have saved.

(Instructional task analysis-4-15 provided below for saving and sending).

4. When finished measuring your interaction press the save button

(this looks like a floppy disk with a green downward arrow, second to the left at the bottom of the screen)

5. In the text box at the top of the screen there is a cursor flashing

6. Enter the participant number, underscore, name of skill, underscore, date.

(**ex. P 36_ budgeting_ January 28, 2017**.)

7. When completed, press green circle with a check mark (bottom right hand side of screen)

8. Press save button (floppy disk arrow facing down)

9. Press send button (file folder with green arrow on top, second from the right at the bottom of the screen)

10. Press to mail (green button to the left) making sure it is the appropriate file.

Make sure that this was the one you saved.

11. Press 3 dots (top right corner).

12. Add from contacts

13. Press Trillium Project

14. Press the icon paper airplane (top right corner, second from right)

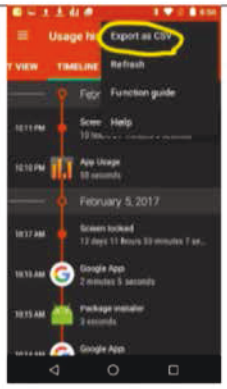
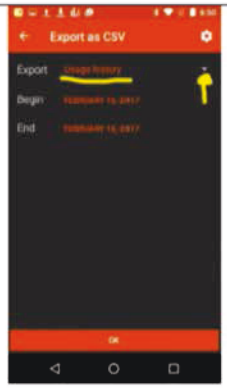
15. Press X (bottom left hand corner)

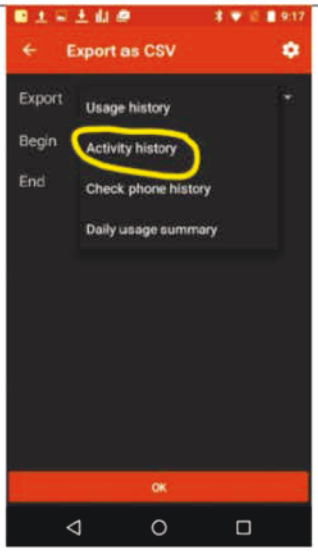
Note: Please be advised that this will not send unless not connected to wifi

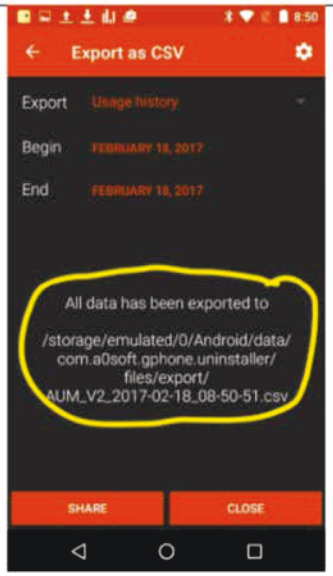
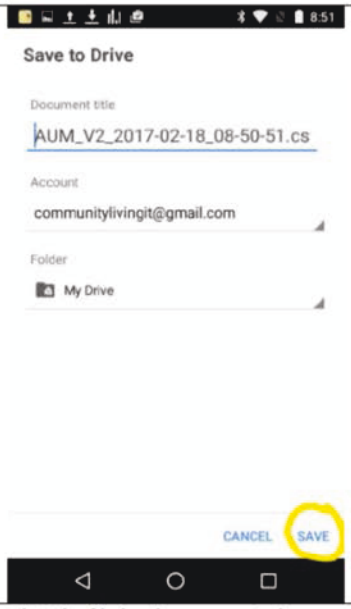
If you find that you have several data points (saved files) on a specific task, please shift your focus to the second specified skill.

Appendix L

Export App Usage Data Directions

Select the vertical three dots in the upper right corner	
Select **Export as CSV**	
The export default setting is **Usage history** – you will need to change this to Activity history. Select the tiny toggle triangle to the right.	

After selecting the toggle triangle, you will need to select – **Activity history**	
Select the **Begin** date and change it to **February 6th** Select the **End** date and change it to **todays date** Select **OK** at the bottom of the screen	

You will receive a prompt that All data has been exported to /storage.... Select **SHARE**	
Select **Share with – Save to Drive** Select **ALWAYS** You may be prompted to **Allow Drive to access photon, media, and files on your device?** Select **ALLOW** You will be prompted with a **Save to Drive** screen Select **SAVE**	
A very brief message will flash on the screen confirming that the file has been exported.	