Intellectual and Developmental Disabilities

Healthy Nutrition for Adults with Intellectual Disability: Piloting a Mobile Health Application and Self-Management Intervention

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Abstract:	While there are many benefits to healthy nutrition, adults with intellectual disability often have poor nutrition habits. The purpose of this pilot study was to examine the use of a nutrition app and self-management intervention to increase awareness of healthy nutrition choices for adults with intellectual disability. Data was gathered on the effectiveness of the intervention and social validity of intervention components. Through a single-case multiple-baseline across participants design, the mobile nutrition app with self-management intervention was effective in increasing awareness of healthier nutrition items for three adults with intellectual disability. Future research is needed to replicate and generalize findings as well as explore additional supports that may be needed for individuals who have more extensive support needs.

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Abstract

While there are many benefits to healthy nutrition, adults with intellectual disability often have poor nutrition habits. The purpose of this pilot study was to examine the use of a nutrition app and self-management intervention to increase awareness of healthy nutrition choices for adults with intellectual disability. Data was gathered on the effectiveness of the intervention and social validity of intervention components. Through a single-case multiple-baseline across participants design, the mobile nutrition app with self-management intervention was effective in increasing awareness of healthier nutrition items for three adults with intellectual disability. Future research is needed to replicate and generalize findings as well as explore additional supports that may be needed for individuals who have more extensive support needs.

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Dietary habits have strong modifiable risk factors for chronic diseases such as diabetes and cardiovascular disease (Branca et al., 2007). While there are many benefits to healthy nutrition, adults with intellectual disability (ID) often have poor nutrition habits compared to individuals without ID (Adolfsson et al., 2008; Koritsas & Iacono, 2016; Nordstrøm et al., 2015). Fewer people with ID meet recommended guidelines for each food group, except for sugar and fat (McGuire et al., 2007), with individuals with ID more often consuming foods high in fat and low in vegetables and fruit (Draheim et al., 2007). With the prevalence of obesity being substantially higher among adults with ID compared to adults without ID (Hsieh et al., 2014), addressing habits to reduce obesity and associated risk factors is needed.

Unfortunately, barriers, such as lack of knowledge, exposure, and accessible resources may limit healthy food choices for individuals with ID (Humphries et al., 2009). For example, Humphries et al. (2009) reported that individuals with ID living in group homes typically have nutritionally poor diets that are planned and prepared by poorly trained staff, who do not support adults with ID in making healthy food choices. In a study by Koritsas and Iacono (2016), a majority of individuals with ID also felt they had little choice in the foods they ate. Adults with ID may be going into independent living situations without experience and exposure to making healthy food choices.

While there is a body of literature on interventions focused on healthy behaviors such as exercise for this population (e.g., Bassette et al., 2020; Carter et al., 2017; Obrusnikova et al., 2019; Silva et al., 2017), little is known about interventions to support healthier nutrition habits. Researchers have reported a need to address poor nutrition habits, including a need to increase nutrition knowledge and cooking skills to support healthier eating habits (Utter et al., 2016), but few studies have focused on increasing healthy nutrition knowledge, skills, and practice for adults with ID (Koritsas & Iacono, 2016).

Technology-Based Physical Health Interventions

Technology such as mobile health applications (apps) may increase exposure and support for adults with ID to engage in healthier nutrition habits. The public market for and acceptance of mobile health technologies, such as smartphone apps has grown significantly. However, little is known about adults with disabilities and their use of such health apps (Jones et al., 2018). Users with disabilities have reported high adoption rates of mobile health apps, but have described challenges and concerns about the universal design of such apps, and the need for additional support for adults with more extensive support needs (Jones et al., 2018). For individuals with ID, technology use with the addition of self-management strategies like goal setting, self-monitoring, and visual support interventions, have been promising in increasing awareness of and promoting behavior change in physical health behaviors such as exercise and nutrition (Author, 2022; Ptomey et al., 2015). Self-management, more broadly, refers to a variety of activities that are related to changing or maintaining behaviors to achieve self-selected outcomes (Browder & Shapiro, 1985). Individuals are taught to manage their behaviors using self-directed strategies such as goal setting, self-monitoring, self-evaluation, and self-reinforcement (Sandjojo et al., 2020)

Ptomey et al. (2015) used a tablet and health apps, an activity tracker, and weekly meetings (data review, problem-solving, goal setting, and social support) to compare the effectiveness of two weight loss diets in overweight and obese adolescents with intellectual and developmental disabilities and determine the feasibility of using the tablet as a weight loss tool.

Both interventions promoted weight loss and the use of a tablet was a feasible tool to deliver a weight loss intervention (Ptomey et al., 2015). In Author (2022), adults with autism and ID in the control group had access to a mobile health app and activity tracker, and adults with autism and ID in the intervention group had access to the same mobile health app, same activity tracker, and self-management strategies. Participants in the intervention group took a greater number of weekly steps across the 12-week intervention (Author, 2022).

Purpose

While we recognize the importance of going beyond awareness of healthy nutrition to being exposed to various foods (e.g., smell, feeling, and taste) and consuming nutritious choices, the purpose of this study was to pilot this nutrition app and self-management intervention on identifying nutritious choices for adults with ID with low levels of nutrition awareness. Increases in knowledge can be an important precursor or mediator of behavior change (Kulik et al., 2019). We examined the use of a mobile nutrition app called *Fooducate* with additional goal setting and self-monitoring supports for adults with ID on identifying nutritious choices. We also explored participants' experiences and perspectives on the *Fooducate* app including feasibility and usability in identifying nutritious choices. This pilot study addressed the following research question: Is there a functional relation between the use of a self-management intervention with a nutrition app and identifying more nutritious choices for adults with ID?

Method

Participants

Approval from the institutional review board and consent were obtained before beginning the study (IRB-22-14). Participation in the study was open to adults who: (a) were 18 years or older, (b) had ID, (c) did not have a guardian, (d) had access to a smartphone or tablet, and (e) reported wanting to make healthier nutrition choices. Specific details on eligibility criteria are listed in the eligibility visit procedures. We recruited three adults with ID.

Harry was a 43-year-old who identified as a Caucasian male with ID, Anita was a 34-year-old who identified as a Hispanic female with ID, and Xavi was a 50-year-old who identified as a Hispanic male with ID. All participants reported wanting to eat healthier or drink more water. Harry and Xavi reported eating healthy about half of the time before participating in the study. Anita reported eating healthy every once in a while before participating in the study. Harry reported *some* awareness of healthy food and drink items, and Anita and Xavi reported *a little* awareness of healthy food and drink items before participating in the study. While no participants had prior experience with using a health app, all reported they were *comfortable* or *very comfortable* with technology and used technology to help them with other tasks. Refer to Table 1 for participant demographics.

Setting

The study took place in each participant's community in the south-central region of the United States. Goal setting sessions took place in each participant's home. During the week, participants were not limited to where they could scan food and drink items or where they had to be to document daily food and/or drink intake. For example, when scanning items, participants could scan barcodes while grocery shopping, in their pantry, or search for items by category or name within the *Fooducate* app.

Materials

Mobile Device

Each participant had access to a mobile device that was compatible with the *Fooducate* app. We decided personal devices were appropriate for this study, as we did not need access to their device. During training, we provided pictorial task-analytic instructions for participants to download the *Fooducate* app directly and provided verbal prompts when needed.

In addition to their mobile device, for fidelity purposes, participants needed access to a second device they could use to record themselves using the *Fooducate* app during some sessions across all study phases and during some intervention goal setting sessions. While we were ready to provide a device for this purpose, each participant had access to a second device. We only required one mobile device for eligibility to encourage continued use of the *Fooducate* app after study completion.

***Fooducate* App**

The *Fooducate* App is a health app designed by © Maple Media, LLC to support individuals in achieving their diet, health, and fitness goals. Users can track their food, water, and fitness as well as search nutrition levels of food and drink items, search for recipes and diet tips, listen to *Fooducate* podcasts, and post within the community blog. The *Fooducate* app also allows users to scan bar codes on food and drink items using their phone camera or search for items that they eat or drink and shows the user a nutrition grade for that food item. There are 10 grades food items can earn between the highest nutrition grade A and lowest grade D (A, A-, B+, B, B-,…, D). All *Fooducate* data come from the nutrition facts label and ingredient list of the product and manufacturers have no input in the grade a product receives (Flynn et al., 2022). The higher the grade a food or drink item gets, the healthier and more natural the food or drink item.

We had access to each participant's *Fooducate* account to pull data throughout the study. We created individual email accounts for each participant and linked those emails to their *Fooducate* app. Only participants and the research team had access to their accounts. After the study was completed, *Fooducate* accounts were transitioned to each participant's personal email address (i.e., research team members could no longer access their accounts).

Dependent Variable

We examined the use of a goal setting intervention with an embedded self-monitoring checklist on adult use of the *Fooducate* app. We determined if the intervention supported a change in awareness of healthy nutrition options. The dependent variable was the number of food and drink items the participant scanned using the *Fooducate* app that had a nutrition grade of A through B-. In a previous study using the *Fooducate* app, food and drink items were split into either a healthy cluster and an unhealthy cluster, with the healthy cluster including ingredients, beverages, and the food pyramid, averaging a 3.0 or a B average and the unhealthy cluster including foods high in fat/sugar, supplements, and prepackaged meals averaging close to 2.0 or a C average (Flynn et al., 2022). For this study, we focused on participants identifying food and drink items included in the food pyramid and food and drink items with less processing (i.e., items that often receive a nutrition grade of A through B- in the *Fooducate* app).

Experimental Design

This pilot study used single-case research design methodology and design implementation followed What Works Clearinghouse guidelines for single-case research design using version 5.0 (WWC, 2022). We used a multiple-baseline design across participants (Ledford & Gast, 2018) with an embedded changing criterion design. Participants were randomized using Excel to determine dyad order and baseline began simultaneously across participants. Intervention effects were demonstrated by introducing the intervention to the behavior in a staggered fashion, with a minimum of three overlapping data points. Phase change decisions were response guided based on the number of food and drink items participants scanned that received a score of A through B-. When a participant reached the criterion, which was meeting their scan goal for three cumulative days, they were notified it was time for a goal setting session, increased their goal, and began the next phase within the changing-criterion phases. Performance was unconstrained (i.e., participants were not prevented from reaching target goals of scanning 15 nutrition grade A through B- items during any intervention phase). Criterion changes for both studies were determined a priori. The goal increased by five nutrition grade items of A through B- for each new goal/phase starting with five items in the first intervention phase. Data was collected approximately three times per week and the study lasted three months for each participant.

Procedures

Eligibility Visit

Demographics Questionnaire. Participants that consented completed a questionnaire via Qualtrics to gather (a) demographics (e.g., age, identified gender, identified race/ethnicity), (b) information on current nutrition habits, (c) information on nutrition awareness, (d) history and comfort with technology apps, and (e) determine if they wanted to learn more about nutrition and change their habits. If participants answered *probably yes* or *definitely yes* to at least one of the following nutrition questions (do you want to start eating healthy, do you want to drink more water), they met the eligibility criteria for wanting to make healthier nutrition choices. If they reported *none, a little,* or *some* awareness of healthy nutrition, and if they were unable to provide examples of healthy food and drink items, they were recommended for inclusion in this pilot study. A separate pilot study was conducted to increase the consumption of nutritious choices for those who reported high awareness and provided multiple examples of healthy food and drink items. Additional nutrition habit questions included participants to report daily cups of water intake and current levels of healthy eating. A researcher was available to read questions and responses to participants if they indicated they needed support and participants answered the questions directly on a tablet (i.e., no proxies were used). After the demographics questionnaire, participants also completed the social validity measure to gather perspectives on nutrition and intervention components before being introduced to the study. Refer to the social validity section in this manuscript for additional information about social validity.

Confirm ID Diagnosis. During the eligibility visit, we also confirmed ID diagnosis using the Leiter International Performance Scale, Third Edition (Leiter-3; Roid et al., 2013). Participants were presented with tasks in four sections including figure-ground, form completion, classification and analogies, and sequential order to test nonverbal intelligence and cognitive abilities. A nonverbal intelligence score below 70 was needed to be eligible for the study.

Fooducate App and Resources. Next, each potential participant was provided a pictorial task-analytic instruction sheet and account details (i.e., username and password) to (a) download the *Fooducate* app from their app store and (b) log in to the app. We reviewed the app with each participant including (a) how to scan or search for food/drink items and (b) what each nutrition grade meant on the food/drink scanner (e.g., A versus D), and spent time scanning and searching for food and drink items. We also provided visual supports of example food items that would score A or B like pears and plain bagels and non-examples including Doritos and Pop Tarts.

Baseline Sessions

Baseline sessions began the first full day after the screening. Participants each had access to the *Fooducate* app as well as instructions and visual supports to support app navigation and examples/non-examples. Participants were instructed to scan healthy food and drink items that would get a grade of an A through a B-.

Intervention Training

Before starting the intervention, participants met with a member of the research team to be introduced to the goal setting meeting worksheets and procedures for recording goal setting sessions. After instructions were provided, each participant watched the researcher (a) fill out the goal setting sheet, (b) take pictures, and (c) record themselves. Next, each participant had an opportunity to fill out the goal setting sheet, take pictures, and record themselves. We provided feedback as well as behavior-specific praise and ended the training session after each participant practiced two times. While we did not require a specific criterion to move forward, fidelity was measured at each recorded goal setting session, and booster training was provided by a research team member if fidelity fell below 90%.

Intervention

During the intervention which included goal setting and self-monitoring strategies, participants continued to have access to the *Fooducate* app, visual supports for app navigation, and visual supports of examples and non-examples. The lead researcher graphed data continuously and contacted the participant when it was time for them to have a goal setting session (i.e., each time they were ready to change phases). During participant-led goal setting sessions, participants filled out a goal setting sheet (flow chart with embedded self-monitoring checklist). The goal setting sheet walked participants through (a) setting a new goal, (b) adding reminders to their phones for days and times to scan food and drink items, and (c) taking notes of questions they had about the study.

The goal setting session concluded with participants using the self-monitoring checklist at the footer of each goal setting sheet to indicate they completed each meeting task. The self-monitoring checklist included (a) I have a new goal, (b) I found at least three days and times to identify healthier food and drink items, (c) I entered three or more days and times to identify healthier food and drink items as events in my phone, and (d) I sent the goal setting video recording to the research team. For fidelity, participants video-recorded some goal setting meetings. After participants finished the goal setting tasks and the self-monitoring checklist, they sent the video recording to the research team's secure drive.

Maintenance

Five weeks after the last intervention session, the research team logged into each participant's *Fooducate* account and reviewed their *Fooducate* history for the prior week (i.e., four weeks post-intervention). Maintenance sessions were designed to measure the participants' ability to utilize the *Fooducate* app while removing the goal setting and self-monitoring supports. During maintenance, we counted how many food and drink items with a score of A through B- were scanned for three separate days.

Reliability

Interobserver agreement (IOA) was calculated for 54–100% of sessions across baseline, intervention, and maintenance phases, exceeding WWC (2022) standards for single-case research designs, and was considered reliable if IOA was 80% or higher. Two independent researchers logged into each participant's Fooducate account and calculated how many nutrition grade A through B- items were scanned during sessions. We calculated IOA using an item-by-item method of dividing the number of agreed individual data points by the total number of agreements plus disagreements and multiplying by 100. IOA was collected for 100% of baseline sessions, 54–86% of intervention sessions, and 100% of maintenance sessions, and agreement was 100% across each phase.

Procedural Fidelity

Procedural fidelity was measured during all study conditions (baseline, intervention, maintenance) to determine if the methods were carried out as intended, including different steps in each condition. For 25–40% of sessions in each phase, participants video recorded themselves or someone helped record them scanning items and uploaded the video for the research team to observe. During the intervention, participants also video-recorded themselves during goal setting meetings and sent the video to the research team to observe. We measured procedural fidelity by using a combination of observation and checklists. We logged into each participant's *Fooducate* dashboard to review their scanning history and reviewed participant videos to (a) ensure it was the participant accessing the app and (b) complete a checklist. Checklists were used for procedures expected to occur one time per session (e.g., participant accurately set a new goal, participant entered reminders into their phone for the upcoming week). Procedural fidelity was 98.9% for Harry, 93.3% for Anita, and 90.0% for Xavi. The most missed fidelity step was not submitting video recordings of the session. When this occurred, participants were instructed to record the next session. Session length was determined from submitted videos. Scanning lasted on average three minutes during baseline sessions and eight minutes during intervention sessions. Goal setting meetings took an average of 10 minutes.

Social Validity

We gathered participants' perspectives on nutrition as well as intervention components both before the study and after the study, using the same questionnaire. The questionnaire consisted of a 3-point Likert visual scale as well as open-ended questions. Each participant read the questionnaire on their own and no additional visuals were needed. Two participants asked if they could respond orally, and the researcher scribed on the social validity questionnaire form for those two participants. Questions included their preferences on making healthy food and drink choices, feelings around eating and drinking healthier, and perceived ability to set goals and use a mobile app to help reach goals.

An additional questionnaire was completed after the study to gather perspectives and experiences with the Fooducate app and intervention components. The questionnaire consisted of a 3-point Likert visual scale as well as yes/no questions covering the feasibility (i.e., appropriateness of the materials from each participant's perspective) and usability (i.e., the user experience of the *Fooducate* app and intervention components).

Data Analysis

Visual analysis was the primary method used to analyze data. We assessed data within each phase (i.e., level, trend, variability, and stability), compared data between adjacent phases (i.e., changes in data patterns, the immediacy of effect, overlap, and consistency in data patterns across similar conditions), and ensured there was an opportunity for at least three demonstrations of an effect at three different points in time. Level was described using the range of the dependent variable within each phase. Stability was defined as 80% of data points within the stability envelope of one scanned item from the median. In addition, we used between-case standardized mean difference (BC-SMD; Hedges et al., 2012) to evaluate intervention effects. BC-SMD is a method to estimate the magnitude of effect that is comparable to a group-design Cohen's d by comparing participant mean performance in adjacent comparable conditions (e.g., baseline to intervention). Effects can be interpreted as small (1.4), medium (3.6), or large (10.1). We used the online BC-SMD application (Pustejovsky et al., 2023).

Results

Identifying Healthy Nutrition Choices

Figure 1 includes a graph of the number of healthy food and drink items participants identified during sessions (i.e., food and drink items that received a grade of A through B- in the *Fooducate* app). All participants met all predetermined goals during intervention phases, which included goals of 5 A/B items scanned for three cumulative days during the first intervention phase, 10 A/B items scanned for three cumulative days during the second intervention phase, and 15 A/B items scanned for three cumulative days during the third intervention phase. From visual analysis of the data in Figure 1, we determined there was a functional relation between the intervention (using a mobile health app with goal setting and self-monitoring) and identifying nutritious food and drink items. We also evaluated effectiveness using BC-SMD, using the restricted maximum likelihood (REML) model on the online calculator. Mean differences between baseline and intervention performance estimate a medium effect (BC-SMD=3.6, 95% confidence interval [CI] = [2.6, 4.6]).

Harry

For Harry, baseline was stable with only one scanned item that received a score of A through B- across six sessions (peanut butter with a grade of A-). Harry scanned more than one item during baseline sessions, however, 80% of scanned items during baseline received lower/unhealthy grades. Level ranged from 0–1 nutrition grade A through B- items scanned in baseline and jumped to a range from 3–8 items in the initial intervention phase, 10–11 items in the next intervention phase, and 13–15 items in the third intervention phase. Levels for maintenance were higher than baseline sessions but dropped to a range of 4–8 items. It took Harry six sessions to meet the first intervention phase goal, three sessions during the second, and five sessions during the third. Trend was decelerating in baseline and either zero celerating or accelerating (improving) in intervention conditions. Data was stable in the second and third intervention phases, but somewhat variability within the first intervention phase. There was no overlap between baseline and intervention.

Anita

For Anita, baseline was stable with only one scanned item that received a score of A through B- across nine sessions. Most items (67%) scanned during baseline received lower grades of C+ through D-. Level ranged from 0–1 nutrition grade A through B- items scanned in baseline and jumped to a range of 5–7 items in the initial intervention phase, 10–13 items in the next intervention phase, 13–15 items in the third intervention phase, and 10–13 items during maintenance. It took Anita five sessions to meet the first intervention phase goal, three sessions during the second, and four sessions during the third. Data was somewhat variable during intervention phases. However, there was no overlap between baseline and intervention.

Xavi

For Xavi, baseline was stable with no scanned items receiving a score of A through B- across 12 sessions. All items Xavi scanned during baseline received lower grades of C+ through D-. Level jumped from 0 nutrition grade A through B- items scanned in baseline to a range of 5–6 items in the initial intervention phase, a range of 4–10 items in the next intervention phase, a range of 5–15 items in the third intervention phase, and a range of 4–8 items during maintenance. It took Xavi three sessions to meet the first intervention phase goal, five sessions during the second, and five sessions during the third. Trend was zero celerating during baseline sessions and accelerating (improving) during intervention phases. Data was stable in the first and second intervention phases, but somewhat variable within the last intervention phase. There was no overlap between baseline and intervention.

Social Validity

Overall, social validity was high across the use of the *Fooducate* app and the intervention. Before the study, all participants reported they did not believe they could set their own goals to increase nutrition awareness. They were also unsure or didn't think they would like to use an app on their phone to help them with their goals. However, all participants reported they believed they could set their own goals at the end of the study. Harry and Xavi shared that they enjoyed the different ways they could search for healthier food and drink items. Harry preferred to scan items to learn about them while Xavi preferred to search for specific items that might be healthier.

All participants agreed (a) they liked the *Fooducate* app, (b) they felt the app helped them keep track of their health, (c) the app helped them want to make healthier nutrition choices, (d) the app gave them information to help them be healthier, (e) the app could help others make healthier choices, and (f) they wanted to keep using the app after the project was over. Participants did not explore app features outside of the features needed for their study (i.e., participants reported they only used the food finder and search feature). All participants agree the goal setting sheets and self-monitoring checklists were easy to understand, felt they learned something from the intervention, and felt the intervention helped them make find healthier choices.

Discussion

The current study piloted a mobile nutrition app with a self-management intervention to increase awareness of healthier food and drink choices. Components of the self-management intervention included goal setting and self-monitoring. Data were gathered on the effectiveness of the intervention, as well as participant perception of the intervention, including feasibility and usability. The combination of the *Fooducate* app with goal setting and self-monitoring was an effective and feasible intervention to support adults with ID with identifying healthier nutrition items.

This pilot study expanded the literature on the use of mobile health apps with additional support for individuals with ID. For example, Bassette et al. (2020) used video-based instruction and the *Exercise Buddy* app with prompting to teach physical activity skills to individuals with autism and ID. Similar to previous research (Author, 2022), access to the mobile health app alone did not result in increased awareness of nutritious food and drink items. During baseline, participants had access to the *Fooducate* app, visual supports to navigate the app, and example and non-example visuals. However, level changes were not present until intervention sessions, when self-management strategies were introduced. Participants stated they liked having a goal and worked hard to reach their goals. Participants also reported it took a long time to scan or search for items that counted because items they thought were healthy got unhealthy scores. Harry and Anita stated that it got easier to figure out which items counted as healthy after some practice. It is important to note that levels dropped for two of the three participants during maintenance sessions, suggesting a more gradual process of fading self-management supports may be necessary before individuals with ID solely use the mobile health app (e.g., fading or removing the self-monitoring checklist first).

Participants needed minimal support in using the intervention, with fidelity rarely falling below 90% for a session. Participants recording themselves when using the app was the most missed fidelity step. When this step was missed, they were asked to record themselves the next time they were on the app. Participants consistently navigated the app appropriately during all phases and filled out the goal sheet, including the self-monitoring checklist accurately and independently during the intervention. Harry stated that it was easy to determine if the goal was met because “we just had to look at the app and count how many As and Bs we had and see if we got the goal three times”.

During initial intervention sessions, Xavi struggled with the goal setting tasks. Xavi was only counting when the exact goal number was scanned and not the goal number plus anything higher (e.g., when the goal was five A through B- items, Xavi only counted it as meeting the goal when the total scanned that session was exactly five A through B- items). Xavi had two fidelity boosters early in intervention sessions and we practiced this step using the same procedures as initial training. Xavi was able to complete the goal setting tasks with more accuracy after the fidelity boosters. While we did not assess math skills before starting the intervention, participants had to compare session numbers to their goals throughout the intervention. In future studies, researchers should consider assessing these skills during eligibility and building additional training or instructional support if needed.

Implications for Practice and Research

Number comparison can be applied within multiple daily living, vocational, and recreational contexts (e.g., budgeting, managing inventory, setting exercise goals) and should be a focus for instruction (Spooner & Browder, 2015). Focusing on contextualized math instruction for students with ID can support self-determined behaviors such as goal setting. Contextualized instruction refers to the development of an academic concept within a real-life activity or natural routine (Saunders et al, 2017).

In addition to focusing on contextualized instruction, school programs and families should consider the role of nutrition when teaching life skills to students with intellectual and other disabilities. Participants in this pilot study lived independently or with a roommate, suggesting participants had greater choice and autonomy around what to eat and when (Koritsas

& Iacono, 2016). However, during the initial social validity questionnaires, Anita and Xavi indicated that they did not know much about healthy foods. They reported they often made what others taught them to make, including food simple in preparation like boxed macaroni and cheese, soup from a can, and prepackaged meals. Xavi also mentioned eating out often and picking the cheapest things on the dollar menus like burgers and small fries. Participant responses suggest that even though there may be freedom in what they choose to eat and drink from a self-determined perspective, they may not have the knowledge, skills, or prior exposure to healthy nutrition which may lead to choosing only familiar and/or unhealthy nutrition options.

There also may be a disconnect between how often individuals with ID perceive themselves to be eating healthy and their healthy eating habits. During the demographics questionnaire, Xavi reported eating healthy about half of the time, however Xavi was only able to provide one example of healthy food and drink items in the same questionnaire (water). In addition, all items Xavi scanned or searched for during baseline were items with nutrition grades of C+ or lower. Future research should consider exploring individual perceptions of their healthy habits while also examining nutrition consumption habits. Even when adults with ID have high awareness of the importance of healthy living and understanding of nutritious food choices, there may be challenges with translating that into healthy behaviors, indicating a need for focused, motivating interventions (Kuijken et al., 2015).

After the study, Anita and Xavi stated they were more aware of healthy food options and wanted to learn more about how to add them to meals. Success in this pilot study may also be contributed to each participant indicating they wanted to learn more about nutrition and make changes to their nutrition habits. Demographic questions surrounding readiness were part of the inclusion criteria to encourage participation from those who were ready to learn and make changes to nutrition behaviors, and for participants to be the ones who decided if they were ready to learn and make those changes.

Limitations and Future Directions

There were several limitations in this study that warrant attention. While the sample size is appropriate for single-case research and the pilot study allowed for the opportunity for three demonstrations of an effect, the findings are not generalizable. Piloting this study allowed us to determine if this mobile health app holds promise to be used with self-management strategies in larger and/or multi-component studies. In future studies, researchers can examine the *Fooducate* app with more adults with ID and/or explore an intervention focused on nutrition and physical activity for individuals with ID.

Next, the intervention included more than one self-management strategy (goal setting and self-monitoring). These strategies were not isolated, so the most critical component of the intervention is unknown. In the future, researchers should continue to explore participant preferences when interventions have multiple components as well as isolate those preferences during the study. In addition, when researchers contacted participants to let them know they were ready for a criterion change, this could have potentially been reinforcing for participants (i.e., a potentially unplanned influence on future intervention sessions).

Finally, while it was beneficial that this pilot study was conducted in real-world contexts, this study did not formally evaluate generalization to other health behaviors or tasks within the *Fooducate* app or similar mobile health apps. While the *Fooducate* app supports users in other behaviors (e.g., food tracker), we only piloted the scanner and search features of this app and results are related to these two features of the app specifically and should not be generalized to other app features. Future studies should explore additional app features before engaging in a larger study requiring their use.

Conclusion

Utilizing mobile health apps with additional self-management supports such as goal setting and self-monitoring can increase awareness of nutrition choices for adults with ID. These results add to previous literature on the use of a combination of mobile health apps with additional self-managed supports to increase knowledge of and engagement in physical health behaviors. These results also highlight the capabilities of adults with ID in using mobile health technology with additional supports they can manage themselves. Moving forward, future research is needed to replicate these results and the generalizability of these findings as well as explore additional supports that may be needed for individuals with ID who have more extensive support needs.

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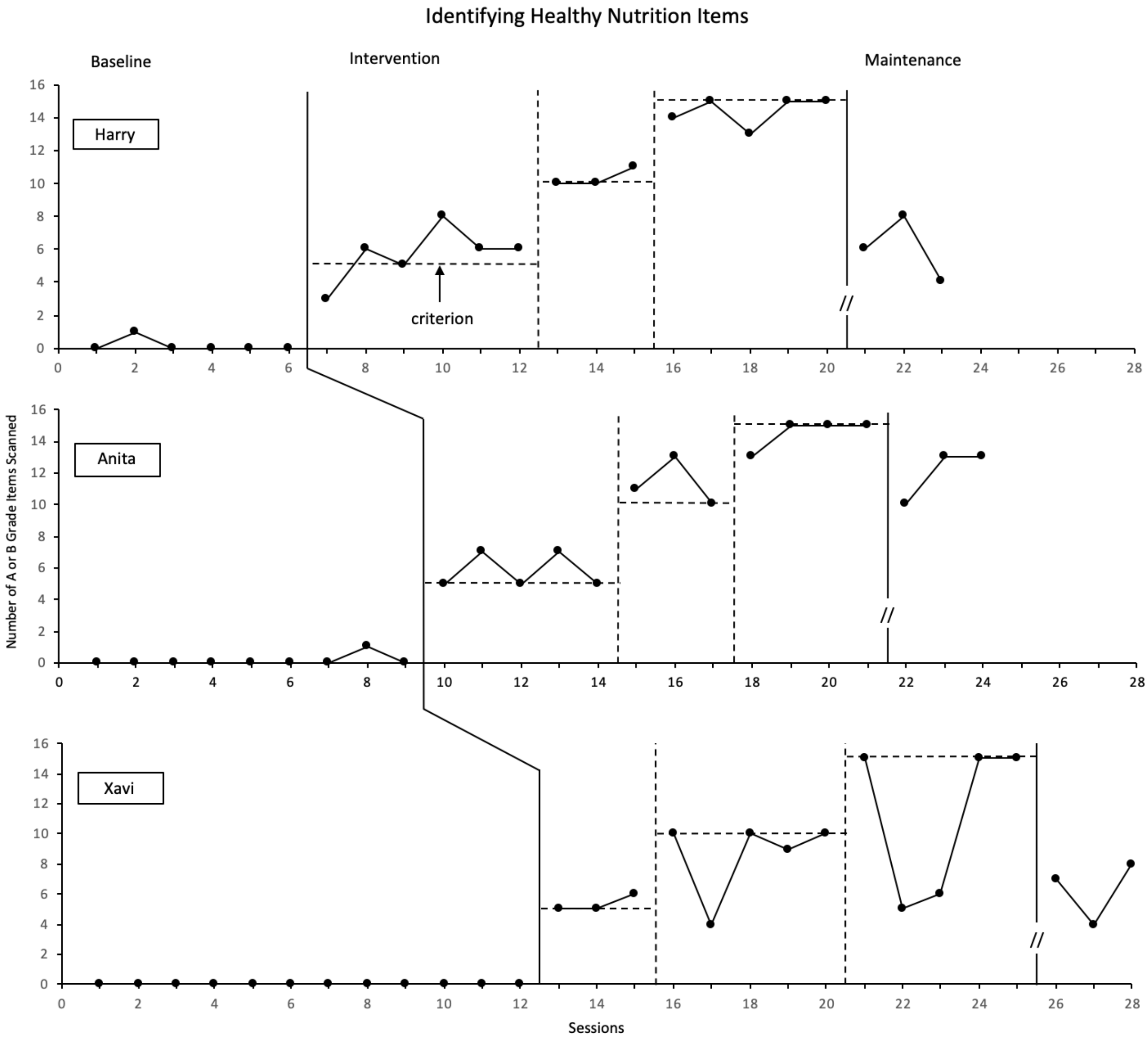
Figure 1

Results



Note. There were approximately three sessions per week. Maintenance data was collected four weeks after last intervention session date. // represents a break in data collection.

Table 1

Participant Demographics

Participant	Age	Identified Ethnicity	Identified Gender	IQ	Perceived Knowledge of Healthy Nutrition	Previous Health App Use
Harry	43	White	Male	60	I know some	No
Anita	34	Hispanic or Latin/x/a/o	Female	57	I know a little	No
Xavi	50	Hispanic or Latin/x/a/o	Male	60	I know a little	No

Note. IQ= intelligence quotient. IQ determined by the Leiter International Performance Scale, Third Edition (Roid et al., 2013) administered by a trained member of the research team.