# Technology to Improve Independent Job Performance of Young Adults with Intellectual Disabilities

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# What is an Intellectual Disability?

Significant intellectual and adaptive limitations, which are manifested in conceptual, social, and practical contexts (Schalock et al., 2010)

- Four common classifications (American Psychiatric Association, 2000)
  - Mild
  - Moderate
  - Severe
  - Profound

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## Our Mission:

The mission of the ClemsonLIFE™ Program at Clemson University is to provide a coordinated course of study that includes career exploration and preparation along with self-awareness, discovery, and personal improvement through a framework of courses, job internships, and community participation.

## Students:

- attend ClemsonLIFE classes with a modified functional curriculum
- take a leisure skills course for 1 hr/semester
- participate in a job internship experience
- participate in cooking classes in their apartment (2xs/week in evenings)
- participate in Creative Inquiry programs: TOP Soccer and Challenger Baseball (1x/week in evenings)

# Research

Conducted in the areas of:

- Time management
- Health/fitness
- Job performance

# Why Focus on Employment Outcomes?

- Only 37.2% of young adults with ID currently have paid employment outside of the home (U.S. Department of Education, 2010)
  - *Compared to other disability categories*
    - Learning Disability: 66.7%
    - Hearing Impairment: 56.4%
    - Emotional/Behavioral Disorder: 48.2%
- Limited employment options (U.S. Department of Education, 2010)
  - Over half work 34 or fewer hours per week
  - Nearly half have an income of less than $7.25 per hour
- Sheltered employment outcomes more likely (Grigal, et al., 2011)
- Consequences?

# Job Loss

- Most common reasons for job loss (Howarth, et al., 2006)
  - Performance problems stemming from excessive absenteeism
  - *Not following instructions*
  - *Not being able to complete assigned work responsibilities*

# Improving Outcomes

- **Supported Employment** (McInnes, et al., 2010; Rusch & Braddock, 2004)
  - Initial assessment of skills
  - Locating jobs aligned with student strengths
  - Developing a plan to obtain employment
  - Provision of individualized supports
    - Workplace accommodations
    - Environmental prompts
    - Personnel supports
  - *Job coach* (Test, et al., 2000)
    - Provision of direct services to the client
    - Assisting with job identification and placement
    - Providing training on the job-site

# Improving Outcomes

- **Self-Management Strategies** (Lancioni & O'Reilly, 2001)
  - Object cues attached to cards
  - Use of picture cues presented on cards
  - Self-verbalizations
- **Assistive Technology** (e.g., Cihak, et al., 2007; Davies et al., 2003; Van Laarhoven et al., 2007)
  - Picture cues presented via computer-based systems
  - Verbal cues stored in audio devices
  - Variety of uses to improve skill acquisition of employment-related tasks

# Portable Electronic Assistive Technology


- **Advantages over other forms of AT**
  - Portable and easy to use (Wehmeyer, et al., 2008)
  - Discrete (Taber-Doughty, 2005)
  - Socially acceptable (Davies, et al., 2002; Gillette & DePompei, 2004)
- **Examples**
  - Handheld computers
    - PDA
    - Pocket PC
    - iPod
    - iPad
  - Vibrating pagers and watches
  - DVD players

# Synopsis of Previous Research

- Research indicates that use of AT is a viable method to assist individuals with ID at employment settings (e.g., Mechling, et al., 2009; Riffel et al., 2005; Van-Laarhoven, et al., 2009)
    - Increased independence
    - Reduction in need of external supports
    - Benefits were derived across multiple settings, participants, and behaviors
- The majority of recent studies used treatment packages (e.g., Lancioni et al., 2000; Mechling et al., 2010; Davies et al., 2002)
    - Need exists to evaluate individual components of each intervention (Banda, et al., 2011; Mechling et al., 2009)
- Need exists to evaluate new and emerging technologies (Wehmeyer, et al., 2008)

# Purpose of this Research

1. Can the use of portable and widely-accessible electronic AT (i.e., iPod Touch) improve the independent and correct completion of employment-related tasks among young adults with ID?

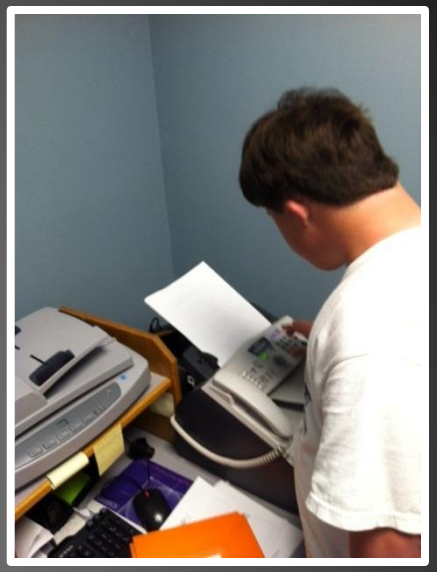
2. Does the specific method of prompting (audio, video, or a combination of both) provided by a portable device have an effect on participants' performance when completing an employment-related task?

3. Is the most effective method of prompting related to the participant's preferred prompting format?

4. Will performance levels be maintained over time?

# Setting and Participants

- Setting
  - Clemson University
    - Office setting
- Participants
  - Three young adults
    - Selection criteria
      - Currently enrolled in ClemsonLIFE
      - Diagnosis of a moderate intellectual disability



| Participant | Age | Race | Gender (M/F) | Disability | Full Scale IQ | Adaptive Behavior Composite |
|---|---|---|---|---|---|---|
| **Chris** | 21-8 | Caucasian | M | ID | 44 | 51 |
| **Dan** | 21-11 | Caucasian | M | ID | 41 | 58 |
| **Mark** | 22-8 | Caucasian | M | ID | 47 | 57 |

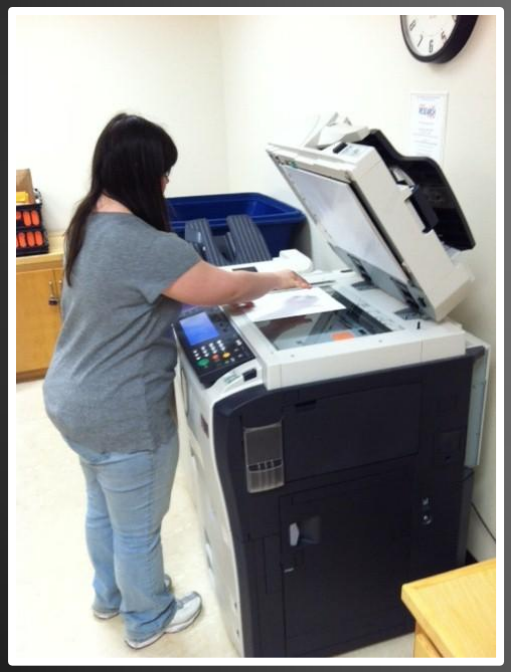
# Procedures

- Task analysis developed for three novel job-related tasks common to an office setting
  - Making a copy
  - Scanning and emailing a document
  - Faxing a document

- Steps of each task recorded into the Functional Planning System application in three formats using an iPod Touch
  - Video only
  - Audio only
  - Video and audio combined

# Task Analysis Example

| Skill | Number of Steps | Sequence of Steps |
|---|---|---|
| Copying | 11 | 1) Pick up papers from inside the purple folder that is labeled "Copy"<br>2) Place papers to be copied face up in the tray on the top of the machine<br>3) Press purple "Copy" button<br>4) Press yellow "Reset" button<br>5) Press the "2" button on the number key pad for number of copies being made<br>6) On the digital screen, touch the gray box labeled "Duplex"<br>7) On the digital screen, touch the box labeled "1-sided>>2-sided"<br>8) Press the green "Start" button<br>9) After copying is complete, remove original papers from the top tray<br>10) Remove copies from the side tray on the left<br>11) Place all papers in the red folder that is labeled "Finished" |



# Materials

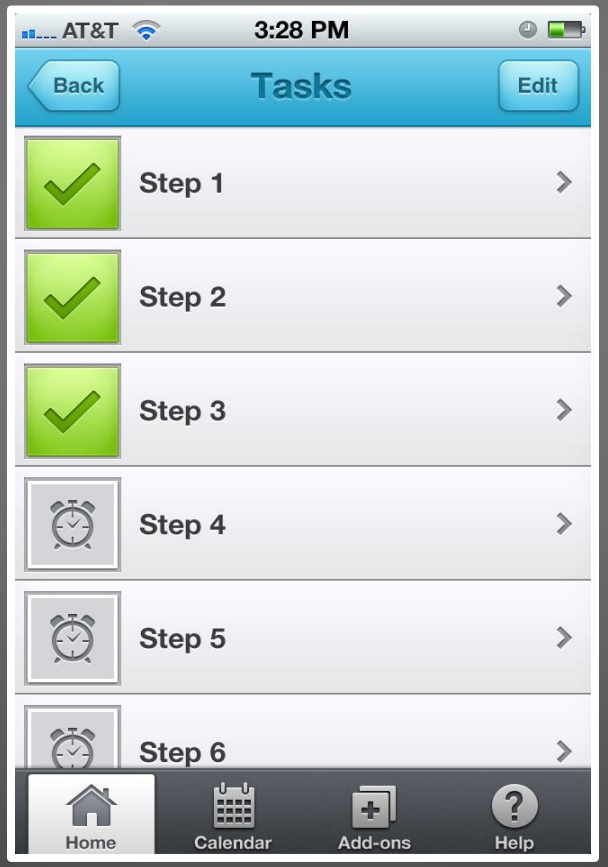
iPod Touch 4G

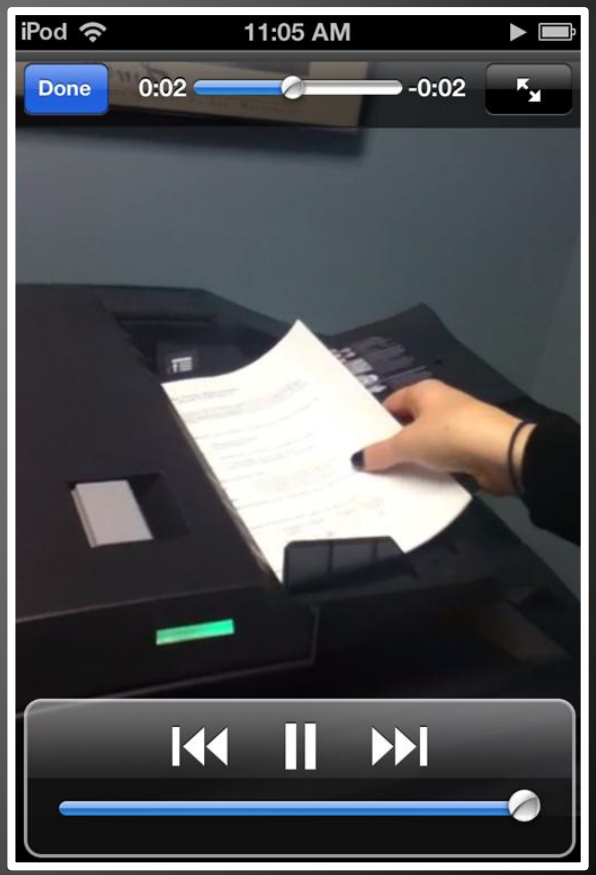
# Materials (continued)

## Functional Planning System application

# Materials (continued)

## Functional Planning System application

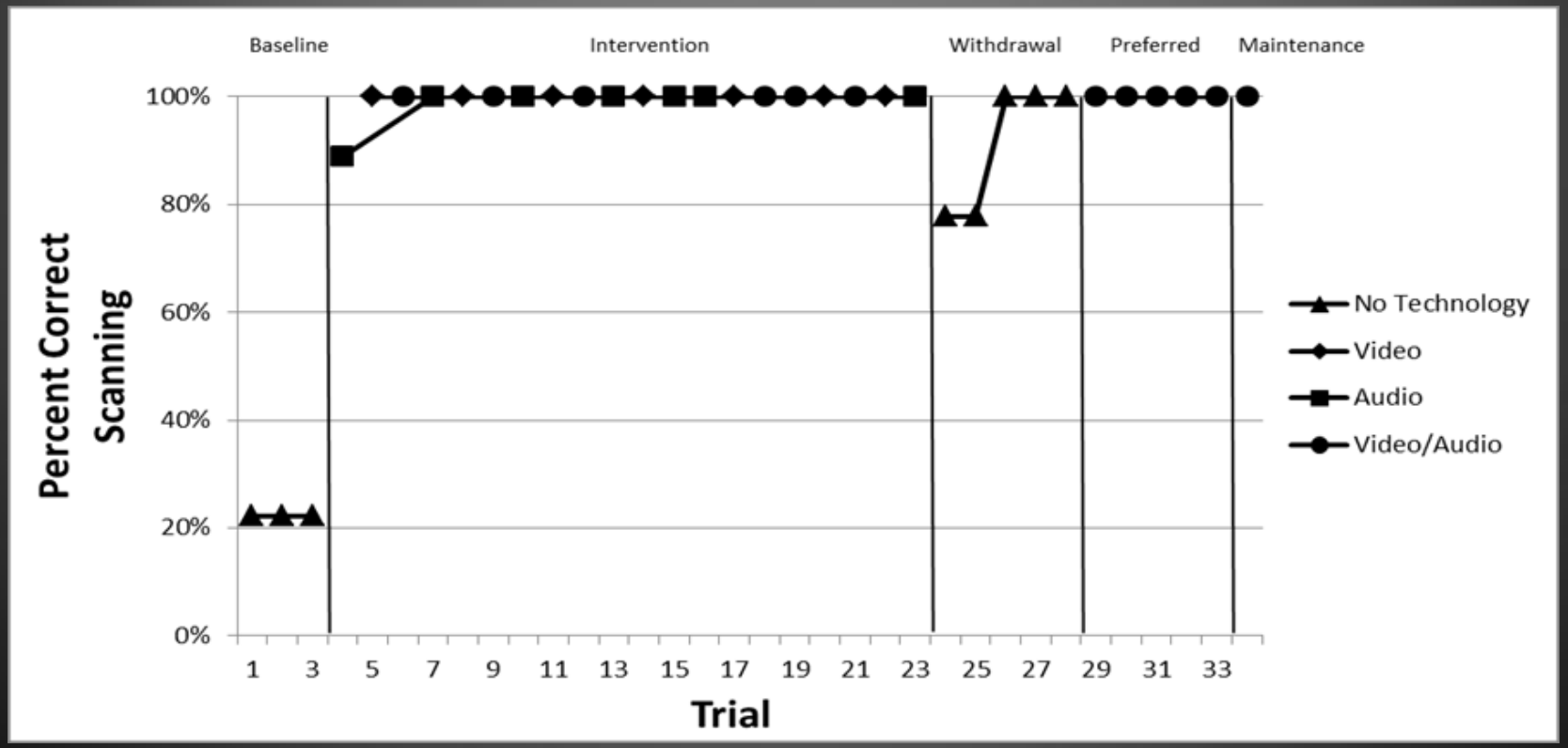



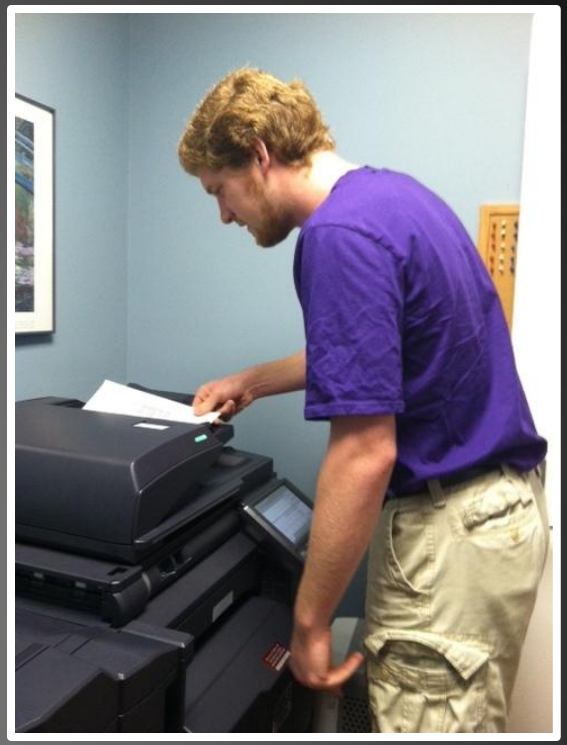
# Design

## Alternating Treatments Design

## Example



# Baseline



- Included several trials for each task
  - No prior training for the task
  - No access to the iPod Touch
- Procedures
  - "Please make a copy of the documents"
  - Verbal encouragement
  - Non-specific verbal praise
  - No assistance or prompting
  - Trial termination
    - Failure to initiate a response within 15 seconds
    - Participant indicated that he was finished or did not know how to do the task
    - Failure to complete the task within 10 minutes

# Training

Participants were initially introduced to the iPod Touch and application

- Use of an unrelated task (shredding papers)
- All three modes of presentation used
- Assistance was provided as-needed

Completion of mastery criteria before proceeding

# Intervention Procedures

- One session per day
  - Each session included a total of three trials
    - One trial for each office task (copying, scanning, or faxing)
    - One mode of presentation per task (video, audio, or video and audio combined)
    - Counterbalanced across sessions
- "Please make a copy of the documents while using the iPod to help you"
  - Prompting and/or assistance provided if the participant
    - Failed to initiate a response within 15 seconds
    - Provided an incorrect response
    - Requested help
  - Least-to-most restrictive prompt hierarchy was used
    - Gestural, verbal, imitative, physical

# Sample Presentation Sequence

| | First Task | | Second Task | | Third Task | |
|---|---|---|---|---|---|---|
| Day | Mode | Task | Mode | Task | Mode | Task |
| 1 | Video | Faxing | Audio | Scanning | Combined | Copying |
| 2 | Audio | Copying | Combined | Faxing | Video | Scanning |
| 3 | Combined | Scanning | Video | Copying | Audio | Faxing |
| 4 | Video | Faxing | Combined | Copying | Audio | Scanning |
| 5 | Audio | Copying | Video | Scanning | Combined | Faxing |
| 6 | Combined | Scanning | Audio | Faxing | Video | Copying |
| 7 | Combined | Copying | Audio | Scanning | Video | Faxing |
| 8 | Video | Scanning | Combined | Faxing | Audio | Copying |
| 9 | Audio | Faxing | Video | Copying | Combined | Scanning |
| 10 | Audio | Scanning | Video | Faxing | Combined | Copying |
| 11 | Combined | Faxing | Video | Scanning | Audio | Copying |
| 12 | Combined | Copying | Video | Faxing | Audio | Scanning |
| 13 | Audio | Scanning | Combined | Copying | Video | Faxing |
| 14 | Combined | Faxing | Audio | Copying | Video | Scanning |
| 15 | Audio | Faxing | Combined | Scanning | Video | Copying |
| 16 | Video | Copying | Audio | Faxing | Combined | Scanning |
| 17 | Video | Scanning | Audio | Copying | Combined | Faxing |
| 18 | Video | Copying | Combined | Scanning | Audio | Faxing |

# What Were We Measuring?

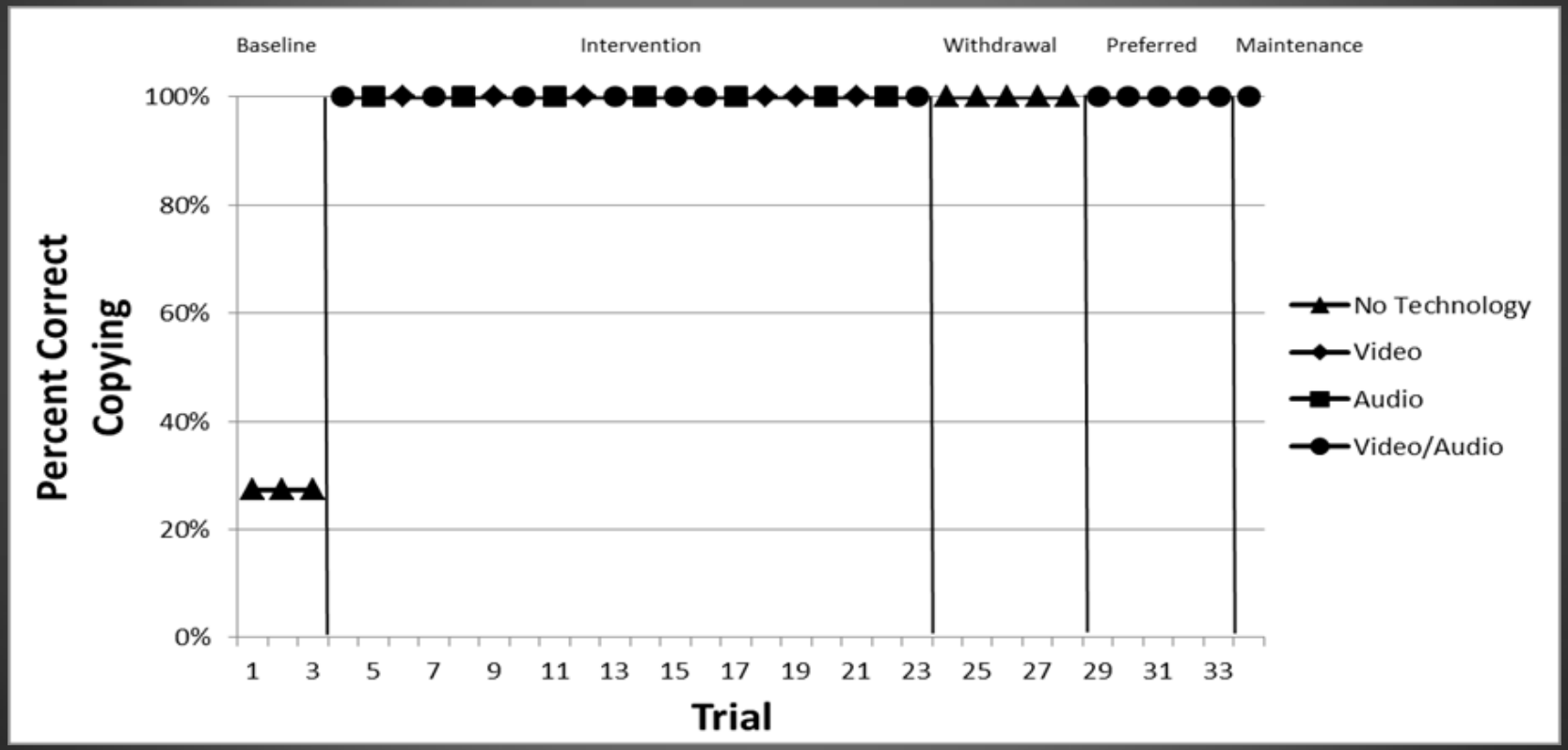
1. Number of steps completed correctly and independently
2. Duration per task throughout the intervention phase
3. Participant's self-reported prompting mode preference
   - Two occasions

# Data Scoring Guidelines

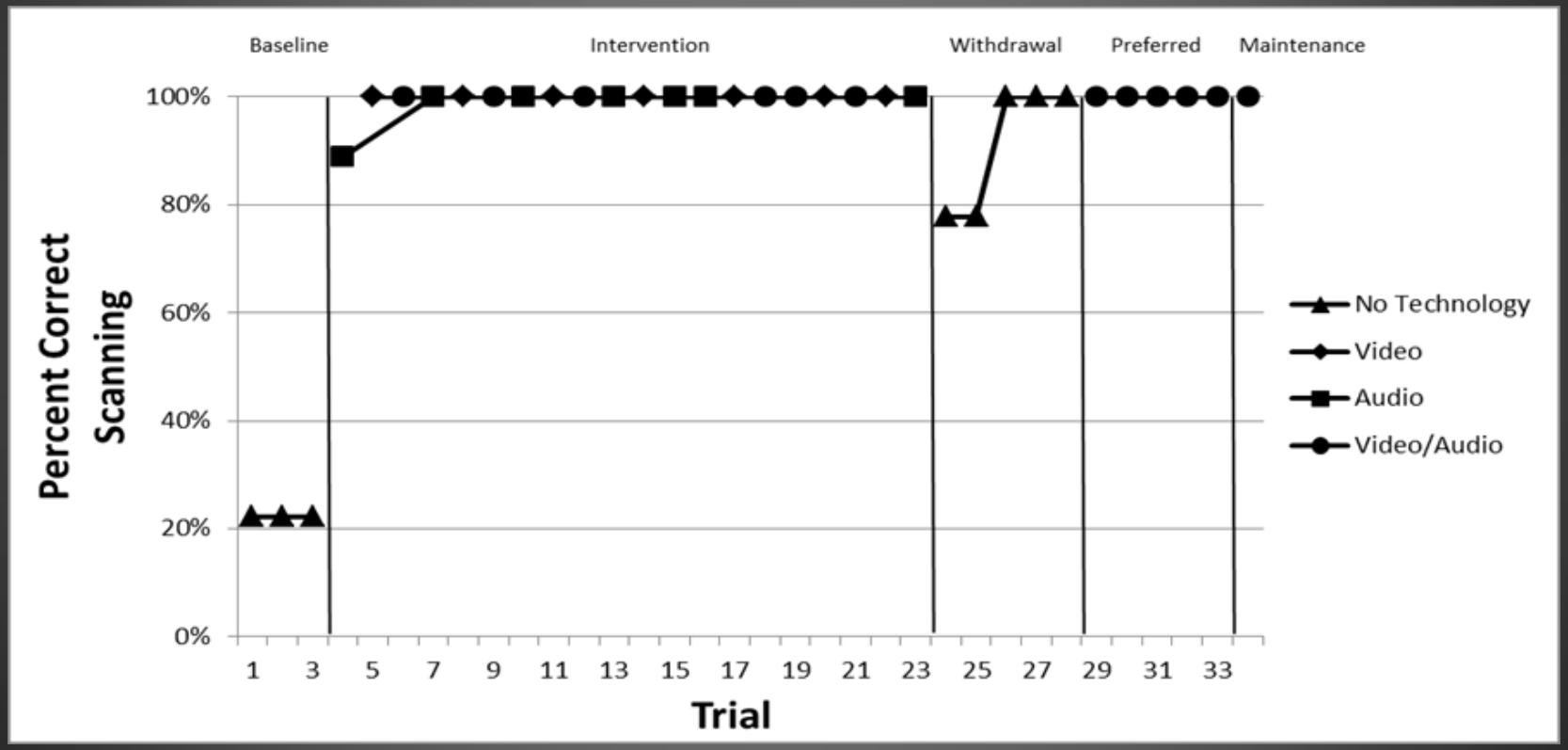
- Independent and correct completion
  - If no prompting was provided and if the step was completed with 100% accuracy
- Duration
  - Timing began after the last word of instructions was provided
  - Stopped when the participant placed papers in the “Finished” folder

# Video Demonstration

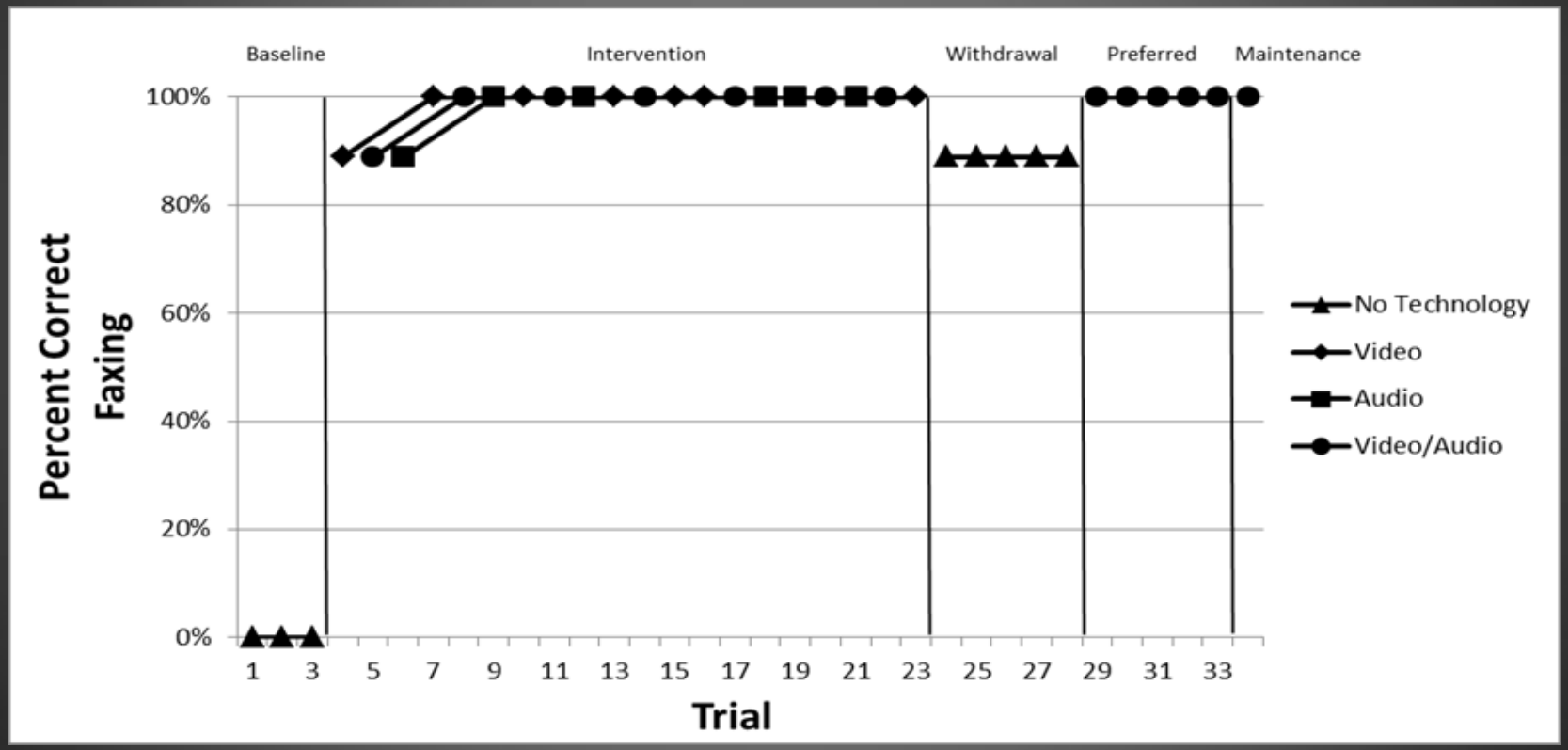
# Chris
# Copying Task



# Chris
# Scanning Task



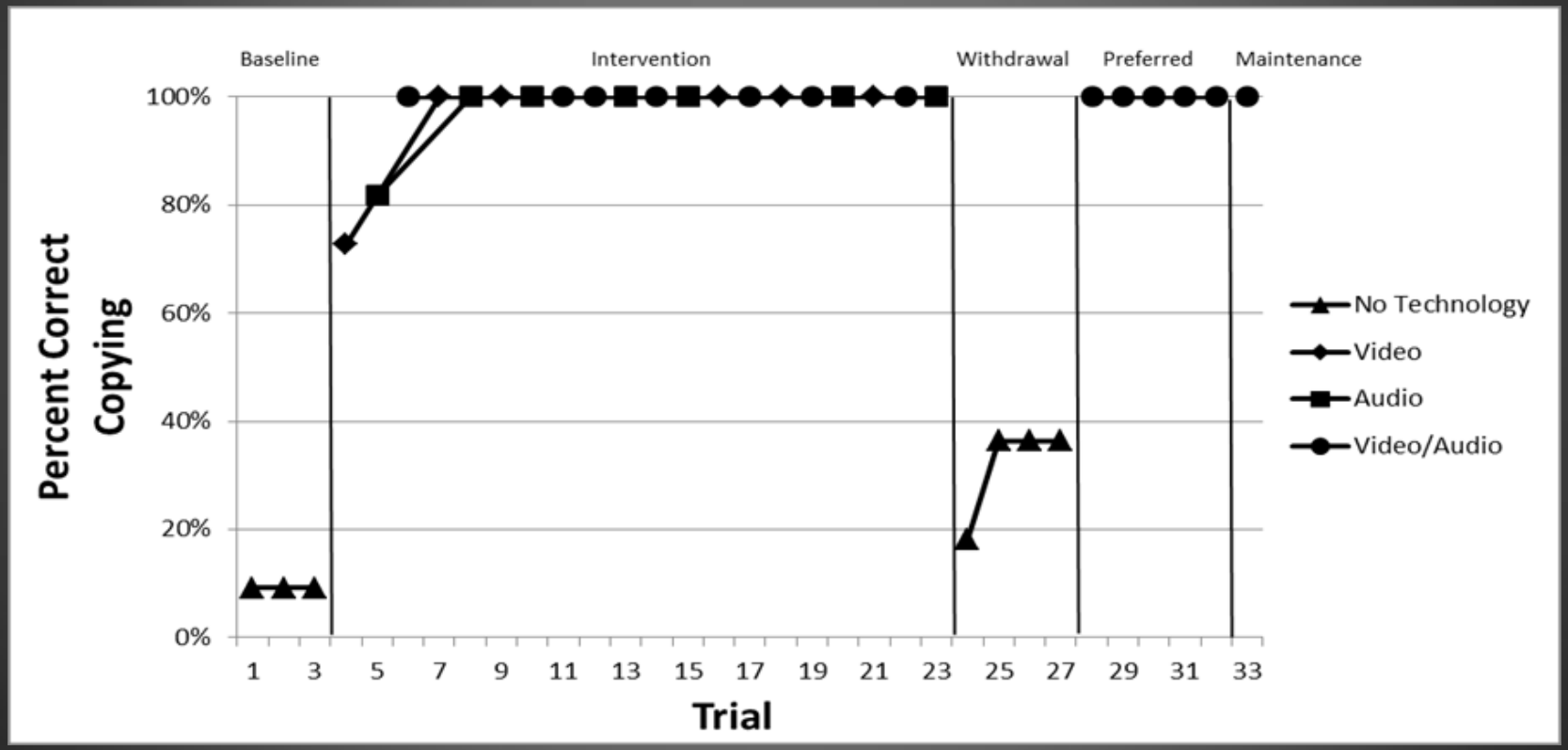
# Chris
# Faxing Task



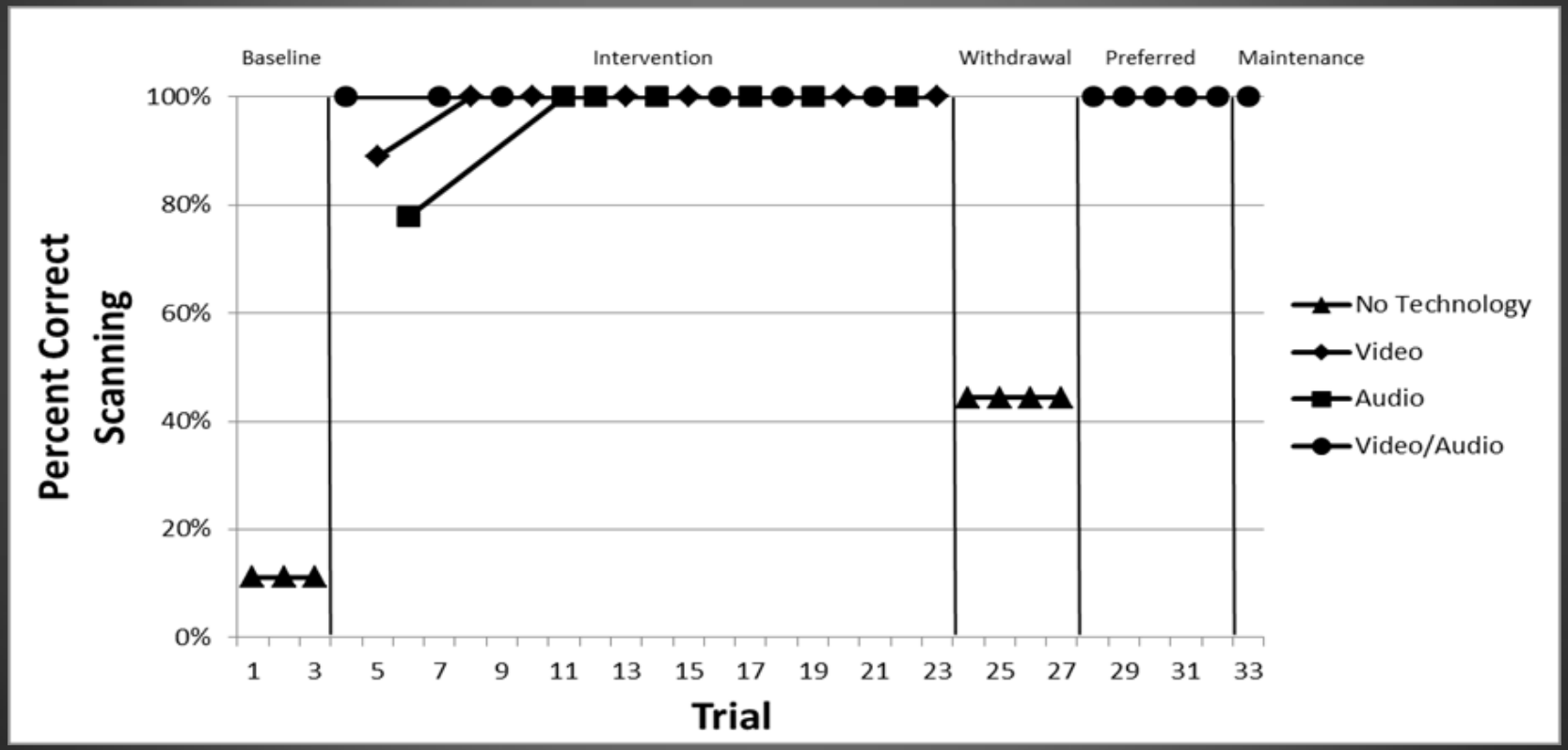
# Chris
# Mean Duration to Complete Tasks

| Mode | First 3 Trials | Last 3 Trials | Change |
|---|---|---|---|
| Copying | 210s | 162s | **-23%** |
| Scanning | 205s | 124s | **-40%** |
| Faxing | 377s | 237s | **-37%** |
| **Overall Mean** | **264s** | **174s** | **-34%** |

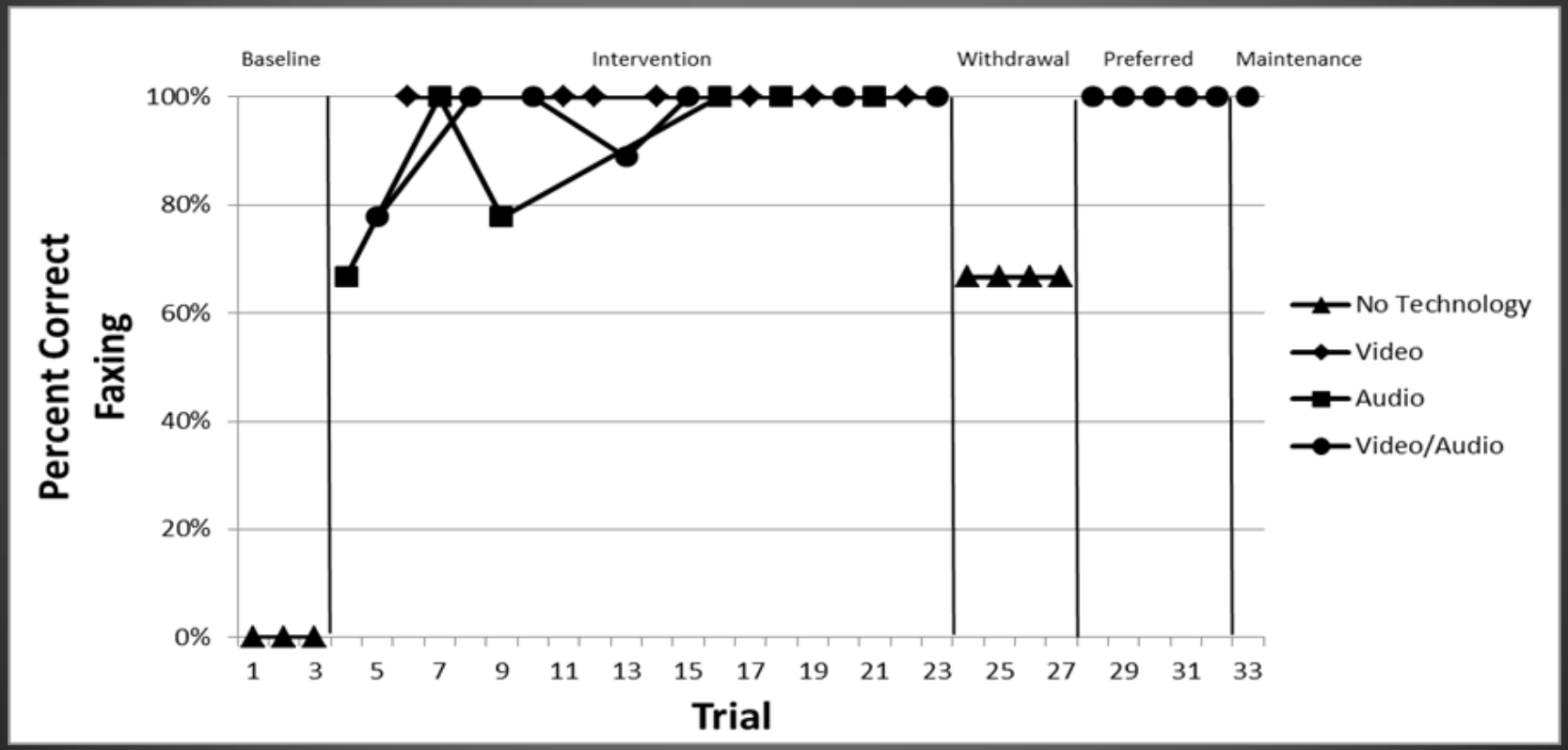
# Dan
# Copying Task



# Dan
# Scanning Task



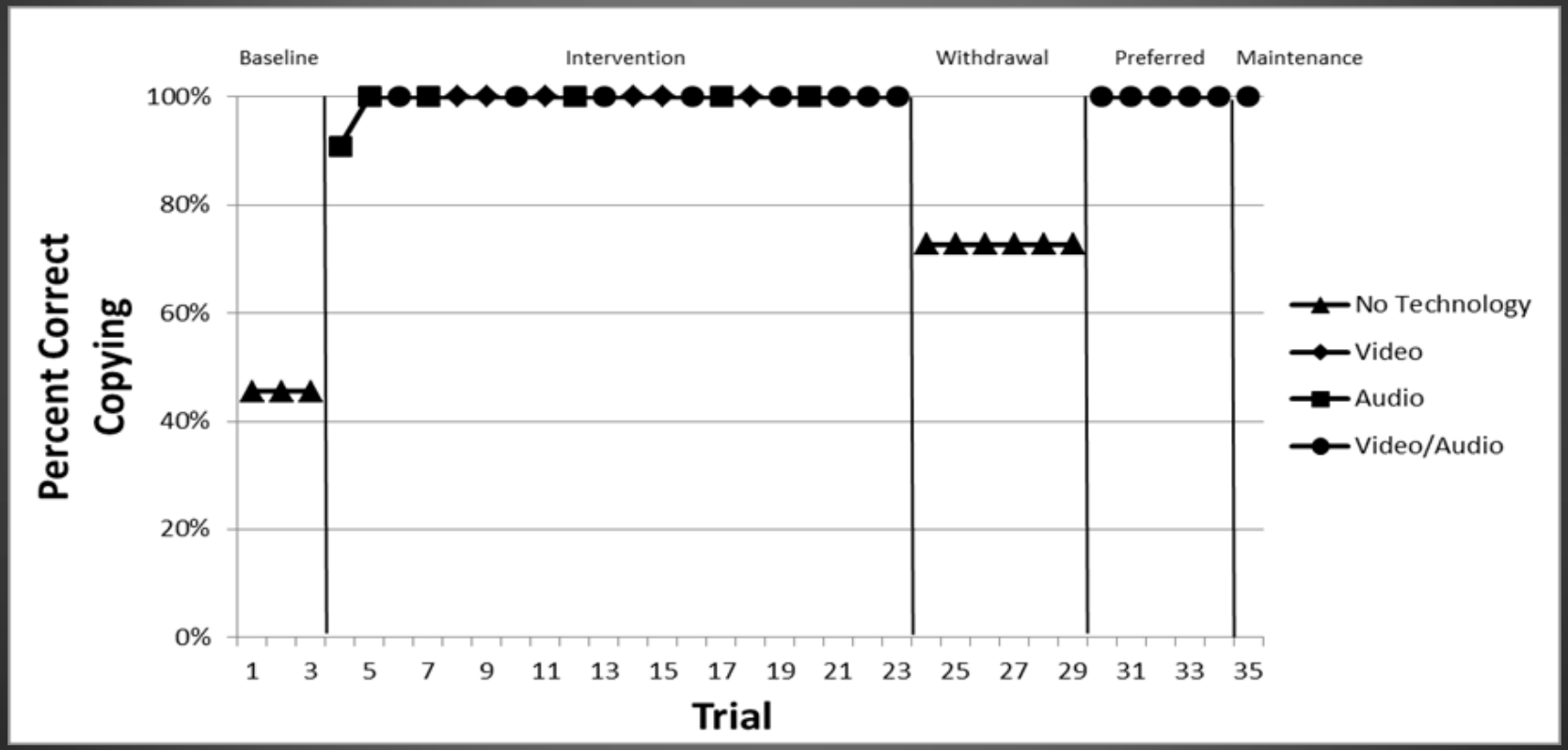
# Dan
# Faxing Task



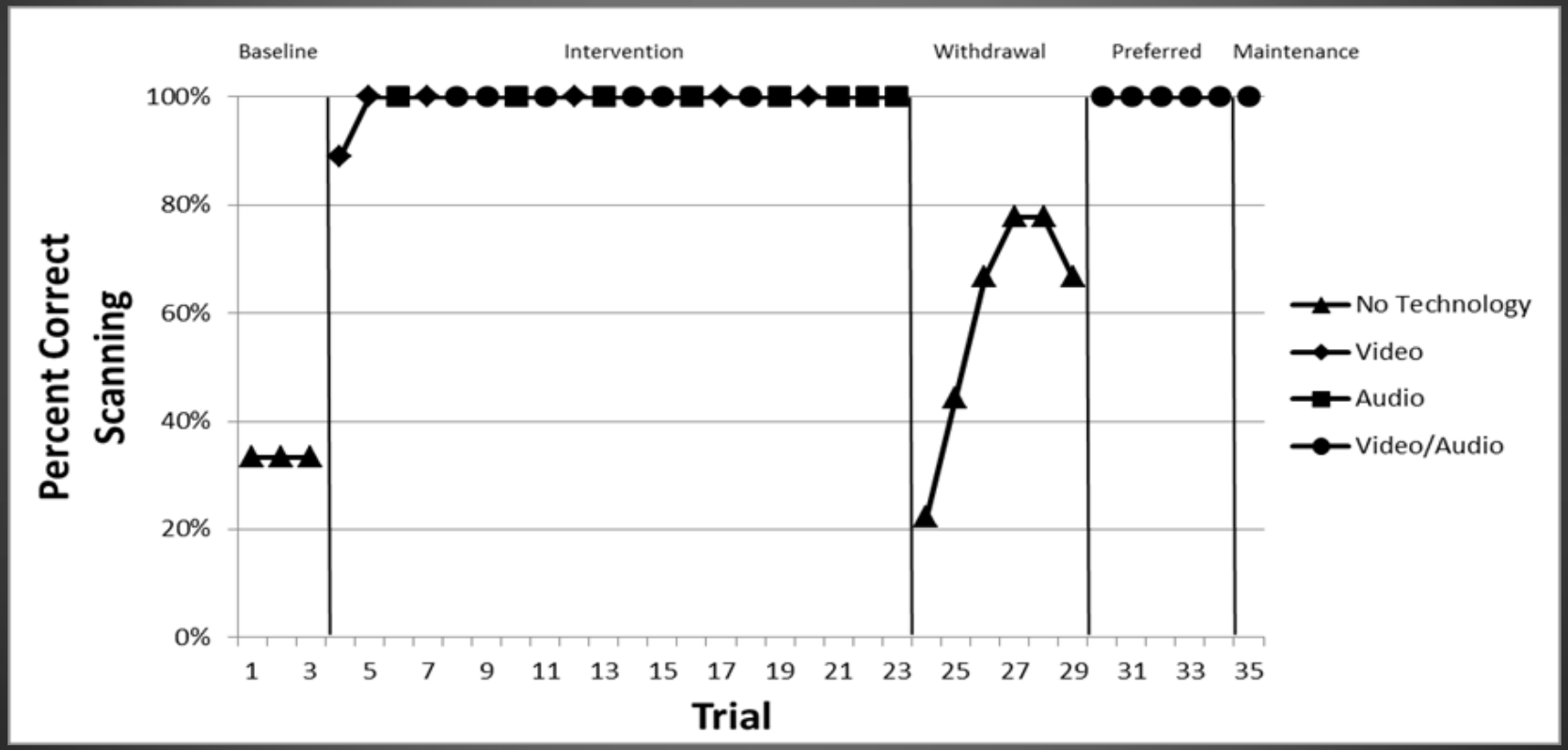
# Dan
# Mean Duration to Complete Tasks

| Mode | First 3 Trials | Last 3 Trials | Change |
|---|---|---|---|
| Copying | 287s | 163s | -43% |
| Scanning | 189s | 140s | -26% |
| Faxing | 374s | 253s | -32% |
| **Overall Mean** | **283s** | **185s** | **-34%** |

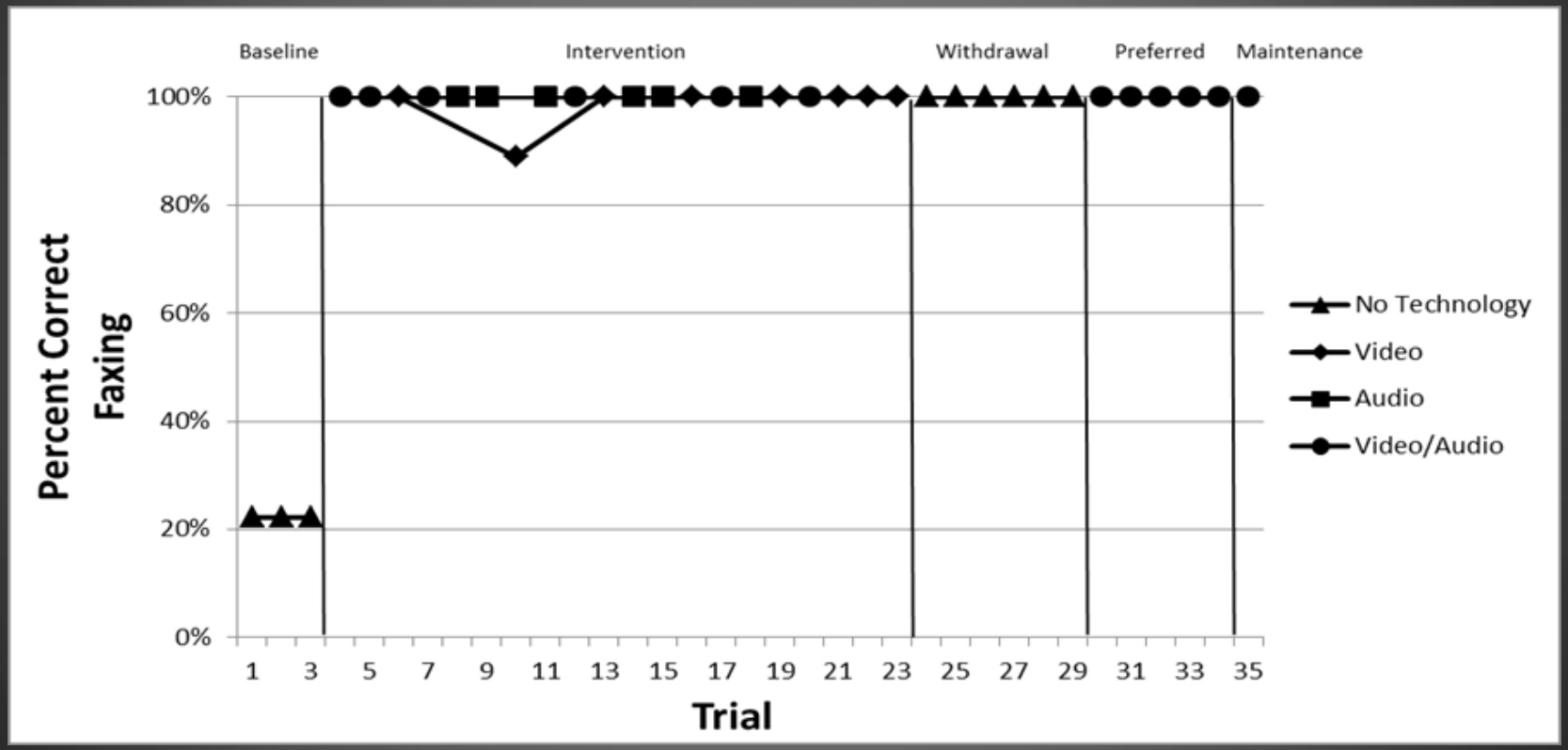
# Mark
# Copying Task



# Mark
# Scanning Task



# Mark
# Faxing Task



# Mark
# Mean Duration to Complete Tasks

| Mode | First 3 Trials | Last 3 Trials | Change |
|---|---|---|---|
| Copying | 274s | 216s | -21% |
| Scanning | 223s | 172s | -23% |
| Faxing | 297s | 262s | -12% |
| **Overall Mean** | **265s** | **217s** | **-18%** |

# Summary of Results

**Baseline Phase**

- All participants were unable to successfully operate the copier, scanner, or fax machine
- Data were consistently stable across all participants and tasks
- *Mean percentage correct across participants and tasks*
  - *19.0%*

# Summary of Results

**Training Phase**

- Each participant successfully completed training in less than one hour
- All participants preferred the video and audio combined mode of presentation

# Summary of Results

**Intervention Phase**

- Abrupt and substantial increase in ability to operate office equipment
- Data stability observed after the first two trials per mode
- No modes of presentation were superior for participants across tasks
- Data resulted in 0% overlap between baseline and intervention phases for all participants
- Discontinuation criteria met for each participant
- *Mean percentage correct across participants and tasks*
  - *Video*
    - *98.8%*
  - *Audio*
    - *97.8%*
  - *Video and audio combined*
    - *99.3%*

# Summary of Results

**Withdrawal Phase**

- Use of the iPod Touch and application was withdrawn
- Phase continued until data stability was observed across all tasks for each participant
- All participants performed less proficiently for the majority of tasks
  - Results improved from those observed during the initial baseline phase
- *Mean percentage correct across participants and tasks*
  - *72.8%*

# Summary of Results

**Preferred Mode of Presentation Phase**

- iPod Touch and Functional Planning System application reintroduced during this phase
  - All participants preferred to use the video and audio combined mode of presentation
- Abrupt increase in ability to correctly and independently complete the majority of office tasks
  - Exceptions were for those who demonstrated mastery of tasks during the withdrawal phase
- Data were stable throughout this phase for all participants
- *Mean percentage correct across participants and tasks*
  - *100%*

# Summary of Results

**Maintenance Phase**

- Consisted of one follow-up probe two weeks after completing the preferred mode of presentation phase
- *Mean percentage correct across participants and tasks*
  - *100%*

# Interobserver Agreement and Procedural Fidelity

- IOA Completed during 45% of sessions
- Mean IOA for all phases was 99.9% (range = 91%-100%)

- PF Completed during 45% of sessions
  - Correct verbal instructions
  - Timely initiation of prompts
  - Adherence to the least-to-most prompting hierarchy
- Mean procedural fidelity was 100% for all areas

# Social Validity

Participant satisfaction

All participants reported that:

- The technology helped them learn new jobs
- It was easy to use
- It helped them function independently
- They would like to use it to learn other job skills
- They would recommend it to their friends

"Oh yeah!!"

"I love this"

"I want the iPod back!"

Research assistant satisfaction

The research assistant strongly agreed that:

- The intervention was helpful for participants
- The iPod Touch and application were easy to use
- The device and application enabled participants to work independently
- The intervention could be successfully applied to other job tasks
- Participants were motivated to use the device and application
- She would recommend this intervention to participants' employers

# Benefits and Implications of This Research

- Extension of the knowledge base (Banda, et al., 2011; Mechling et al., 2009)
- Evaluation of emerging technology (Wehmeyer, et al., 2008)
- Many advantages of using technology (Davies, et al., 2002; Gillette & DePompei, 2004; Taber-Doughty, 2005; Wehmeyer, et al., 2008)
- Potential to improve outcomes (e.g., Lancioni et al., 2000; Mechling et al., 2008; Riffel et al., 2005; Van Laarhoven et al., 2009)
  - Increased independence
  - Increased employment opportunities

# Limitations

1. Carryover Effects
2. Practice Effects
3. Small and homogeneous sample size
4. Duration of maintenance phase

# Recommendations for Future Research

1. Systematic replication
2. Evaluation of video/audio sequences within task analyses with varying levels of detail
3. Evaluation of new technology
4. Further evaluation of mode of presentation preference compared to performance

# Questions?

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# References


American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (Revised 4th ed.)*. Washington, DC: Author.

Banda, D. R., Dogoe, M. S., & Matuszny, R. M. (2011). Review of Video Prompting Studies with Persons with Developmental Disabilities. *Education & Training in Autism & Developmental Disabilities, 46*(4), 514-527.

Cihak, D. F., Kessler, K. B., & Alberto, P. A. (2007). Generalized Use of a Handheld Prompting System. *Research in Developmental Disabilities: A Multidisciplinary Journal, 28*(4), 397-408.

Davies, D. K., Stock, S. E., & Wehmeyer, M. L. (2002). Enhancing Independent Task Performance for Individuals with Mental Retardation Through Use of a Handheld Self-Directed Visual and Audio Prompting System. *Education and Training in Mental Retardation and Developmental Disabilities, 37*(2), 209-218.

# References


Davies, D. K., Stock, S. E., & Wehmeyer, M. L. (2003). A Palmtop Computer-Based Intelligent Aid for Individuals With Intellectual Disabilities to Increase Independent Decision Making. *Research & Practice for Persons with Severe Disabilities, 28*(4), 182-193.

Gillette, Y., & DePompei, R. (2004). The potential of electronic organizers as a tool in the cognitive rehabilitation of young people. *NeuroRehabilitation, 19*(3), 233-243.

Grigal, M., Hart, D., & Migliore, A. (2011). Comparing the Transition Planning, Postsecondary Education, and Employment Outcomes of Students With Intellectual and Other Disabilities. *Career Development for Exceptional Individuals, 34*(1), 4-17.

Howarth, E., Mann, J. R., Zhou, H., McDermott, S., & Butkus, S. (2006). What predicts re-employment after job loss for individuals with mental retardation? *Journal of Vocational Rehabilitation, 24*(3), 183-189.

# References


Lancioni, G. E., & O'Reilly, M. F. (2001). Self-Management of Instruction Cues for Occupation: Review of Studies with People with Severe and Profound Developmental Disabilities. Research in Developmental Disabilities, 22(1), 41-65.

Lancioni, G. E., O'Reilly, M. F., Seedhouse, P., Furniss, F., & Cunha, B. (2000). Promoting Independent Task Performance by Persons With Severe Developmental Disabilities Through a New Computer-Aided System. *Behavior Modification, 24*(5), 700.

McInnes, M. M., Ozturk, O. D., McDermott, S., & Mann, J. R. (2010). Does supported employment work? *Journal of Policy Analysis and Management, 29*(3), 506-525.

Mechling, L. C., Gast, D., & Fields, E. (2008). Evaluation of a Portable DVD Player and System of Least Prompts to Self-Prompt Cooking Task Completion by Young Adults With Moderate Intellectual Disabilities. *The Journal of Special Education, 42*(3), 179-190.

# References


Mechling, L. C., Gast, D. L., & Seid, N. H. (2010). Evaluation of a Personal Digital Assistant as a Self-Prompting Device for Increasing Multi-Step Task Completion by Students with Moderate Intellectual Disabilities. *Education and Training in Autism and Developmental Disabilities, 45*(3), 422-439.

Mechling, L. C., & Gustafson, M. (2009). Comparison of the Effects of Static Picture and Video Prompting on Completion of Cooking Related Tasks by Students with Moderate Intellectual Disabilities. *Exceptionality, 17*(2), 103-116.

Riffel, L. A., Wehmeyer, M. L., Turnbull, A. P., Lattimore, J., Davies, D., Stock, S., & Fisher, S. (2005). Promoting Independent Performance of Transition-Related Tasks Using a Palmtop PC-based Self-Directed Visual and Auditory Prompting System. *Journal of Special Education Technology, 20*(2), 5-14.

Rusch, F. R., & Braddock, D. (2004). Adult Day Programs versus Supported Employment (1988-2002): Spending and Service Practices of Mental Retardation and Developmental Disabilities State Agencies. *Research and Practice for Persons with Severe Disabilities (RPSD), 29*(4), 237-242.

# References


Schalock, R. L., Borthwick-Duffy, S. A., Bradley, V. J., Buntinx, W. H. E., Coulter, D. L., Craig, E. M., . . . Yeager, M. H. (2010). *Intellectual Disability: Definition, Classification, and Systems of Supports. Eleventh Edition:* American Association on Intellectual and Developmental Disabilities.

Taber-Doughty, T. (2005). Considering Student Choice when Selecting Instructional Strategies: A Comparison of Three Prompting Systems. *Research in Developmental Disabilities: A Multidisciplinary Journal, 26*(5), 411-432.

Test, D. W., Carver, T., Ewers, L., Haddad, J., & Person, J. (2000). Longitudinal Job Satisfaction of Persons in Supported Employment. *Education and Training in Mental Retardation and Developmental Disabilities, 35(4)*, 365-373.

U.S. Department of Education. (2010). National Longitudinal Transition Study-2. Washington, DC: National Center for Education Research.

# References


Van Laarhoven, T., Johnson, J. W., Van Laarhoven-Myers, T., Grider, K. L., & Grider, K. M. (2009). The Effectiveness of Using a Video iPod as a Prompting Device in Employment Settings. *Journal of Behavioral Education, 18*(2), 119-141.

Van Laarhoven, T., Van Laarhoven-Myers, T., & Zurita, L. M. (2007). The Effectiveness of Using a Pocket PC as a Video Modeling and Feedback Device for Individuals with Developmental Disabilities in Vocational Settings. *Assistive Technology Outcomes and Benefits, 4(1)*, 28-45.

Wehmeyer, M. L., Palmer, S. B., Smith, S. J., Davies, D. K., & Stock, S. E. (2008). The Efficacy of Technology Use by People with Intellectual Disability: A Single-Subject Design Meta-Analysis. *Journal of Special Education Technology, 23*(3), 21-30.