


**Effects of the instructional use of an iPad on challenging behavior and academic engagement for students with autism**

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### Background

2


- Individuals with ASD often display challenging behavior during academic instruction (Derby et al., 1992; Mace, Browder, & Yin, 1987) with escape being the most common function of the challenging behavior (Hanley, Iwata, & McCord, 2003)
- When the academic task is aversive the value of escape from the task is increased
- Antecedent interventions for escape maintained behavior that altered the value of escape
  - Modify the demand (Ebanks & Fisher, 2003)
  - Behavioral momentum (Mace & Belfiore, 1990)
  - Noncontingent reinforcement (Carr & Newsom, 1985)



### Background

3


- Rapid technological advances
- Most studies utilized computers as assistive technology or to teach skills (Ayres, Maguire, & McClimon, 2009; Burke, Anderson, Bowen, Howard, & Allen, 2010; Pennington, 2010; Ramdoss, et al., 2011; Tanaka, 2010; Wainer & Ingersoll, 2011)



### Rationale

4


- iPads are being widely utilized in classrooms yet there is only anecdotal evidence to support their learning benefits (Quillen, 2011).
- Few studies have analyzed computers' effect on escape maintained challenging behavior
  - Limitations:
    - Anecdotal data (Bosseler & Massaro, 2003; Cihak et al., 2010)
    - Lack of functional behavior assessment (Pilenis & Romanszyk, 1986)
- Need to investigate the use of technology as a potential treatment for escape maintained behavior during academic instruction



### Purpose

5

Compare the effects of instruction using an iPad versus traditional instructional methods on academic engagement and escape maintained behavior for students with autism



### Participants

6

Name	Gender	Age	Diagnosis	Setting	Targeted Skill
Elton	Male	7 yrs	Asperger's Syndrome	Home	Double digit subtraction with regrouping
Dan	Male	3 yrs	PDD-NOS	Clinic	Matching color cards

### Procedure

- Assessment**
  - Questions About Behavioral Function (Matson & Vollmer, 1995)
  - Pairwise Functional Analysis (Hanley, Iwata, & McCord, 2003; Iwata et al., 1994)
- Experimental Design:** ABAB reversal
  - Traditional Instruction:* completing academic task with traditional methods
  - iPad instruction:* using an iPad to complete the same academic task utilized during the traditional instruction condition

### Dependant Variables

Name	Challenging Behavior (Partial Interval)	Academic Engagement (Whole Interval)
Elton	<b>Verbal protests:</b> "No", "Shut up", "humph", or any other protests against academic work; yelling at levels above conversational level	Looking at the assignment, verbally or physically (by writing, typing, or selecting on a computer) responding to questions, or engaged in task related conversation
	<b>Aggression:</b> Kicking, pushing, biting, hitting, throwing items, or any verbal threat of aggression	
	<b>Elopement:</b> running away from therapist, dropping to the floor, closing eyes	
Dan	<b>Verbal protests:</b> "No", screaming or yelling at levels above conversational levels or any other protests against academic work	Looking at the assignment, physically (by holding the cards and matching them or by moving the cards on the screen to match them) responding to questions
	<b>Aggression:</b> Pushing therapist's arm, hitting himself, clapping hands	
	<b>Elopement:</b> turning body or moving body away from the task, closing eyes, laying on table, moving eyes away from the task, or taking longer than 2 sec to respond to the task	

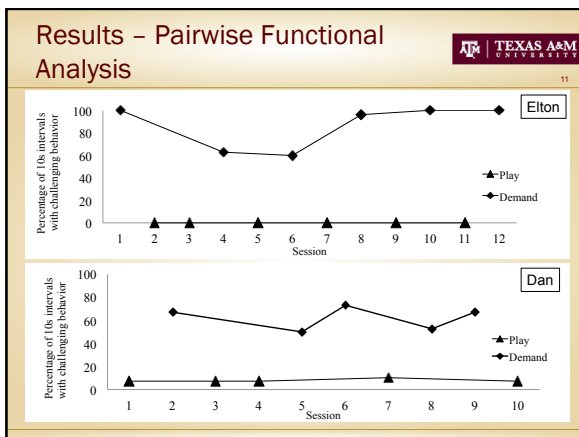
### Assessment - QABF Results

Name	Attention	Escape	Tangible	Pain	Automatic
Elton	11	13	15	14	4
Dan	0	13	9	1	1

- QABF suggests that both engaged in high level of escape maintained behavior

### Assessment - Pairwise Functional Analysis

- Demand condition:** Researcher presented demand, provided least-to-most prompting, and praised the participant upon completion of demand. If targeted behaviors were exhibited, researcher removed demand for 10s and reintroduced after behaviors had ceased for 10s
- Play:** Researcher and participant played with preferred toys. All behaviors were ignored



### Results - Pairwise Functional Analysis

**Elton:** Challenging Behavior (CB) in majority of intervals during demand (M=84% of the intervals, with a range 60-100%) and none of the play intervals

**Dan:** CB in majority of intervals during demand (M=62% of the intervals, with a range 50-73%) and small percentage of the play sessions (8%, range 7-10%)

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## Intervention Procedure

Procedures were *identical* in both traditional and iPad instructional conditions, which are also same procedures utilized in demand condition of functional analysis

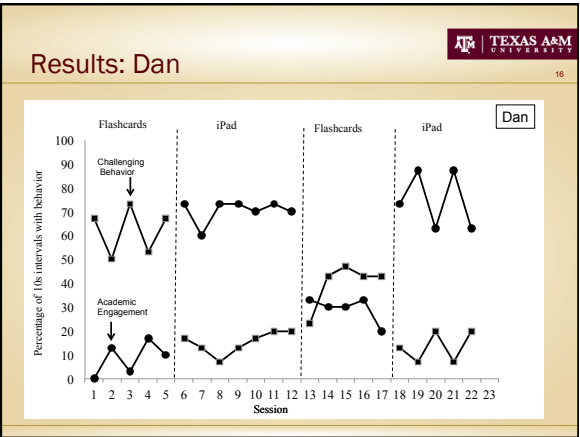
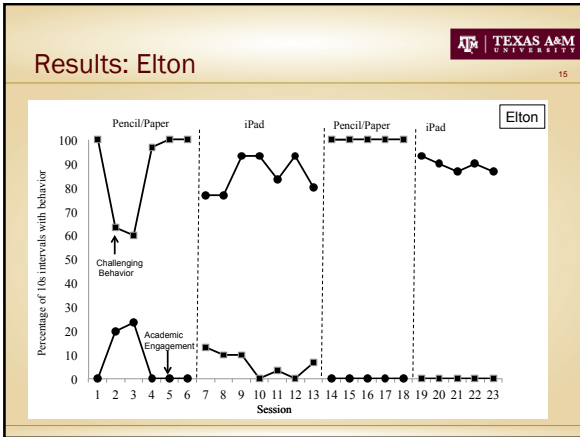
- Present the task
  - Elton: Double digit subtraction with regrouping
  - Dan: Color card matching
- Provide least-to-most prompting
- Provide brief vocal praise upon the completion of task
- If any of the targeted challenging behavior was exhibited, the researcher would remove the demand until 10 seconds had lapsed following the termination of the challenging behavior
- All other behaviors were ignored

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## Interobserver Agreement and Procedural Fidelity

- IOA collected for at least 40% of all sessions for each participant during each phase of the study
- Procedural fidelity data collected for 40% of sessions

Name	Challenging Behavior	Academic Engagement	Procedural Fidelity
Elton	M=99% (range 90-100%)	M=98% (range 87-100%)	M=100% (range 100%)
Dan	M=97% (range 87-100%)	M=98% (range 90-100%)	M=99% (range 84-100%)



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## Discussion

- Summary of findings**
  - Decrease in challenging behavior and increase in academic engagement were observed for both participants
  - These effects were reversed when traditional methods of instruction were implemented

What these results suggest is that the iPad serves as a motivating operation to decrease the value of negative reinforcement that these students were obtaining by displaying challenging behavior.

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## Discussion

- Potential explanations**
  - Motivating operation** reducing the aversiveness of the demand
  - Novelty** - disassociation with academic work
  - History of reinforcement** with using iPad
  - Noncontingent reinforcement** - receiving reinforcement just by interacting with the iPad (Wilder, Normand, & Atwell, 2005)<sup>1</sup>

<sup>1</sup>Wilder et al. (embed preferred items into instruction) found that continuous, noncontingent access to a preferred activity (movie) increased food acceptance and decreased escape-maintained self-injurious behavior of an individual with developmental disabilities

### Assessment – QABF Results

Name	Attention	Escape	Tangible	Pain	Automatic
Elton	11	13	15	14	4
Dan	0	13	9	1	1

Multiply maintained - QABF suggests that the behavior might have been multiply maintained so it is possible that this intervention addressed two functions by not only making the task less aversive but may have included a preferred tangible

### Conclusion

- Because of the small amount of participants, strong conclusions cannot be made, but the results are very promising for future research and practices in the classroom
- Use of technological devices is increasing in schools and therapy settings; this study lends evidence to the growing body of research focusing on the effectiveness of these devices in interventions

### Limitations

- Absence of full functional analysis
- Need replication with more participants
- With Dan treatment interference is a possibility

### Future Research

- Environmental factors that might serve as an EO that outweigh the AN/MO (ie. Satiation: Is there a point where the motivational effects of the iPad are negated by length of task? Would the iPad hold it's motivational effects over a length of time?)
- Social validity of this intervention (what are the thoughts of the teachers and children while using these devices in this intervention?)
- Other academic uses of the iPad
- Singularly maintained behavior (if it was not tangibly maintained, would we see the same results?)

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