ADHD and Backward Chaining of Basic Flying Skills Using a Desktop Computer Simulator



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INTRODUCTION

- "(N)ot qualified for certification"
- Diagnosis of Attention Deficit Hyperactivity Disorder (ADHD)
- Taking medications (FAA) for ADHD
- FAA concerns
- · Medications for ADHD treatment may result in cognitive deficits
- · Pilot unsafe to perform the requisite flying duties
- FAA neuropsychological testing
- Medication must be discontinued for at least 90 days prior to testing

ADHD STATISTICS

Retrieved from ADDitude (2019).

- Total children and adults in US 2011 statistics: 11%
- 4-17 years of age 2016 statistics: 11%=6.1 million
- Teens only: 3-5%=2 million
- Boys: 13.2%
- Girls: 5.6%
- Adults: 4.4%
- Reported diagnoses
- · Many remain undiagnosed especially ADHD-I (primarily females)
- · Over lifetime diagnosis:
- 12.9% of men • 4.9% of women

CAR ACCIDENT RATES

- · Compared to peers without ADHD
- · 2-4 times as many citations
- 4 times as many accidents
- · 7 times more likely to have second accident
- · 4 times more likely to be at fault · 6-8 times more likely to have license revoked

PARTICIPANTS

- Participant 1: Male
- · 30 years old
- Inattentive: 13

Participant 2: Female

30 years old

Inattentive: 26

• Hyperactive-Impulsive: 20

• Hyperactive-Impulsive: 22

- Hyperactive-Impulsive: 23
 - Participant 2: Female

• 21 years old

Inattentive: 16

 57 years old Inattentive: 28

• Participant 3: Female

• Hyperactive-Impulsive: 25

FEEDBACK SYSTEM DEVELOPMENT

- Electronic training system
- How to perform each procedure
- Presented prior to each procedure
- Automated feedback system · Corrective and reinforcing feedback
- · Learning to land an aircraft using instruments
- X-Plane© (11): Desktop flight simulator
- · Instrument flight configuration
- Experimenter bias issues · Careful monitoring of actions
- Corrective feedback
- Reinforcing feedback
- Automation of recording
- · Required due to amount and pace of data
- · Inevitable human researcher errors had to be controlled

DESIGN AND MEASURES

- Pretesting delivered through Qualtrics©
- Demographic information
- Adult ADHD self-report scale (ASRS 1.1) (World Health Organization, 2003)
- Reliability and validity (Garnier-Dykstra, 2010; Kessler, et al., 2005)
- Two scales
- ADHD-Inattentive
- ADHD-Hyperactive-Impulsive
- Cutoff criteria for either scale
- 0-16: Unlikely to have ADHD
- · 16-23: Likely to have ADHD
- 24+: Highly likely to have ADHD

BASELINE ASSESSMENT



- Aircraft on final approach
- "Land the aircraft"



- **INTERVENTION PROCEDURES**
- Multimedia presentation of each skill in the behavioral chain
- Video/Static/Quiz
- All questions must be at 100% success
- · Repeat any portion of presentation is participant's option
- · All aircraft procedures to mastery · Three consecutive correct executions of task
- · Backward chaining procedure for taxiing tasks (Cooper, Heron, & Heward, 2007a)
- · Backward chaining and stimulus prompting and fading procedure for VOR and ILS tasks (Cooper, Heron, & Heward, 2007b)

TAXIING

- Aircraft configuration
- Cessna 172S
- X-Plane 11 model · Braking maintaining centerline
- 1200 RPM
- 1500 RPM
- Full stop
- · Braking + Rudder maintaining centerline

SHORT FINAL

RESULTS

Rudde

CONCLUSION

· Performance variability eliminated from Braking at 1200 RPM to Braking at 1500 RPM

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Short Final

Braking 1500

Participant 1: IN: 13 HI: 20

Participant 2: IN: 26 HI: 22

Participant 3: IN: 16 HI: 23

Participant 4: IN: 28 HI: 25

- Multimedia procedure demonstration included stimulus prompting and fading
- Aircraft configuration for following scenarios
- 80 KIAS Tracking at 10 NM
- VOR CDI heading
- Yoke + Rudder
- VOR CDI 30 degree interception at 10 NM
- Yoke + Rudder
- ILS CDI GS descending to intercept at 5 NM Maintaining glideslope
 - Rudder
- Braking to full stop

Rudder

40

35

30

25

20

15

10

n

Baseline

· Backward chaining:

Age may be a confound

· Braking 1200 and Short Final

Braking 1200

· Baseline: Participants did not know how to land the aircraft

· Rudder required minimal attempts for three participants

· Task demand: Increase steps for Short Final procedure

· Short Final required many attempts from three participants Performance correlated with higher diagnostic score

· Required more attempts to master two of the four conditions:

Atter

Braking to full stop

· Braking to full stop

 ILS CDI GS climbing to intercept at 5 NM Maintaining glideslope Rudder

 ILS CDI GS turn to intercept at 5 NM Maintaining glideslope