New Age Vocational Training Program for Adults with Autism:
Integration of Soft Skills Training and Software Testing

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INTRODUCTION

Longitudinal studies of intellectually able adults with autism have shown consistent and persistent deficits across cognitive, social, and vocational domains, indicating a significant need for effective treatments for these functional disabilities (Howlin, 2000). The cognitive and social skill deficits, "Soft Skills" which predict vocational outcomes, have been identified as major challenges to employment success for these adults (Hillier et al, 2007; Kautz et al, 2014). Additionally, individuals with AS gravitate to technology fields more than general population (Wei et al, 2013), providing a well-suited career choice.

Objectives

This study tested a novel, community-based intervention that combines a soft skills manualized intervention, **Su**pported employment, **C**omprehensive **C**ognitive **E**nhancement & **S**ocial **S**kills (SUCCESS) with a software testing training program for adults with ASD. An open trial pilot study was conducted to obtain estimates of effects of multiple outcomes: cognitive skills, social skills, technical skills, vocational skills and satisfaction.

Method

A total of 25 young adults with ASD; 3 dropped, 3 had incomplete data: n=19

An open trial design of the NFAR Technical Skills program which includes SUCCESS program and software testing skills training. Pre and post assessments include a full battery of assessments with executive functioning: BRIEF-A & DKEFS and social functioning: SRS-2 & SSPA, technical skills performance (completion rates, accuracy of bug detection, program proficiency), work skills (attendance, productivity) and vocational outcomes (employment).

Participants participated in the program 3 days a week for 3 hours each day totaling 9 hours a week over 6 months. The SUCCESS© curriculum was delivered weekly for 90minutes via active group participation during a work meeting. SUCCESS© curriculum teaches vocational "soft skills" of executive functioning, social cognitions and social communication. The technical skills curriculum prepares the participant for a position as an entry level Software QA Tester in the high tech industry, and also prepares the student to obtain a Certificate in Software Testing (from ISTQB).

Participants

Participants with ASD Demographics:

Age m= **24 (sd=4.7)** range, **18-34**, 95% male

11% working (part-time), 42% enrolled disability services, 26% enrolled in Dept of Rehab, 11% SSI

100% high school graduates, 79% attended some college, 32% college graduate, 53% independent drivers

84% white, 5% black, 5% Asian/PI, 6% Hispanic

Measures

Executive Functioning (EF):

Delis-Kaplan Executive Functioning Scale (D-KEFS): Measures (a) cognitive flexibility (b) fluency inhibition (d) problem-solving, (e) categorical processing, (f) deductive reasoning, (g) spatial planning, (f) verbal abstraction

The Behavior Rating Inventory of Executive Functioning, Adult (BRIEF-A): Measures 8 EF skills: inhibit, shift, emotional control, initiate, working memory, plan/organize, organization of materials, monitor.

Social Functioning:

Social Responsiveness Scale-2 (SRS-2): 5 subdomains- social awareness, social cognition, social communication, social motivation and restricted, repetitive behaviors and a total t-score.

The Social Skills Performance Assessment (SSPA) for ASD: 4 Role-play scenes with 17 social behavior codes (Data presented in SSPA poster)

Work & Technical Skills:

Attendance, timecard completion, Skillport Modules completion, ISTQB certificate training completion and passing

Data Analysis

Paired sample t-test and effect sizes were used to compare pre and post scores on each measure. ES is Cohen d.

SUCCESS© CURRICULUM

1. CURRICULUM OVERVIEW
2. PROSPECTIVE MEMORY PART I
3. PROSPECTIVE MEMORY PART II
4. LEARNING & MEMORY PART I: Attention
5. LEARNING & MEMORY PART II: Encoding I
6. LEARNING & MEMORY PART III: Encoding II
7. LEARNING & MEMORY PART IV: Retrieval
8. COGNITIVE FLEXIBILITY
9. COGNITIVE FLEXIBILITY & PROBLEM-SOLVING
10. GOAL-ORIENTED THINKING
11. CONTEXT AWARENESS PART I
12. CONTEXT AWARENESS PART II

1. INTRODUCTION TO SOCIAL THINKING
2. PERSPECTIVE-TAKING & SOCIAL BEHAVIOR MAPPING
3. REPAIR AND RECOVER
16. EMOTIONAL AWARENESS & EMOTION REGULATION
17. SOCIAL COMMUNICATION PART I
18. SOCIAL COMMUNICATION PART II
19. SEEKING, GIVING & RECEIVING COMPLIMENTS
20. SEEKING, GIVING & RECEIVING CONSTRUCTIVE CRITICISM
21. SEEKING, GIVING & RECEIVING HELP
22. WORKING WITH OTHERS III: RELATIONSHIPS, CONFORMITY, TEAMWORK,
23. SOCIAL NETWORKING & SOCIAL TECHNOLOGY
24. CELEBRATE SUCCESS

RESULTS

Executive Functioning

DKEFS	n=19		Baseline		6mth Post		Statistics	
		DKEFS Subtest*	Mean	SD	Mean	SD	ES	p
Cognitive Flexibility		Trail Making (number-letter switching)	8.69	2.71	8.84	3.22	.05	.37
Verbal Fluency		Verbal Fluency (category switching)	9.63	4.32	9.00	3.84	-.15	.27
Design Fluency		Design Fluency (switching)	10.32	3.6	10.84	3.76	.14	.20
Inhibition		Color-Word Interference (inhibition/switching)	9.26	3.74	10.42	3.66	.32	.01
Problem Solving		Sorting (confirmed correct sorts)	10.58	2.64	12.79	2.46	.86	.00
Deductive Reasoning		Word Context (total consecutively correct)	9.21	3.26	11.11	2.96	.61	.01
Spatial Planning		Tower (total achievement score)	9.47	3.73	11.37	2.81	.57	.01

BRIEF-A n=19	Participant Pre and 6mth Post				Parent Pre and 6mth Post				Facilitator Pre and 6mth Post			
T-Scores	pre-mean	post-mean	effect size	p- value	pre-mean	post-mean	effect size	p-value	pre-mean	post-mean	effect size	p-value
Inhibit	55.11	50.42	-.39	.01	50.42	51.42	.13	.13	58.26	49.53	-.81	.00
Shift	58.21	55.84	-.20	.11	59.58	58.63	-.07	.32	67.42	55.74	-1.16	.00
Emotional control	50.00	48.58	-.14	.16	51.84	50.11	-.17	.22	55.47	46.16	-.92	.00
Self-monitor	52.95	48.79	-.35	.01	50.74	49.79	-.11	.30	57.21	46.53	-1.06	.00
Initiate	58.74	55.63	-.25	.05	59.42	60.42	.07	.32	61.68	51.79	-.89	.00
Working memory	61.05	57.00	-.28	.01	55.79	56.47	.05	.37	66.47	54.84	-1.16	.00
Plan/organize	59.95	54.95	-.38	.01	60.95	60.11	-.76	.37	74.26	60.63	-1.63	.00
Task monitor	55.68	53.26	-.18	.05	58.42	59.11	.06	.35	69.11	58.21	-1.04	.00
Organization of materials	54.53	52.74	-.14	.09	57.26	56.21	-.10	.27	58.68	48.79	-.97	.00
Behavioral Regulation Index	54.05	50.58	-.31	.01	52.74	51.58	-.13	.26	59.84	48.16	-1.17	.00
Metacognition Index	59.58	56.68	-.21	.05	59.42	60.21	.06	.35	67.95	56.37	-1.12	.00
Global Executive Composite	57.74	53.79	-.31	.00	56.74	56.42	-.03	.43	64.95	52.32	-1.41	.00

Social Functioning

SSPA- "original" Scenes	Scene 1 "new neighbor"				Scene 2 "landlord"			
Rating Score	pre-mean	post-mean	effect size	p-value	pre-mean	post-mean	effect size	p-value
Interest level	4.42	4.53	.13	.17	4.89	4.74	-.29	.29
Fluency	3.63	4.00	.34	.05	3.67	4.11	.36	.02
Clarity	4.05	4.42	.44	.02	4.06	4.37	.35	.09
Focus	4.26	4.42	.15	21	4.56	4.74	.25	.05
Overall conversation/argument	358	4.16	.54	.01	3.83	4.21	.35	.02
Social appropriateness	4.10	4.74	.82	.01	4.56	4.74	.26	.02
Eye Contact	3.64	4.37	.62	.01	-	-	-	-
Intonation/Pattern of speech	3.58	4.00	.38	.07	3.67	4.11	.38	.02
Body language	3.42	4.26	.86	.00	--	--	--	--
Facial expression	3.63	4.26	.81	.00	---	----	----	----
Reading social cues	3.68	4.37	.74	.01	3.72	4.37	.67	.01
Perspective-taking	3.79	4.31	.53	.02	3.56	4.26	.61	.01
Connectedness	3.63	4.16	.52	.00	3.56	4.11	.61	.01

Social Functioning

SSPA- "New" Scenes	Scene 3 "coworker chat"				Scene "boss"			
Rating Score	pre-mean	post-mean	effect size	p-value	pre-mean	post-mean	effect size	p-value
Interest level	4.88	4.68	-.39	.08	4.67	4.79	.13	.29
Fluency	3.22	4.00	.73	.00	3.78	4.10	.27	.14
Clarity	3.89	4.47	.67	.00	3.72	4.52	.72	.00
Focus	4.17	4.58	.45	.05	4.28	4.74	.58	.01
Overall conversation/	3.61	4.21	.65	.00	3.83	4.37	.55	.02
Social appropriate-ness	4.00	4.74	1.03	.00	3.94	4.32	.40-	.12
Eye Contact	3.67	4.26	.52	.01	3.78	4.37	.62	.01
Intonation/Pattern of speech	3.72	4.16	.41	.01	3.72	4.16	.43	.04
Body language	3.50	4.26	.88	.00	3.33	4.21	.99	.00
Facial expression	3.72	4.21	.52	.01	3.67	4.31	.81	.02
Reading social cues	3.94	4.32	.44	.04	3.72	4.53	.80	.00
Perspective-taking	4.00	4.26	.30	.07	3.72	4.32	.64	.02
Connectedness	3.56	4.32	.78	.00	3.72	4.26	.55	.03

SRS-2 n=19	Participant Pre and 6mth Post				Parent Pre and 6mth Post				Facilitator Pre and 6mth Post			
T Scores	pre-mean	post-mean	ES	p	pre-mean	post-mean	ES	p	pre-mean	post-mean	ES	p
Social awareness	53.48	48.95	-.45	.00	60.42	49.58	-.63	.03	60.63	51.37	-.68	.03
Social cognition	55.74	54.21	-.17	.15	59.95	48.37	-.66	.03	64.26	51.89	-1.03	.00
Social communication	54.79	52.63	-.26	.05	59.21	50.32	-.44	.04	71.21	56.21	-.96	.00
Social motivation	58.68	57.16	-.15	.17	61.47	50.95	-.48	.03	68.68	53.53	-.94	.00
RRBS-Total	59.95	59.58	-.00	.49	65.37	50.79	-.78	.02	67.68	54.74	-.84	.01
SCI Domain Total	56.21	53.68	-.30	.02	59.84	50.63	-.45	.04	69.63	56.68	-.93	.00
SRS-2 Total	57.00	54.58	-.27	.03	60.26	51.26	-.44	.04	69.68	56.42	-.96	.00

Technical Skills

Microsoft Office SkillPort	64% completed all
	36% completed 1/2 or more
ISTQB Certification training	67% completed all
	60% passed all
ISTQB Certification Exam	71% passed

Work Skills

	1st month	Last month
Attendance	82.5%	91.5%
Time card accuracy	61%	75%

Vocational

	Pre	Post
Employment	17% (μ=6 hrs, 2-10hrs)	50% (μ=20.2 hrs, 10-40hrs)

DISCUSSION

This study demonstrates that an integrated program designed to develop technical skills and vocational soft skills positively impacts adults with ASD. These adults were substantially more prepared for the workforce and obtained employment at high rates. This job-training program revealed high satisfaction and promise towards vocational success for adults with ASD.

Main limitation to this study is the lack of a control group. A small RCT study (n=40) is currently underway in order to test preliminary causal effects of SUCCESS (only). The SUCCESS curriculum has also been adapted for college students called College SUCCESS and is currently being adapted for lower functioning adults and for High School populations.

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