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ORIGINAL PAPER

Competitive Employment for Youth with Autism Spectrum Disorders: Early Results from a Randomized Clinical Trial

Paul H. Wehman · Carol M. Schall · Jennifer McDonough · John Kregel · Valerie Brooke · Alissa Molinelli · Whitney Ham · Carolyn W. Graham · J. Erin Riehle · Holly T. Collins · Weston Thiss

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Abstract For most youth with autism spectrum disorders (ASD), employment upon graduation from high school or college is elusive. Employment rates are reported in many studies to be very low despite many years of intensive special education services. This paper presented the preliminary results of a randomized clinical trial of Project SEARCH plus ASD Supports on the employment outcomes for youth with ASD between the ages of 18–21 years of age. This model provides very promising results in that the employment outcomes for youth in the treatment group were much higher in non-traditional jobs with higher than minimum wage incomes than for youth in the control condition. Specifically, 21 out of 24 (87.5 %) treatment group participants acquired employment while 1 of 16 (6.25 %) of control group participants acquired employment.

Keywords Autism · ASD · Transition to employment · Applied behavior analysis · Positive behavior support · Project SEARCH

P. H. Wehman · C. W. Graham
Department of Physical Medicine and Rehabilitation, Virginia Commonwealth University, Richmond, VA 23298-3038, USA

P. H. Wehman · C. M. Schall · J. McDonough · J. Kregel · V. Brooke · A. Molinelli · W. Ham · H. T. Collins
Rehabilitation Research and Training Center, Virginia Commonwealth University, Richmond, VA 23284-2011, USA

C. M. Schall (✉)
Department of Special Education and Disability Policy, School of Education, VCU Autism Center for Excellence, Virginia Commonwealth University, Box 842011, Richmond, VA 23284-2011, USA
e-mail: cmschall@vcu.edu

J. Kregel
Department of Special Education and Disability Policy, School of Education, Virginia Commonwealth University, Box 842011, Richmond, VA 23284-2011, USA

J. Erin Riehle
Division of Disability Services, Cincinnati Children's Hospital Medical Center, Cincinnati, OH 45229-3039, USA

W. Thiss
St. Mary's Hospital, Richmond, VA 23226, USA

Introduction

Transition from school to work is a major need for youth with disabilities as Certo et al. (2008) noted in their call for programs targeting seamless transition. Young people with autism spectrum disorders (ASD) present unique challenges related to post school employment outcomes (Schall and McDonough 2010; Schall et al. 2012). Employment rates for individuals with ASD, regardless of intellectual ability, reportedly range between 4.1 and 11.8 % (Taylor and Selzer 2011). These findings of very poor employment outcomes hold regardless of the intellectual abilities of the individual with ASD (Hendricks and Wehman 2009; Henninger and Taylor 2012; Hurlbutt and Chalmers 2004; Schall et al. 2013). Across the ability spectrum, individuals with ASD have lower rates of participation in vocational or technical education, employment, and post secondary education in 2 or 4-year programs than their peers with speech language impairments, learning disabilities or intellectual disabilities for as long as 7 years post high school (Shattuck et al. 2012).

Additionally, vocational rehabilitation (VR) programs are experiencing substantial difficulties in responding to the employment service needs of transition age youth with ASD. For example, in an analysis of RSA 911 data,

R. E. Cimera (Personal Communication, August 14, 2012) calculated the Rehabilitation Rate for transition age individuals with a primary disability of autism at age at application for VR services of 22 or younger. Nationwide, the trend from FY 2008—FY 2011 was that Vocational Rehabilitation agencies served more transition age youth with autism, but the Rehabilitation Rate for this population declined overall. The demand for VR services for transition age youth with a primary disability of autism is increasing steadily, but the VR success in achieving employment outcome rate with this population has declined noticeably in recent years.

Wehman et al. (2012) recently conducted one study that demonstrated the effect of supported employment with young adults with ASD. In this study, 33 adults with ASD were enrolled in a supported employment program with 27 placed in competitive employment by the end of the study. This work also demonstrated that individuals with ASD initially required a very high intensity of support on the job and behavioral training skills; however, all placed individuals achieved a reasonable level of independence within a year of intervention.

Challenges in Attaining Employment

The reasons for the challenges that individuals with ASD face in achieving employment have been explored in some research studies. Specifically, Holwerda et al. (2012) completed a systematic literature review on factors hindering work for individuals with ASD. They identified one factor that was consistently associated with hindering work participation. That factor was limited cognitive ability. In addition, they found eight reported factors that were mentioned in studies as hindering work participation although there was not consistency in these findings: (1) severity of the disorder, (2) co-morbidity of psychiatric disorders, oppositional personality, or epilepsy, (3) gender with females being more likely to have a poor outcome, (4) lower speech and language abilities, (5) the presence of maladaptive behavior, (6) the presence of social impairments and poor social skills, (7) lack of drive, and (8) prior institutionalization. Further, they found two factors that were reported to have positive impacts on job participation: higher educational attainment and family support for work.

Despite this literature, there continues to be a paucity of research on interventions for adults with ASD. The International Autism Coordinating Committee notes that only 4 % of all studies on ASD in 2010 were "LifeSpan Studies" (Office of Autism Research Coordination 2012). One model that has been utilized nationally to improve school to work transition for individuals with developmental disabilities is Project SEARCH, an intensive internship program (Daston et al. 2012; Rutkowski et al. 2006). Wehman et al. (2013) provided a description of a modified Project SEARCH model for youth with ASD. In this work, they implemented the key elements of the Project SEARCH model, (e.g., intensive business based internships, collaboration and complete embedment in the final year of high school, etc.; Daston et al. 2012) with ASD specific interventions. Those ASD specific elements included: (a) regular behavioral consultation with a behavior analyst, (b) specialized structure and schedules designed to meet the needs of youth with ASD in internship rotations, (c) enhanced behavioral definition of workplace social communication, idioms, and behavioral expectations, (d) use of ASD specific visual supports, (e) use of self-monitoring reinforcement programs, (f) intensive social skill instruction through role play and behavioral practice, and (g) the use of applied behavior analysis instructional techniques to ensure student success. This article presented two case studies describing the employment of two young men with ASD in non-traditional jobs in a suburban hospital (Wehman et al. 2012). The subjects described in these two case studies were enrolled in a larger randomized clinical trial, which is the focus of this paper.

The primary purpose of this paper is to examine the effectiveness of obtaining employment for students with ASD in a randomized clinical trial of Project SEARCH plus ASD Supports treatment compared to high school students' individualized education program as delivered in their assigned high school during the final year of school.

Hypotheses

Primary Hypothesis

Higher number of individuals who participate in an employer-based employment training and placement program will be employed than those in the control condition at (a) completion of intervention (Time 2) and (b) 3 months post completion of the intervention (Time 3). Hours worked, hourly wage, and paid benefits will be explored to further understand the employment characteristics of students with ASD obtaining employment.

Secondary Hypothesis

Individuals who participate in an employer-based employment training and placement program will require less work support as measured by the Support Intensity Scale Employment Activities Subscale (Thompson et al. 2004a) than those in the control condition at (a) completion of intervention (Time 2) and (b) 3 months post completion of the intervention (Time 3).

This study is continuing as of this writing and this analysis presents results from the first 3 years of cohorts who have

completed one school year in Project SEARCH plus ASD Supports. The students participated in this study between September 2009 and September 2012. The study is on-going with the fourth cohort currently in their school year intervention. As a preliminary review of these results, this paper will review outcomes collected at (a) baseline (Time 1), (b) completion of 9-month intervention (Time 2), and (c) 3 months post completion of the intervention (Time 3).

Methods

This study used a randomized clinical design with discrete treatment and control groups. The study did not use a waitlist control method due to the impact that a waitlist for a transition to employment program may have on the employment outcomes of control group subjects. To wit, waitlisted control group subjects may not seek employment while waiting to participate in a program that provides intensive training for employment. The research team concluded that a waitlisted control group would compromise the validity of conclusions that would be able to be drawn from the research. As a result, control group subjects were discrete from treatment group subjects.

Recruitment

Upon approval from the university, state vocational rehabilitation services (VR), and public school institutional review boards, recruitment began. Participants in this study were students in two public special education programs in Virginia prior to inclusion in this Project SEARCH plus ASD Supports replication. They applied to become Project SEARCH interns in their final year of high school. The application process required applicants or their proxy to complete a written detailed application.

After receipt of the application, the students then participated in an interview to confirm that potential applicants met the research criteria, further determine their match for the program and begin to assess potential internship matches. Applicants who met the research eligibility criteria were assigned numbers and randomized into the Project SEARCH program (treatment group) or continued in the public school setting where they had previously received their education (control group). Inclusion criteria were: (1) over the age of 18, (2) had an ASD diagnosis and/or educational eligibility of Autism, (3) were independent and self-caring (dressing, daily personal hygiene, and eating), (4) capability to provide consent or assent, (5) had continued eligibility for special education services in high school. Students who had co-morbid medical, developmental, or psychiatric diagnoses or who displayed challenging behaviors were not prohibited from being included in the study. Students were excluded if they could not provide consent or assent, were not independent in self-care (dressing, daily personal hygiene, and eating), or had a history of fire setting or drug abuse. Individuals with limited support needs were perceived as not needing the intensity of instruction provided by this model, while individuals with pervasive support needs requiring extensive self-care support and were not able to be served in this program.

Randomization

A total of 70 high school students between the ages of 18–22 applied to participate in the project. Twenty-six of those students did not meet the inclusion criteria leaving 44 eligible students. These 44 youth who were between the ages of 18 and 21 with a medical diagnosis or educational eligibility of Autism, Pervasive Developmental Disorder-Not Otherwise Specified, or Aspergers Disorder were randomly assigned to one of two groups: (1) the treatment group—Project SEARCH plus ASD Supports and (2) the control group—students attended their assigned high schools and received services as stipulated in their Individualized Education Plans (IEP's). Four students who were randomly assigned to the control group dropped out prior to initiation of the study leaving a total 40 students participating in the study. Random assignment was achieved by numbering each application and randomly assigning the numbers to "A" (treatment) or "B" (control) group through a random numbers generator. A colleague without any connection to the study completed the randomization. The students in the treatment group received a full year of exposure to Project SEARCH plus Supports for students with ASD (Wehman et al. 2013) in their final year of high school. The control group received their education in their home high school following their individualized education programs. This condition was referred to as "business as usual" as these students did not receive any services or supports other than those planned for in their IEP's. Subjects in both groups were evaluated at three time periods: Time 1: baseline, Time 2: completion of school year (control group) or 9-month intervention (treatment group), and Time 3: 3 months post completion of school year or 9-month intervention.

Participants

After the attrition of 4 students in the control group, a total of 40 students were randomized into the study, 16 were in the control group while 24 were in the treatment group. The control and treatment groups were equivalent on a number of demographic variables including race, gender, medical diagnosis, and IEP services category in the study. There is a significant difference [(t (38) = 2.359,

Table 1 Demographic variables for participants

Variable	Control group ($n = 16$)	Treatment group ($n = 24$)	Statistical analysis
Mean age	19.13 years old (SD = 1.09)	19.96 years old (SD = 1.09)	t test, $t = -2.262$, $df = 38$, $p = 0.028$
Gender	68 % Male	75 % Male	Fisher's exact test, value = 0.188, $df = 1$, $p = 0.728$
Race	46.7 % African American 46.7 % White 6.7 % Asian	41.7 % African American 58.3 % White 0 % Asian	Pearson Chi Square, value = 1.886, $df = 2$, $p = 0.389$
Medical diagnosis	Autism 81 % PDD-NOS 12.5 % Aspergers 6.3 %	Autism 62.5 % PDD-NOS 25 % Aspergers 12.5 %	Pearson Chi Square, value = 1.607, $df = 2$, $p = 0.448$
IEP eligibility category	Autism 75 % Intellectual disability 25 % Other Health Impaired 0 % Speech language impaired 6.3 % Multiple categories 6.3 %	Autism 66.7 % Intellectual disability 25 % Other health impaired 8.3 % Speech language impaired 0 % Multiple categories 0 %	Pearson Chi Square value = 5.179, $df = 4$, $p = 0.269$

$p = 0.024$] between the ages of the treatment ($M =$ 19.97 years, SD = 1.09) and control groups ($M =$ 19.13 years, SD = 1.09). Both groups age ranges are 18 years old to 21.5 years old and the mean difference between these two groups is slightly less than 10 months. Table 1 provides means, standard deviations and significance values for each of the demographic and pre experimental variables collected at baseline.

Measures

Application and Interviews

In addition to the SIS, the researchers collected information from the application and through interviews at baseline, and data collection times 2 and 3. The application collected information on the following variables: personal and demographic data (name, address, date of birth, diagnosis, gender, etc.), school services data (GPA, attendance history, copy of student's IEP, total credits achieved, etc.), paid employment and unpaid internship history, future employment goals, list of services provided by all possible agencies, independent living supports needed, behavioral supports needed, open ended questions for students regarding future goals, and list of personal and professional references.

A brief interview consisting of four questions was used to collect information on employment status, wage earned, hours worked, and employer-paid benefits provided at data collection times 2–3. Those questions were:

1. Are you currently employed? Yes or no
2. If you are currently employed, how much money do you make per hour?
3. If you are currently employed, approximately how many hours do you work weekly?
4. If you are currently employed, do you receive any employer paid benefits?

Supports Intensity Scale (SIS)

The only standardized measure used in this study was the Supports Intensity Scale (Thompson et al. 2004a). SIS is commonly used to assess adaptive behavior and intensity of support needs. This scale is designed to measure the relative intensity of support that each person with developmental disabilities (including individuals with ASD) needs to fully participate in community life. The SIS interview measures the frequency, amount of time, and type of supports individuals with disabilities require across six subscales. The SIS's six subscales that were used: (1) Home Living, (2) Community Living, (3) Lifelong Learning, (4) Employment, (5) Health and Safety, and (6) Social. Two SIS subscales that are not included in the final Support Needs Index, but were administered for this study were: (1) Supplemental Protection and Advocacy Subscale and (2) Exceptional Medical and Behavioral Support Needs Subscale. For the purposes of this study, the SIS allowed us to identify the types of employment supports participants required as well as provide a measure of the overall adaptive behavior support needs of subjects at baseline. The final score provides a normative Support Needs Index (SNI) score. The final SNI score indicates whether the individual requires limited support (SNI 1-60), intermittent support (SNI 61-84), extensive support (SNI 85–116) and pervasive support (SNI 117 and above). Reliability has been established for internal consistency

(each factor exceeds .94), test–retest reliability (corrected *r* for each factor ranged from .74 to .94), inter-rater reliability (inter-interviewer ratings ranged from .74 to .96; Thompson et al. 2004b, 2008). Validity has also been established for content, criterion, construct (6 factor structure) validity (Bossaert et al. 2009; Kuppens et al. 2010; Thompson et al. 2004b; Weiss et al. 2009). Data collectors were trained in the administration of the SIS and inter-rater reliability checks were completed on 20 % of data collected in each group. Inter-rater reliability for this study was calculated at a mean of 92.5 % with a range of 89–98 % agreement.

The Project SEARCH Model

Project SEARCH, as designed at Cincinnati Children's Hospital, is a 9-month internship model where youth with developmental disabilities in their last year of high school are embedded in a large community business such as a hospital, government complex, or banking center. The original design of this model was not disability specific. Rather, students with developmental disabilities who participated in this model rotated through three 10–12 week internships within the business where they log approximately 720 h of internship time learning marketable skills and 180 h of classroom time at the business for a total of approximately 900 h embedded in the business setting. As originally designed, this project is a collaborative model between students with developmental disabilities and their family members, a local education agency (LEA), a local community rehabilitation program (CRP), the state vocational rehabilitation program (VR), and a host business. The student and family members identify their personalized employment goals and participate in vocational assessments and internships. The LEA provides a teacher and an adequate number of instructional assistants to implement the senior year IEP of student interns in the program. The state VR provides funding and supervision for job coaching services that are provided through out the final year of school in the internships. The CRP provides job coaches to assess student interests, develop and supervise internships, and provide on-site job coaching during the school day. Finally, the business provides internship sites in high need, high turnover positions.

In this study, participants rotated through numerous internships in two different suburban hospitals. Table 2 presents a sample of the internships through which participants in the treatment group rotated as well as a sampling of the job skills and tasks learned on those internship rotations.

The beginning and end of each school day is spent in a classroom located on the business site learning job skills and social communication behaviors. This model is designed for youth with developmental disabilities who are seeking employment upon graduation from high school (Daston et al. 2012).

Project SEARCH Plus ASD Supports

The original design of Project SEARCH is not disability specific. This study, however, was designed to meet the needs of youth with ASD. Thus, additional components were added to the model to meet the learning and behavioral needs of youth with ASD. Those elements allowed for autism specific supports and services (Wehman et al. 2012). The specific ASD supports that were added to the Project SEARCH Model for this project included: (1) on-site, intensive, systematic instruction using the principles of applied behavior analysis, (2) on-site support and consultation from a behavior/autism specialist, and (3) intensive staff training in ASD and the Project SEARCH Model. Table 3 presents the supports added to the Project SEARCH model and the indicators of fidelity that define each of these key components.

These additional supports were applied on an individual basis for participants based upon their needs and allowed the team to implement the model for the participants previously described as requiring increased support for behavioral challenges. (For a thorough discussion of the Project SEARCH plus Supports for Students with ASD model, see Wehman et al. 2012). The Project SEARCH plus ASD Supports intervention team was composed of an interdisciplinary team of individuals who worked together to ensure the success of the students in the Project SEARCH plus ASD intervention. At each of the two intervention sites, the team included a full time special education teacher and instructional assistant, two full time employment specialists and a business liaison who dedicated a minimal amount of his full time job to the project. In addition, an offsite team provided oversight, ensured collaboration and fidelity of implementation of the Project SEARCH plus ASD Supports Model and managed recruitment efforts. That team included a project director, a positive behavior support facilitator and research director from the research university, a rehabilitation counselor from VR, and an autism or transition specialist from the LEA.

Study Procedures

Control Group

Students assigned to the control group continued to receive the educational supports and services as identified in their individualized education programs (IEP's) without interaction from the Project SEARCH staff or research team beyond intervals of data collection on outcomes.

Table 2 Sample internships and job skills practiced

Internships	Job skills practiced
Nursing units	Stock drawers in patient rooms with medical supplies
	Stock counters in patient rooms w/gloves and hand sanitizer
	Stock clean linen in patient rooms
	Remove soiled linen and take to chute
	Verify patient information on charts (make sure names match up)
	Stamp flowsheets
	Stock colored test tubes in trays
	Stock nursing station (needles, syringes, gauze, glucose strips)
	Clean kitchen and breakroom (sanitize fridge, microwave, pull expired items from fridge/freeze)
	Sanitize/restock isolation carts w/supplies
Family center	Provide classroom assistance for each age group (different class/day)
	Assist with art projects, reading, free time, playground, lunch
	Prepare lunch in kitchen
	Assist in office as needed
	Clean
	Maintain required certifications (CPR and Continuing Education)
Durable medical equipment	Work on teams,
	Clean IV pumps and poles, isolettes, giraffes, etc
	Round floors,
	Steer a cart
	Independently navigate hospital
Materials management	Work in stock room and loading dock
	Unload totes of supplies
	Deliver and stock totes with supplies on units according to type
	Complete reconciliation of supplies
	Use of par-excellence wand
	Move throughout hospital to get to units
Central sterile	Scan instruments into computer
	Peel-pack “extra” instruments
	Wrap surgical trays
	Restock scissors
	File washer reports
Surgical services	Remove and replace full sharps boxes,
	Stock pods, blanket warmers,
	Clean equipment in hallways and pods,
	Check/record blanket and liquid temperatures,
	Restock sutures according to type,
	Transport case carts to the loading dock,
	Make lab deliveries,
	Assist with room turnover, patient transport, equipment delivery and pick-up
Physical rehabilitation and sports medicine	Turnover Rooms
	Stock clean linen in rooms
	Remove soiled linen
	Clean pool equipment and chairs
	Clean equipment in gym: cardio, weights, balance balls
	Stock clean linen in gym
	Refill gel bottles
	File patient charts (alphabetical and color coded according to insurance)
	Pull patient charts for PT’s upcoming appointments
	Assemble new-patient packets

Table 2 continued

Internships	Job skills practiced
Laboratory services	File glass specimen slides in alphabetical and numerical order
	File blocks and molds
	Re-file blocks according to year, hospital, numerical order
	Sort wax block molds according to size
	Add paraffin wax to warming tray
	File pathology reports in numerical order
	Sort inter-department mail
	Complete lab runs (on a team)
	Display independent work and strong attention to detail
Doctors' offices and medical office building offices	File patient charts on shelves in alphabetical order
	File medical miscellaneous forms in patient chart
	Assist in process of going paperless by going through folders & following a system to know which to throw away, shred, or keep
	Scan medical records to go paperless
	Display independent behavior in a busy medical records room with a lot of chatting
Pharmacy	Check dates on all drugs and
	Place expired items in pink bin
	Short-date those expiring next month (put drugs in a clear bag with "short date" sticker)
	Dust and organize shelves
	Clean break room
	Re-shelve drugs that have been removed from Pyxis on floor
	File Chemotherapy orders by patient name
	File prescription slips in numerical order
Infection control	Stock and sanitize isolation carts
	Refill Purell free-standing hand sanitizers
	Check dates and maintain up-to-date stock on all supplies
	Replace batteries as needed
Printing	Bind books
	Sort and Meter mail
	Deliver inter-hospital mail (on a team)
	Complete projects as assigned: folding brochures, collating, etc
Employee wellness	Scan all employee documents into computer and file onto computer folders or create and name new folders
	Assemble Fit Masks
	Unwrap band aids

Treatment Group

Those students assigned to the Project SEARCH plus ASD Supports group attended their final year of high school at the host businesses, which were (1) a 391 bed suburban hospital with adjoining medical office buildings and (2) a 130 bed suburban hospital with adjoining medical office buildings in Richmond, VA. During their year in the Project SEARCH plus ASD Supports program, treatment group participants attended class on the business site for approximately 1 h, 45 min during the school day then rotated through three different internships in the hospital throughout the school year. The classroom curriculum was focused entirely on the acquisition of work skills and work related adaptive behavior including: getting to and from work on public transportation, using a cell phone to call in sick, asking for help, accepting supervisor and co-worker correction, independently navigating the hospital, focusing only on work tasks at work, etc. These students also received a program composed of "braided services." More specifically, they received their educational supports through the LEA while also receiving case management through VR and job coaching through the CRP. No adverse effects due to the treatment were reported during the 3-year period.

Data Analysis

Preliminary analysis consisted of examination of frequencies, means, standard deviations, and distribution of scores.

Table 3 ASD specific program components and indicators of treatment fidelity

Program component	Indicators of treatment fidelity
On-site systematic instruction	1. Job coaches and teachers design, implement, and evaluate customized employment strategies (modifying, eliminating, or adding job duties) to design job descriptions and tasks to eliminate acquisition or performance issues affecting the individual's ability to successfully complete the job to employer's satisfaction
	2. Job coaches and teachers design, implement, and evaluate advanced stimulus control procedures (discrimination and generalization) to address job performance problems
	3. Job coaches and teachers design, implement, and evaluate self-management procedures, including self-monitoring, self-reinforcement, and self-instruction strategies, to address job performance problems
	4. Job coaches and teachers use devices, technologies, environmental design, and visual supports to enable individuals to perform tasks to employer accuracy and production strategies
	5. Job coaches and teachers use stimulus transfer strategies to fade control from training stimuli to the naturally occurring supervision activities on the job site
Behavior specialist on-site support	1. Behavior analyst/behavior support facilitator meets with staff at least bi-weekly to review student progress, analyze any problem behaviors or social communication skill deficits and plan interventions as needed
	2. Behavior analyst/behavior support facilitator observes students on internship sites to complete functional behavior assessment as necessary
	3. Behavior analyst/behavior support facilitator observes in classroom to ensure the development and delivery of intensive applied behavior analysis in daily instruction
	4. Behavior analyst/behavior support facilitator develops behavior intervention plans and social communication skill instruction for individual students as necessary
	5. Behavior analyst/behavior support facilitator trains direct staff in the implantation of plans
Intensive staff training	1. Each teacher and job coach participates in 80 h of training prior to serving students in the three study sites
	2. Training is based on the Project SEARCH implementation manual and materials specific to the serving students with Autism Spectrum Disorders in community settings.
	3. Each teacher and job coach is observed weekly and receives feedback on their performance

For baseline analyses to determine equivalence, t-tests were used to examine differences between treatment and control groups on age and previous employment experience. Chi square tests were conducted to determine whether there was equivalence between the two groups and SIS baseline support needs, reported psychotropic medication to manage behavioral and psychiatric symptoms. Chi square tests were also used to test equivalence between the two groups on race, medical diagnosis, and IEP services. Fisher's Exact test was used to examine differences between the two groups for gender.

The primary hypothesis in the primary data analysis was tested using Fisher's Exact to determine the number of participants who attained employment in the treatment group compared to the control group. The exploration of employment characteristics were conducted through descriptive statistics and paired t-tests between Time 2 and Time 3 for the treatment group only. The one participant in the control group who attained employment upon graduation from high school declined to report hours worked weekly, hourly wage, or benefits status. Therefore, no between group comparisons were conducted on employment characteristics. For the secondary hypothesis concerning the supports needed, independent t-tests were performed to test equivalence between the two groups across the three data collection times, (Times 1, 2, & 3).

Results

Baseline Analyses

There were no significant differences between the treatment ($M = 0.52, \text{SD} = 0.95$) and control ($M = 0.94, \text{SD} = 1.57$) groups related to their baseline paid part-time employment ($p = 0.478$, $t = 1.032$, $df = 37$). Likewise, there were no significant differences for unpaid internships between the treatment ($M = 1.22$, $\text{SD} = 1.28$) and control ($M = 1.25$, $\text{SD} = 1.18$) unpaid internships [$t\,(37) = 0.081, p = 0.312$]. Few students in either the control (37.5 %) or treatment (17.4 %) group were previously employed part time.

There were no significant differences in intensity of support (SIS) that students in each group required at baseline, the Support Needs Index (SNI) mean for the control group was 80.87 ($\text{SD} = 5.68$) with a range of 71–91; whereas the SNI mean for the treatment group was 82.00 ($\text{SD} = 7.93$) with a range of 61–91 [$t = (36)\ -0.478$, $p = 0.396$]. Both groups represented individuals who required intermittent to extensive support. In addition, students in both groups displayed an array of behavioral and medical challenges at baseline that are typical in the population of students who are diagnosed with ASD. Table 4 presents SIS findings from the Exceptional Medical and Behavioral Support Needs Subscale, use of psychotropic medication to manage behavior or psychiatric

Table 4 Behavioral and medical characteristics of participants at baseline

Variable	Control group ($n = 16$)	Treatment group ($n = 24$)	Statistical analysis
Support Intensity Scale findings for behavioral support needs	Mean behaviors noted as needing support = 0.77 (SD = 0.44)	Mean behaviors noted as needing support = 1.48 (SD = 1.085)	Pearson Chi Square, value = 8.623, $df = 3$, $p = 0.035$
Support Intensity Scale findings for medical support needs	Mean co-morbid medical diagnoses noted as needing support = 0.23 (SD = .599)	Mean co-morbid medical diagnoses noted as needing support = 0.52 (SD = 0.586)	Pearson Chi Square, Value = 5.232, $df = 2$, $p = 0.041$
Reported use of psychotropic medication to managed behavioral and psychiatric symptoms	Percentage of participants taking psychotropic medication to address behavioral or psychiatric symptoms = 50 %	Percentage of participants taking psychotropic medication to address behavioral or psychiatric symptoms = 79 %	Pearson Chi Square, Value = 3.723, $df = 1$, $p = 0.054$

Table 5 Reported percentages of behavioral challenges and co-morbid medical diagnoses in the treatment and control group participants

Variable	Control[a]	Treatment[a]
Reported behavioral challenges	None = 15.4 %	None = 19.2 %
	Aggression = 0 %	Aggression = 11.5 %
	Stealing = 0 %	Stealing = 3.8 %
	Inappropriate behavior = 7.7 %	Inappropriate Behavior = 19.2 %
	Tantrums = 53.8 %	Tantrums = 11.5 %
	Wandering = 0 %	Wandering = 15.3 %
	Anxiety or depression = 23.1 %	Anxiety or depression = 38.4 %
	Other = 0 %	Other = 7.7 %
Reported co-morbid medical diagnoses	None = 84.6 %	None = 50 %
	Seizures = 0 %	Seizures = 11.5 %
	Receives speech, occupational, or physical therapy = 15.3 %	Receives speech, occupational, or physical therapy = 23.1 %
	Other = 7.6 %	Other = 19.2 %

[a] Percentages do not equal 100 % because participants could report challenges or diagnoses in more than one item

conditions, and co-morbid medical challenges associated with the subjects in the treatment and control groups at baseline (Time 1).

These results indicate that, at baseline, the treatment group reported requiring significantly more support for behavioral challenges and co-morbid medical diagnoses as well as taking significantly more psychotropic medication. Table 5 presents the percentage of participants in the treatment and control groups who reported displaying specific challenging behaviors and co-morbid medical diagnoses.

The control group reported displaying inappropriate behavior,[1] tantrums, and anxiety or depression while the treatment group reported more behavioral challenges including; aggression, stealing, inappropriate behavior, tantrums, wandering, anxiety or depression, and other. Some other behaviors that were noted included over-activity, flapping hands, fidgeting, occasional incontinence, and talking to self. Finally, the control group reported receiving speech, occupational or physical therapy, and having additional medical conditions (e.g., asthma or allergies) while the treatment group reported having seizures, receiving speech, occupational or physical therapy, and having additional medical conditions (e.g., scoliosis, asthma, allergies). Clinically, the participants in the treatment group displayed many of the secondary symptoms (behavioral challenges and co-morbid medical diagnoses) associated with ASD while the control group displayed less of those secondary symptoms.

Primary and Secondary Hypotheses Analyses

Fisher's Exact test indicated a significant difference ($p = .000$) in the number of participants who attained employment in the treatment group when compared to the control group. The treatment group attained employment at a rate of 87.5 % ($n = 21$) upon completion of the Project Search plus ASD program whereas the control group attained employment at

[1] The Support Intensity Scale defines "inappropriate behavior" as "non-aggressive but inappropriate behavior, e.g., exposes self in public, exhibitionism, inappropriate touching or gesturing" (Thompson et al. 2004a, p. 7).

Table 6 Employment outcomes for treatment and control groups

Variable	Control group ($n = 16$)	Treatment group ($n = 16$)	Statistical analysis and P value
Baseline employment status	100 % unemployed	100 % unemployed	N/A
Employment status June/July after 9 month school year in study	93.75 % unemployed, 6.25 % employed	12.5 % unemployed, 87.5 % employed	Fisher's exact test, value = 23.422, $df = 1$, $p = 0.000$
Employment status September/October, 1 year after enrollment in the study	93.75 % unemployed, 6.25 % employed	12.5 % unemployed, 87.5 % employed	Fisher's exact test, value = 23.422, $df = 1$, $p = 0.000$
Hours worked per week, June/July after 9 month school year in study	[a]	17.92 h (SD = 7.21)	[a]
Hours worked per week, September/October, 1 year after enrollment in the study	[a]	18.13 h (SD = 8.18)	[a]
Hourly wage earned, June/July after 9 month school year in study	[a]	$8.21 per hour (SD = $3.17)	[a]
Hourly wage, September/October, 1 year after enrollment in the study	[a]	$8.25 per hour (SD = $3.19)	[a]
Employer paid benefits status, June/July after 9 month school year in study	[a]	0 % have employer paid benefits	[a]
Employer paid benefits status, September/October, 1 year after enrollment in the study	[a]	4.2 % have employer paid benefits	[a]

[a] Not able to analyze or report. The one participant in the control group who was employed declined to provide information on wage earned, hours worked, or employer paid benefits status

6.25 % ($n = 1$). The same employment attainment difference (i.e., treatment = 87.5 %; control = 6.25 %) was maintained at same rate 3 months later. The one participant in the control group who attained employment upon graduation from high school declined to report hours worked weekly, hourly wage, or benefits status. For the 24 participants in The Project SEARCH plus ASD program, graduates saw an increase in the weekly hours worked from the end of the program at graduation ($M = 17.92$ h per week) and 3 months later ($M = 18.13$ h). The range of wage earned for the 21 participants in the treatment group who were employed ranged from $9.00 to $9.63 per hour. Fisher's Exact test indicated a non-significant difference ($p = 0.632$) in employer paid benefits for the treatment group when one of the treatment group participants achieved full time employment with employer paid benefits. See Table 6 for the statistics for the employment outcome measures.

There were also significant differences noted in the reported need for employment supports according to the Employment Subscale of the SIS. Figure 1 presents the reported standard score on the employment subscale for the SIS at baseline, and data collection times 2 and 3.

As with the SNI, higher standard subscale scores indicate higher support needs on the SIS Employment Activities subscale. At baseline, no difference [t (36) = −0.919, $p = 0.364$] was indicated between the control group mean support score of 8.33 (SD = 1.05) and the treatment group mean support score of 8.74 (SD = 1.48). Upon graduation, the control group reported a slight increase in employment support intensity with a mean support score of 8.36 (SD = 0.84) while the treatment group showed a slight decrease with their mean score of 8.23 (SD = 1.27). By 3 months out, however, there was a significant difference between the treatment ($M = 7.65$, SD = 0.98) and control

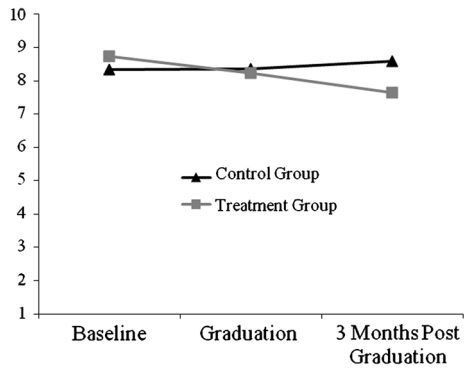

Fig. 1 Employment activities subsection standard scores at baseline, time 2 and 3 for the treatment and control group

Table 7 Employment outcomes for treatment group

Department	Job title
Infection control	Assistant
Family center	Teacher's aide
Intensive care unit	ICU assistant
Environmental services	Aide
Central Sterile Services	Aide
Mother and infant unit	Aide
Durable medical equipment	Technician
Surgical care	Surgical care technician
Print shop	Technician
Pharmacy	Pharmacy assistant
Environmental services	Aide
Linen distribution	Assistant
Dinning and nutrition	Assistant
Coronary care unit	Aide
Neurology unit	Aide
Physicians office	Clerical assistant
Medical/surgical unit	Assistant

($M = 8.58$, SD $= 0.52$) group mean standard scores on the Employment Activities Subscale of the SIS, [$t(34) = 3.058$, $p = .004$]. It appears that even 3 months of employment after an intensive internship transition program could prove to be therapeutic in that the intensity of support needs appeared to decrease over this short of a period.

In addition to achieving employment at a statistically higher rate, participants in the treatment group also achieved employment in competitive jobs that have not traditionally been considered for youth with ASD. Table 7 presents a listing of jobs and job titles in which individuals in the treatment group were employed.

Discussion

Achieving competitive employment is an important outcome for young adults graduating from high school or college. Adolescents go to high school and sometimes college in order to obtain meaningful employment in the workplace. Youth with disabilities, especially those with significant intellectual and developmental disabilities (Carter et al. 2011), have struggled to make this transition. Shattuck et al. (2012) and Taylor and Selzer (2011) further note that for youth with autism, unemployment after school can range from 50 % to as high as 86 % rate. This is an unacceptable outcome after many years of specialized education and schooling.

Therefore, we designed and implemented an intensive 9-month intervention based on the Project SEARCH model of hospital internships for youth with ASD over a three-year period. In this approach, we strongly relied upon applied behavior analysis as a mechanism for systematic instruction as students moved through three different 10–12-week internship rotations. Teachers, teaching assistants and job coaches provided direct instruction during the internship rotations in collaboration with department supervisors and coworkers to help students acquire proficiency in job skills and adaptive work behaviors. Departments where internships occurred included neonatal and pediatric intensive care units, diabetic wellness units, the hospital pharmacy, coronary care unit, environmental services, ambulatory surgery, and others. The job tasks and settings were atypical for youth with significant developmental disabilities and ASD who historically have been placed in entry-level service jobs in hospitality and cleaning industries. At the same time, the internships were largely composed of high level, repetitive tasks that require a high attention to detail and an intensive focus on order and structure to complete successfully.

To our knowledge, this is the first study to use a randomized clinical design to evaluate employment outcomes for youth with ASD. Additionally, this is also the first study to evaluate the efficacy of the Project SEARCH internship model on employment outcomes using a highly rigorous experimental design.

The early employment results from these efforts were quite positive and encouraging. We found that 21 individuals with ASD in the treatment group were hired into competitive employment in jobs such as pharmacy technician, ICU assistant, teacher's aide, surgical care technician, and clerical assistant. This compared favorably with those in the control group where one person was competitively employed during the 3-year study. In addition to acquisition of employment, the wages earned by treatment group participants were up to 24 % above the minimum wage of $7.25 in Virginia at the time of the study. Furthermore, subsequent papers will review employment maintenance at 12 and 24 months. Early results in this area are also extremely positive with 78 % of clients maintaining competitive employment and earning increasingly higher wages at 12 and 24 months.

Additionally, we observed that the students in the treatment group became increasingly independent at work than those in the control group as measured by the Support Intensity Scale Employment Activities Subscale. These findings were especially of interest to us since most of the students in the overall pool that were involved in the 3 years displayed significant behavioral and medical challenges associated with ASD at baseline. These were students who required significant staff time and extraordinary supports, including 1:1 staff ratios and extensive behavior supports, prior to entering the study. Usually those students who have been identified as having behavioral challenges

by the educational team are among the most difficult to successfully transition to employment. Yet, after a year of the Project SEARCH plus ASD Supports Intervention, they not only successfully completed the internships but also gained and retained competitive employment at a much higher rate than those in the control group.

Findings

This study yielded a number of highly favorable outcomes which we gradually saw accrue over the three-year time. First, students with ASD who had never worked before in health care settings were given the opportunity to do so and successfully completed three different 10–12-week internship rotations. Students had to learn to successfully navigate the hospital, communicate with staff and patients and learn appropriate social, communication, and work skills.

Second, over the 3-year period, most students in the treatment condition demonstrated sufficient competency that resulted in employment in the host hospital. As data show, most of these students remain successfully employed at 3-months post intervention.[2] Given the historically high unemployment rate of youth with ASD these results were very positive.

Third, hospital staff, including department heads, supervisors, nurses, therapists, administrators, and physicians became acquainted with the students over the 9-month intervention. They spoke eloquently at each year's graduation of the positive impact these students had in their departments. The hospitals showed a tremendous commitment to working with the Project SEARCH teachers and job coaches as demonstrated by agreeing to continue to participate and hiring most of the students into open positions in the hospitals.

Fourth, this intervention demonstrated a seamless transition from school to employment through a business-based internship model. The seamless transition (Certo et al. 2008) has been elusive for most students with significant disabilities and this intervention provides strong early data to suggest that a protracted intensive immersion in the workplace through internships can be a powerful way to achieve competitive employment upon graduation from high school.

Fifth, the families of treatment participants showed initial disbelief that their sons and daughters with ASD could work followed by incredible support for their employment. These families realized that their children with ASD could be valuable employees in a hospital. This disbelief turned into pride and joy as social and vocational competence emerged throughout the internship period.

Finally, this intervention demonstrated the power of shared funding across multiple agencies including public schools, university resources, and vocational rehabilitation, which played a major role in funding and support. All of the individuals who were employed were ultimately successfully closed in the VR system.

Potential Reasons for Success

Collaboration

One reason for the success of this project was the collaboration of all partners mentioned. Both the onsite and administrative teams worked together to meet the needs of both the students and business on a daily basis. The entire team met together on a monthly basis to raise concerns regarding interns, classroom instruction, and internship sites, brainstorm solutions, and celebrate successes. Likewise, the host business "bought into" the intervention and embraced the value that students with ASD added to their business environment. This was a result of the collaboration and support provided on-site. In fact, many supervisors anecdotally reported that they learned how to use positive reinforcement to support their existing employees because of their interaction with Project SEARCH plus ASD Supports interns and staff.

Training and Experience

The project assured that the staff was highly trained in transition to employment, supported employment, and ASD supports. In addition, over the course of the project's 3 years, staff received extensive training in providing positive behavior supports, applied behavior analysis, and systematic instruction. In order to ensure success, the on site team met daily to plan the day's activities and weekly to talk more in depth about future student and business needs.

ASD Specific Supports

Integral to this project's success was the implementation of applied behavior analysis and positive behavior supports. Participants' instructional and behavioral plans were individualized based on behavioral assessment. Additionally, there was an intensive focus on the contextual fit of individualized behavioral and instructional interventions in the business environment. This ensured that interventions were designed to meet the needs of the individual student in the context of the business. This was critical to the successful implementation of behavioral support on the job site (Schall 2010).

Because of the intensive embedment in the business site and the application of applied behavior analysis,

[2] As noted, this study is ongoing. This research team will report on 1-year post intervention employment retention in a subsequent paper.

participants in the treatment condition had the opportunity to practice job specific skills in a generalized setting with a very high number of trials so that mastery, fluency, and generalization of skills was guaranteed through the model itself. This element of the model, in particular, seems to be critical to the successful learning of youth with ASD and mirrors the intensity of intervention that young children with ASD receive in successful ABA-based early intervention models (Wehman et al. 2013). Thus, students in the treatment condition had multiple opportunities across the day to practice job, social and communication skills essential to employment while control group participants likely had fewer opportunities to practice such skills in contrived environments.

Limitations

There are some limitations to the findings presented in this study. First, four subjects dropped from the study. All four were from the control group. These subjects dropped prior to data collection, so it is not possible to analyze the affect, if any, that these four would have on the conclusions drawn from the study. This could limit the findings from this study, but would not likely affect the significant difference between the treatment and control group on the primary endpoint of employment. Second, the research team did not confirm the pre-experimental diagnoses of ASD with further diagnostic testing. The incoming diagnosis, behavioral descriptions provided through the SIS, and interviews were deemed sufficient to find students eligible for inclusion in the study. Nevertheless, all students had been identified or diagnosed with ASD by the child study team or their physician. Third, the research team had little interaction with the control group. It is likely that their individualized programs varied greatly due to the nature of special education in high school settings. Thus, it is not possible to generalize any conclusions about the reason for low employment rates for the control group or if the "business-as-usual" condition is, in fact, similar to any other high school special education context outside of this study. Finally, this study was completed at two different hospitals within the same geographic location with largely the same support staff at each site. It is possible that this geographic location or specialized staffing skill sets are unique in the employment of individuals with ASD. Finally, students who required extensive support in personal care and personal independence were not included in this study. These limitations suggest that it may not be possible to generalize findings to other settings beyond the current study. Further research is needed to confirm the efficacy of the Project SEARCH plus ASD Supports model and its effect on employment outcomes for youth with ASD.

Future Research

Future research will need to explore the efficacy of this model. This is a staff intensive model with funding from multiple agencies. The current study did not include an analysis of the cost versus benefits attained. It also did not explore the extent to which others can replicate the model. Is it possible to replicate this model in other settings, locations, and businesses? What are the essential elements of the intervention that result in employment outcomes? Are there elements of the model that are not required to result in employment? What is the availability of behavioral supports and ABA interventions for adults with ASD after public education is complete? What national policy changes are necessary to ensure wider access to the type of supports provided in this model? Future research should explore these questions.

Conclusion

This paper presented the preliminary results of a randomized clinical trial of Project SEARCH plus ASD Supports on the employment outcomes for youth with ASD between the ages of 18–21 years of age. For most youth with ASD, employment upon graduation from high school or college is elusive. This model provides very promising results in that the employment outcomes for youth in the treatment group were much higher in non-traditional jobs with higher than minimum wage incomes than for youth in the control condition. Specifically, 21 out of 24 (87.5 %) treatment group participants acquired employment while 1 of 16 (6.25 %) of control group participants acquired employment. This study provides compelling evidence that employment upon graduation from high school is achievable for youth with ASD who also display challenging behavior and have co-morbid medical diagnoses.

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