I, Kathryn A Doyle, hereby submit this original work as part of the requirements for the degree of Doctor of Philosophy in Educational Studies.

It is entitled:
Social Scripts to Teach Conversation Skills to Adults Significantly Impacted by ASD

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Social Scripts to Teach Conversation Skills to Adults Significantly Impacted by ASD

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A script that was systematically faded from end to beginning was used to teach peer initiations about recent completed, current, and future activities. The effectiveness of the script-fading procedure was assessed via multiple baseline design across 3 adults with significant ASD and comorbid ID. During baseline, the adults seldom initiated to peers. When the script was introduced, peer initiations increased, and as the script was faded, scripted initiations were maintained. The participants could generalize the initiations to a different setting, time, activity, and person. The results were maintained at a 2 month follow up for 2 of the 3 study participants. This script fading procedure allowed adults with significant ASD and comorbid ID to participate in conversations that were not prompted by staff. Implications for practice and future research are discussed.
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Social Scripts to Teach Conversation Skills to Adults Significantly Impacted by ASD

**Autism Spectrum Disorder**

Autism Spectrum Disorder (ASD) is diagnosed upon established deficits in social communication and excessive engagement in restrictive or repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2013). These differences in social communication often result in difficulty maintaining reciprocal social interactions and difficulty with initiating and responding in social interactions. This can lead to deficits in developing and maintaining relationships. In individuals with ASD, restricted and repetitive behaviors can manifest as stereotyped speech, repetitive use of objects, rigid adherence to routines, and highly restricted interests.

**Autism Spectrum Disorder and Intellectual Disability**

Individuals with Intellectual Disability (ID) have deficits in adaptive and intellectual functioning. Intelligence Quotient (IQ) scores are a general guideline for IQ, with a score of 70 or below indicating an intellectual disability. However, the Diagnostic and Statistical Manual 5 (DSM-5) emphasizes the need for clinicians to use both clinical assessment and standardized testing to diagnose ID. In looking at the prevalence of comorbid ASD/ID the data show wide discrepancy across studies.

Fombonne (2003) suggested that prevalence of coexisting ASD/ID lay between 50 – 70%. LaMalfa, Lassi, Bertelli, Salvini, and Placidi (2004) concluded that 70% of individuals with ASD have coexisting ID. The most recent prevalence study conducted by the Centers for Disease Control (CDC) which used records from 2008, indicated that 38% of children with ASD had coexisting ID. In a 2011 study, Charman, Pickles, Simonoff, Chandler, Loucas, and Baird found...
that of the 75 children with ASD, 55% of the children had an intellectual disability with 16% having a moderate to severe intellectual disability. In the Wong et al. (2014) report on Evidence Based Practice’s for youth, children, and young adults with ASD, of the 456 intervention articles included in the evidence base, the co-occurring condition descriptor identified most frequently was intellectual disability (25.4% of all studies).

**The Impact of Comorbid ASD/ ID on Social Competence**

The strongest prognostic indicators for individuals with ASD are intellectual and verbal functioning (Howlin & Magiati, 2017). Few individuals with ASD and an IQ below 70 live independently as adults with job and social prospects being poor. Individuals with ASD and ID tend to exhibit fewer positive social behaviors (e.g. attempts to communicate with others, positive non-verbal social skills), with more challenging social profiles (e.g. isolating, disruptive) than those without ASD (Wilkins & Matson, 2009). This is likely because individuals with ASD and ID often demonstrate more significant communication challenges and are less likely to use verbal language socially. Unfortunately, both social skills and cognitive skills generally do not improve with development into adulthood for individuals with ASD and comorbid ID (Lord, Bishop, & Anderson, 2015; Woodman, Smith, Greenberg, and Malick, 2015, 2016).

While it is recognized that ASD is a lifelong social communication disability, many of the interventions to increase social competency are targeted in the early intervention years for individuals with ASD. Twenty-six of the twenty-seven EBP’s (excluding exercise) identified by Wong et al. (2014) were used to target social outcomes with a majority targeting students under the age of 15. However, social challenges not only persist into adulthood (past school age services), but the social demands and expectations become increasingly complex and nuanced in the adult world.
Generalization

Although social competence skills are being targeted for individuals with ASD from a young age, the skills gains are not being maintained into adolescence and adulthood. The ASD literature would suggest that lack of generalization is the primary issue that needs to be addressed (Bellini et al. 2007; Gresham, Stokes & Baer, 1977; Sugai, & Horner, 2001). Generalization is defined as “the occurrence of relevant behavior under different, non-training conditions (i.e. across subjects, settings, people, behaviors, and/or time) without the scheduling of the same events in those conditions as had been scheduled in the training conditions” (p.50; Stokes & Baer, 1977). As Stokes and Baer (1977) argued, generalization is not simply a passive occurrence, but rather a response that requires explicit programming into the intervention. The occurrence of the targeted behavior should occur in non-training conditions across subjects, settings, and times. A continual weakness in the methodological design in the social skill literature is the lack of generalization of the targeted skill in the natural environment (Bellini et al. 2007; Gresham, Sugai, & Horner, 2001).

The Grim Adult Landscape

The current adult landscape for individuals with ASD/ID is grim. It is beleaguered by issues such as a lack of a continuum of services, a high burn-out rate for staff, and a lack of research in the adult autism population (Gerhardt & Lainer, 2011). Services for adults with significant ASD that target employment and community participation are lacking. While there are pockets of excellence in the U.S., many communities lack the continuum of services needed for adults with ASD. Unfortunately, many adults without ASD remain without any appropriate services once they transition out of school age services (Gerhardt & Lainer, 2011).
For adults with autism, employment rates range between 4.1 to 11.8%, regardless of their IQ or education level (Autism Speaks, 2012; Taylor & Selzer, 2011), leaving a substantial number of individuals unemployed or underemployed. Only a small proportion of adults with severe intellectual disabilities, autism, or multiple disabilities access paid work experiences in their local communities (Butterworth, Smith, Hall, Migliore, & Winsor, 2010; Carter, Austin, & Trainor, 2013). As emphasized earlier, individuals with ASD and comorbid ID function significantly lower in the domains education, living situations, and general independence than those without ID.

A second issue plaguing the adult service landscape is stress and burnout levels in caregivers of individuals with ASD/ID are excessively high (Hatton et al., 1999 & Schieve et al., 2007). This burnout rate is even higher for staff working in secluded settings (Aiken & Schloss, 1994). The US Department of Health and Human Services (DHHS; 2006) reported that the turnover for long term service staff and support staff for individuals with ID/DD is around 50%. Recruitment alone cannot fulfill this need. Thus, focusing on retention and staff training with EBP’s is essential. While staff training is not the focus of this study, it is hypothesized that a positive byproduct of a successful social competence intervention could be decreased staff burnout and increased competency.

The third critical issue this study addresses is the sparse amount of research addressing the needs of adults on the spectrum, (Gerhardt & Lainer, 2011), specifically adults with comorbid ASD/ID. In the Reichow and Volkmar (2010) best evidence synthesis of interventions to increase social behavior for individuals with ASD, only three of the 66 studies published in peer-reviewed journals targeted adolescent or adult participants. To date, here are no studies examining individuals who are more significantly impacted by ASD. Thus, there is limited research regarding social competency interventions for adults with ASD and comorbid ID.
Changing the Adult Landscape for Individuals with Significant ASD

There is a dire need to improve the outcomes for adults with ASD and coexisting ID. While the research on outcomes in adult life is growing, findings for this population remain inconsistent and conflicting (Howlin & Magiati, 2017). There needs to be an emphasis on increased research in the adult autism population that targets EBPs. Identifying interventions that improve staff-client relationships, increase staff’s feelings of competence, and lead to social gains for individuals with ID/ASD is critical to changing the adult landscape.

A Social Competence Intervention for Adults with Significant ASD

There is a gap in the extant literature examining social competence in adults with ASD/ID, likely because most of the interventions target challenging behaviors and life skills (Laugeson, & Ellingsen, 2014; Mayville, 2013; Walton & Ingersoll, 2013). While focusing on social skills for individuals with ASD from a young age is important, targeting social skills remains critical across the lifespan. Due to the unique profile of adults with ASD/ID, and the lack of consideration given to this population in the research, identifying effective treatment options that result in the large, generalized skill changes is critically important.

Recently, Walton and Ingersoll (2013) recommended interventions be created with an eye toward developmental appropriateness, noting that the few interventions that have been researched for this population have been created based upon the interaction styles of younger children. By drawing on the large body of research examining social skills interventions for young children with ASD, “it provides a potentially promising framework for developing future interventions,” (Walton & Ingersoll, 2013, p. 611).
The skills targeted for younger children (e.g. joint attention, appropriate initiation, gestures, etc.) are apt to be more suitable than the skills targeted for students with higher functioning ASD (e.g. emotional understanding, theory of mind, friendship building, social problem solving) (Walton & Ingersoll, 2013). The review identified seventeen studies targeting positive social behaviors. The treatment categories included: (a) video modeling, (b) developmental/relationship-based interventions, (c) peer mediated interventions, (d) behavioral interventions, and (e) structured teaching. Of the six behavioral interventions identified, three targeted teaching individuals with ASD/ID to initiate appropriate social interactions with others. Drawing upon the developmental framework, the authors propose that this is a relevant commencement point to develop interventions for adults with ASD/ID.

Taking together the suggestion for developmental practice and the lack of intervention for this population, there is a critical need for researchers to explore interventions for adults with ASD and comorbid ID within the developmental framework. A script fading intervention for adults with significant ASD and comorbid ID was selected for this study due to the success of the intervention for younger children with ASD. It was also hypothesized that an added benefit to a successful social skills intervention would be the increased rapport between clients and staff that could decrease burnout (Gerhardt & Lainer, 201; Walton & Ingersoll, 2013). This intervention would allow direct care staff to be trained in relevant, evidence based practices and demonstrate competence. Stated another way, not only can scripts meet the developmental needs of individuals with ASD/ID, but they could also serve as the foundation for relationship development and social interactions.
Script and Script Fading Interventions

Scripting is an EBP to teach social communication language skills to school age individuals with ASD (Wong et al., 2014). Scripting involves providing the individual with ASD specific verbal or written phrases to increase initiations and serve as a model for the learner (Fleury, 2013). The foundation of scripting is to help the individual with ASD predict what may occur during an activity and expand their opportunities to participate in the activity. Scripting has enough qualifying evidence to meet evidence based criteria with 1 group design and 8 single case design studies (Fleury, 2013) with the intervention being effective for preschoolers (3-5 years) and high school age learners (15-18 years) (Brown, Krantz, McClannahan, & Poulson, 2008; Charlop-Christy & Kelso, 2003; Dotto-Fojut, Reeve, Townsend, & Progar, 2011; Ganz, Kaylor, Bourgeois, & Hadden, 2008; Goldsmith, LeBlanc, & Sautter, 2007; Krantz & McClannahn, 1993; MacDuff, Ledo, McClannahan, & Krantz, 2007; Murdock & Hobbs, 2011; Stevenson, Krantz, & McClannahan, 2011). Scripting interventions have been shown effective to improve social, communication, joint attention, play, and vocational skills. The National Professional Development Center (NPDC) on ASD compiles and advocates for the use of EBPs. While scripting is identified as an EBP, the review did not focus on script fading (Akers et al., 2016). Six of the studies included in the NPDC review included script fading.

Scripts often include phrases or visuals to increase initiations in specific contexts (Krantz & McClannahan, 1993). The length and presentation of the script (e.g. written vs. pictures) varies based on the individual’s skill level. Script fading is an effective intervention to increase the frequency of social initiations used by people with ASD. These scripts allow individuals with ASD to engage in social interactions and practice critical social skills (Goldstein & Cisar, 1992).
There is a dearth of social skills interventions available for adults who have significant ASD/ID. Significant issues with this shortage of research include the absence of useful interventions obstructs the continued growth of adults with ASD and ID and the lack of interventions to support staff working with and supporting this population.

This study used a single case design test to determine if scripting is a successful intervention for the adult population with significant ASD and comorbid ID. The script intervention was chosen because it is relatively cost and time effective. The materials can be made simply and are easy to transport in a variety of settings. It is perceived that the intervention will be relatively easy to train direct care staff on, leading to an increase in their repertoire of skills. The intervention was also chosen because it can be effectively used across a wide variety of naturalistic settings. Learning opportunities created in natural environments often facilitate generalization more effectively (Harris, Wolchik, & Weitz, 1981).

There is a critical demand to examine the array, availability, and effectiveness of EBPs targeting social skills for adults with significant disabilities. Many of the difficulties associated with ASD in childhood persist into, and often intensify, in adulthood. Thus, interventions are needed that target communication, social interaction, and flexibility of thinking and behavior, that are comparable to those stated in the analyses of the child ASD literature (Matson, Benavidez, Compton, Paclawskyj, & Baglio, 1996; Odom, Boyd, Hall, & Hume, 2010), may be applicable in the treatment of adults with ASD. Script fading is an intervention that can contribute to the gap in the social skills literature for the adult population significantly impacted by ASD with comorbid ID.
Statement of Purpose

The purpose of this research study was to examine the effects of both the introduction of a script and a script fading procedure on social interactions with young adults with significant ASD and comorbid ID. Social scripting and script fading have demonstrated that they are effective interventions to expand the language skills with individuals with ASD (Brown et al., 2008; Krantz & McClannahan, 1993; Reagon and Higbee, 2009). Scripts are used with individuals with ASD to serve as prompts or cues of purposely taught words or phrases (Akers et al., 2016). An additional objective is to add to the limited extant literature on social competence interventions for adults with ASD and comorbid ID.

This study used a behavior analytic technique, a script fading procedure, to teach social interaction skills to adults with significant ASD. Script fading encompasses many of the responses necessary to engage in social interactions: (a) approaching others, (b) initiating conversations, (c) orienting to those who are speaking, (d) waiting while other people talk, and (e) emitting reciprocal responses (McClannahan & Krantz, 2005).

Research Questions

The following research questions were investigated: (a) Will the young adults with ASD and comorbid ID increase target conversation skills (most specifically appropriate initiations) using written scripts? (b) Will the script fading procedure be effective for adults diagnosed with significant ASD? (c) Can the adults generalize the skills to different settings and people after the scripting intervention is faded?
Literature Review

The purpose of this review was to examine the most recent findings in regards to scripting and script fading interventions for individuals with significant ASD. This literature review aims to: (a) identify practices that currently exist for adults with significant ASD using scripting, and (b) examine the effectiveness of scripting and (c) determine if there are any gaps in the extant research. This research will benefit individuals with significant ASD, the families and communities that support them, employers, social agencies, researchers and practitioners in the field of special education.

Method

Literature Search

An extensive search of literature from the following databases was conducted: EBSCOhost, Education Resources Information Center (ERIC), Sage Journals Online, ProQuest, Education Research Complete, Wiley Online Library, PsycINFO, Test and Measures in the Social Sciences, World of Learning, and Google Scholar. The search was conducted through January 2016. For the key word search, script* was combined with the following terms: significant disability, autism spectrum disorder, autism, evidence based practices, visuals, applied behavioral analysis, video based strategies, significant, script fading, and intellectual disability. Additionally, the reference sections of identified studies were searched by hand to detect work missed by the electronic search. Any studies that were referenced, but were not located in the database search were also considered as potential studies for review. All the articles were found in electronic databases using keyword searches.
The term significant disability has been defined various ways by many different entities. The term significant cognitive disability was added in the 1997 amendment to IDEA (IDEA, 2004). For purposes of nondiscrimination laws (e.g. the Americans with Disabilities Act, Section 503 of the Rehabilitation Act of 1973 and Section 188 of the Workforce Investment Act), a person with a disability is generally defined as someone who (a) has a physical or mental impairment that substantially limits one or more "major life activities," (b) has a record of such an impairment, or (c) is regarded as having such an impairment (Department of Labor, 2014). Handleman (1986) introduced the term severe developmental disabilities as a primary term to refer to the disabilities of individuals with autism, severe intellectual disabilities, and multiple disabilities. In this review, the term significant disability was used.

**Inclusion Criteria**

The following inclusionary criteria were applied for this review:

- The study was published between 1993 and 2016 in a peer reviewed journal.
- The study sample included at least one individual with ASD.
- The studies were written in English.
- No limitations were placed on the geographical location of the studies.
- No limitations were placed on the age of the participants in the study.

**Results**

The search identified twenty-four studies that fit the inclusionary criteria. Scripting was determined to be an EBP by Wong et al. (2014) for increasing communication, social, play, joint attention, cognitive, and vocational skills. Scripting meets the evidence based criteria with 1 group design and 8 single case studies (Fleury, 2013). Scripting has been shown to be effective for
preschoolers (3-5 years old) to high school age learners (15 – 18 years old) (Brown, Krantz, McClannahn, & Poulson, 2008; Charlop-Christy & Kelso, 2003; Dotto-Fojut, Reeve, Townsend, & Progar, 2011; Ganz, Kaylor, Bourgeois, & Hadden, 2008; Goldsmith, LeBlanc, & Sautter, 2007; Krantz & McClannahn, 1993; MacDuff, Ledo, McClannahn, & Krantz, 2007; Murdock & Hobbs, 2011; Stevenson, Krantz, & McClannahn, 2011).

In this search, studies regarding scripting interventions for individuals with ASD yielded 4 distinct themes (a) auditory scripts, (b) visual scripts, (c) interventions that included script fading and (d) scripts that targeted individuals 14 years and older. Eighteen of the studies used visual scripts to teach the selected skills to the individuals with ASD. Six of the studies used audio scripts to teach the selected skills to the individuals with ASD. Eighteen of the studies used script fading within the scripting intervention. Only four of the studies targeted individuals that were older than fourteen years of age. No studies were found that targeted students who were no longer to eligible to receive school age services due to age (older than 22).

Seminal Script Fading Study

Krantz and McClannahn (1993) ran the seminal script fading study in which in addition to teaching social scripting procedures to four adolescents with ASD, they could fade the words in the visual script. Krantz and McClannahn (1993) used written scripts to teach four children to emit peer initiations during art activities. The study provided participants with visual scripts that taught them to talk about items present in the environment. The scripts were faded by deleting one word at a time until all the scripts were blank. In the final step, the blank piece of paper was left with a cue to talk. Using a multiple baseline across participants design, they showed all the students in the study increased their scripted and unscripted initiations.
Audio Scripts

Stevenson, Krantz, & McClannahan (2000) used audio scripts with four children with ASD ages ten to fifteen years old. The researchers embedded Language Master © cards into activity schedules and taught the children to initiate with adults about their recent activity. The recipients of the interactions responded with an extension of the statement or question. After approximately four interactions, a closing statement was modeled for the child. Using a multiple baseline across participants design, they demonstrated that unscripted initiations increased as script fading was introduced. The effects were maintained for at least 10 and up to 92 sessions. A limitation was that the study did not assess for generalization.

Howlett et al. (2011) used contriving establishing operations (EO) to evoke mands in two three-year-old boys. The experimenters used an audiotaped script to teach the mand, “Where’s the [object]?”. During each session, trials were alternated in which high-preference items were present or missing from their typical locations. Both participants learned to mand when the object was missing trials and not to mand when the object was present. Using a multiple-probe design across participants they showed generalization of manding was demonstrated across novel instructors, stimuli, and settings. The manding was maintained 3 to 4 weeks following the intervention.

Dotto-Fojut, Reeve, Townsend, & Progar (2011) used a combination and auditory and written scripts depending upon the skill set of the participant. The purpose of the study was to determine whether adolescents with ASD could be taught to approach an instructor posing as a work supervisor, describe a problem, and request assistance when a work-related problem was encountered. Auditory scripts delivered via voice activators were used for the student who was not a skilled reader. A multiple-baseline, across-participants design showed that all four adolescents, including the student with the auditory script, were successful with the target skill of
requesting assistance in the study. The study demonstrated that script fading can be used to teach effective interactions regarding work-related problems. It was noted that the participants rarely varied from the scripts with novel initiations.

MacDuff, Ledo, McClannahan, and Krantz (2007) used audio scripts with young children to increase joint attention bids. Joint attention is the process in which two people share an interest in an object or event and there is an awareness between the two people that they are both interested in the same object or event (Jones & Carr, 2016). The researchers attached audiotaped scripts to toys and photographs in various areas of the school. The children were taught to (a) activate the recorder, (b) point to the pictures and toys, (c) orient to a conversation partner, and 4) say the script. Using a multiple-probe design across participants the study demonstrated that the three participants could make bids for joint attention across multiple settings and untrained materials.

Wichnick, Vener, Keating, and Poulson (2010a) used toys with prerecorded scripts on voice over recording devices to evoke initiations to peers and to measure unscripted and novel utterances. A multiple baseline across participants experimental design was used to assess the effects of the scripts on the number of peer to peer initiations emitted by three young children with autism. The novel responses to peer initiations increased systematically with the introduction of the script fading procedure.

Wichnick, Vener, Keating, and Poulson (2010b) used prerecorded scripts to teach young children with ASD to respond to each other’s initiations. Although the three participants were taught to initiate in the previous study, all three participants displayed a deficit in peer responses to initiations. The researchers were able to systematically introduce the responses via audio scripts which increased appropriate peer responses. Using a multiple-baseline across participants
experimental design, they were able to show when the scripts were faded, the number of appropriate peer responses remained at an increased level.

**Study Participants 14 Years of Age and Over**

Most the participants in the scripting studies were *under* 14 years of age. There were only four studies that targeted individuals 14 years and older with a script intervention. Davis, Boon, Cihak, & Fore (2010) used power cards to increase conversational skills in adolescents with Asperger syndrome. The participants in the study were ages 16 – 17 years old. A multiple-probe across participants demonstrated that Power Cards for increasing students’ conversational skills were effective.

Stevenson, Krantz, & McClannahan (2000) targeted social interaction skills for children with ASD using a script fading procedure for non-readers. The researchers embedded Language Master © cards into activity schedules and taught the children to initiate with adults about their recent activity. One of the four participants in the study was 15 years old. The multiple-probe design across participants study showed that the intervention procedures increased unscripted interaction.

The Argott et al. (2008) study included one 14-year-old. Argott et al. (2008) used visual scripts to targeting verbal statements of empathy after the experimenter engaged in a common gesture to evoke an empathetic statement. A multiple-baseline across-participants experimental design was used to show that adolescents with autism can learn to differentiate non-verbal affective stimuli and display differential empathic responses with behavioral interventions.

McDonald and Hemmes (2003) increased an 18-year old’s social initiations toward adult caregivers in a classroom setting to increase social rapport with staff. Under a multiple-baseline
across subject design, in combination with a multi-element design, they demonstrated that frequency of spontaneous initiating toward the youth increased for each adult during treatment when the youth’s frequency of initiating toward a given adult increased.

Together, these studies suggest that scripting fading is a viable intervention for adolescents with ASD. However, it is important to note that half (two of four) of this small amount of studies targeted individuals with autism and a typical IQ range. There is a gap in the literature demonstrating the use of a scripting intervention with the adult ASD population, specifically adults with ID.

**Script Fading**

An important difference between scripting and script fading is the systematic removal, or fading of the script. In script fading, fading step are applied once the individual can consistently produce the script. In fading the script, it is anticipated that the individual will not only generalize the script, but also starts to use the script to engage in novel initiations and responses (Krantz & McClannahan, 1993). The goal of script fading is for the individual with ASD to engage in the scripted phrase based on a discriminative stimulus in the environment (a peer, a vocational activity) rather than the presence of the script (Akers, Pyle, Higbeen, & Gereneser, 2016). Script fading is implemented when (a) the individual can verbalize the script, and (b) the individual can consistently produce the script. Once the individual reliably produces the script, the script is systematically faded until it is completed faded. Depending on the data, the script may or may not be completely faded from the environment (Akers et al., 2016).
In a recent review of the literature, Akers et al. (2016) synthesized script fading interventions. Sixteen studies published in peer reviewed journals that met the inclusionary criteria for their review. The criteria included: (a) studies were published between 1993 – 2013; (b) participants were between birth – 18 years old with an ASD diagnosis; (c) studies had an experimental, quasi-experimental, or single cade design; (d) script fading was the primary independent variable; (e) scripts were systematically faded, and (f) the studies were published in English (Akers, 2016). Script fading was utilized with children ages 2 through 15 with most studies conducted in a specialized classroom designed for individuals with ASD. In 56% of the studies, classroom instructors implemented the intervention. In 31% of the studies, the experimenter implemented the intervention and in the remaining studies, parents implemented the intervention. Akers et al. (2016) found that no studies evaluated the effectiveness of script fading interventions for children with ASD younger than 2 or within the ages of 16-18. While intervention duration varied between the studies, over half of the sessions lasting between 3 and 5 minutes. The duration of the studies ran from 14 to 197 sessions (Akers et al., 2016).

There is wide variation across the script used in the studies. Of the studies reviewed, it was found that initiating was the most targeted intervention (e.g. play, food. Bids for joint attention, requesting for help) with the other studies targeting requesting. Most studies used scripts with one to five words. Only one study, Wichnick et al. (2010b), targeted participants responding to initiations made by other peers. Akers et al (2016) reported in examining script fading procedures, most the studies (69%) completely faded the script as well as a stimulus that was associated with the script; 31% of the studies did not completely fade the scripts. 75% percent of the studies reported measures of generalization and 63 % of the studies measured for maintenance. 31% of
the studies in the Akers et al. (2016) review measured treatment fidelity and 13% of the studies included a measure of social validity. All the studies reviewed used measures of frequency, per opportunity, or partial interval recording.

**Additional Literature Since Akers (2016) Synthesis**

Ledbetter-Cho et al. (2015) used a multiple baseline across participants to replicate and extend the script training literature. The researchers examined the peer to peer communication of 3 children with ASD during group play with peers by systematically implementing visual scripts. They demonstrated that unscripted initiations, responses, and appropriate changes in topics to peers increased with all three participants. The intervention gains were maintained in a 4-week follow-up.

Wichnick-Gillis, Vener, and Poulson (2016) extended their 2010 work by transferring the stimulus for the script-fading procedure to a natural stimulus. They note that while many researchers have been successful in increasing social interactions emitted by people with ASD, in many of the studies, the discriminative control of the social interactions was often restricted to stimuli that are not usually present in a typical environment. In the study, the researcher’s facilitated transfer of stimulus control by superimposing the printed scripts upon the five teaching stimuli included in their leisure time routine. The multiple baseline across participants demonstrated a functional relation between the script fading procedure and the number of peer interactions emitted by the three participants.

**Pedagogical Implications**

The lack of social skills intervention is likely to become a critical problem as more individuals with significant disabilities who have access to EBPs in inclusive schooling settings
want, and need, to enter the workforce and community integrated life (Hillier et al., 2007). All of the studies in this review are rooted in behavioral principles. The lack of behavioral supports, rooted in applied behavioral analysis, generally available in public school education, are virtually absent in adult services. The result is a substantial gap for service provision and support once individuals with significant disabilities reach adulthood. This review specifically highlighted the lack of social skills interventions available for the adult population with significant ASD and co-morbid ID.

Research Implications

Many of the studies in this literature review offer promising research in script fading for individuals with significant ASD. Only four of the studies targeted individuals fourteen years and older. There is a total of six participants over 14 years of age who have participated in script fading interventions and none had left school age services. This creates a demand to examine script fading as an available and effective intervention for adults with significant ASD in adult programming. While, the Stevenson, Krantz, & McClannahan (2000) did target individuals with ASD who were non-readers, little to no research has focused on adults with significant ASD using the script fading intervention. More research needs to be conducted to determine if script fading is a successful intervention for adults with significant ASD in adult programming.

Conclusion

In conclusion, the purpose of this review was to examine the most recent findings in regards to scripting and script fading interventions for individuals with ASD. This literature review aimed to: (a) identify practices that currently exist for adults with significant ASD using scripting, and (b) examine the effectiveness of scripting and (c) determine if there are any gaps in the extant
research. This literature review found a body of literature that addresses script and script fading for individuals with ASD. It is clearly delineated an evidence based practice by the National Professional Development Center for Autism.

Most of the studies incorporate script fading into the intervention and target preschool and elementary school age children. Four of the 24 studies identified target children who are older than fourteen. No studies were found that targeted individuals who had exited school age services. Thus, there is a gap in the extant literature targeting adults with the script fading intervention. This creates a demand to examine the effectiveness of this intervention in the adult population with significant ASD. This research will benefit individuals with significant ASD, the families and communities that support them, employers, social agencies, researchers and practitioners in the field of special education.
Method

Participants

Participants in the study included three adults (age 21-26 years old) with ASD, whom have significant behavioral, communication, and sensory differences that impacted their ability to engage with others. All three participants were Caucasian. Participants were recruited based on agency referral for social communication support. They were referred because of few initiations and limited generalization of taught skills across people and settings. Participant involvement depended upon guardian consent (appendix A) and participant assent (Appendix B).

Records Review. Reviews of the participant’s records were conducted to gain background information on the participant including program assessments and application information. Data obtained from the record reviews were kept in the form of descriptive and reflective field notes (Creswell, 2013). All data gathered was uploaded to a secure cloud-based database or stored in a locked cabinet following each session.

Clinical Evaluation of Language Fundamentals

Prior to the start of the study, the Clinical Evaluation of Language Fundamentals (CELF-5; Wiig, Semel, & Secord, 2013) was administered to all participants. The purpose of the CELF-5 is to screen for and diagnose language disorders in children and young adults. It can also be used for follow-up evaluation. It addresses the language concerns of students aged 5 to 21 years. The test is comprised of 9 tests that are used to give standard scores in 5 domains; Core Language Score (CLS), Receptive Language Index (RLI), Expressive Language Index (ELI), Language Content Index (LCI), and Language Memory Index (LMI).
Core Language Score. The Core Language Score is a measure of general language ability and provides an easy and reliable way to quantify overall language performance. The Core Language Score has a mean of 100 and a standard deviation of 15. A score of 100 on this scale represents the performance of the typical student of a given age. For the Core Language Score, the following tests were administered: Word Classes, Formulated Sentences, Recalling Sentences, and Semantic Relationships.

Receptive Language Index. The Receptive Language Index is a measure of performance on three tests designed to best probe receptive aspects of language including comprehension and listening. The Receptive Language Index has a mean of 100 and a standard deviation of 15. A score of 100 on this scale represents the performance of the typical student of a given age. For the Receptive Language Index score, the following tests were administered: Word Classes, Following Directions, and Semantic Relationships.

Expressive Language Index. The Expressive Language Index is a measure of performance on three tests that probe expressive aspects of language including oral language expression. The Expressive Language Index has a mean of 100 and a standard deviation of 15. A score of 100 on this scale represents the performance of the typical student of a given age. For an Expressive Language Index score, the following tests were administered: Formulated Sentences, Recalling Sentences, and Sentence Assembly.

Language Content Index. The Language Content Index is a measure of performance on three tests designed to probe vocabulary and word knowledge. The Language Content Index score has a mean of 100 and a standard deviation of 15. A score of 100 on this scale represents the performance of the typical student of a given age. For the Language Content Index score, the
following tests were administered: Word Classes, Understanding Spoken Paragraphs, and Word Definitions.

Language Memory Index. The Language Memory Index is a measure of performance on three tests designed to probe memory dependent language tasks. The Language Memory Index score has a mean of 100 and a standard deviation of 15. A score of 100 on this scale represents the performance of the typical student of a given age. For a Language Memory Index score, the following tests were administered: Following Directions, Formulated Sentences, and Recalling Sentences.

All three participants had histories of deficits in communication, imitation, adaptive, social and academic skills. Each participant had a history of speech and occupational therapy. The participants knew how to follow visuals schedules that were programmed into an app on a tablet which were used daily. Each participant had some functional language, all generally responded to staff with short utterances and phrases. However, the participants rarely initiated or used spontaneous language with staff, peers, or employers.

Sara. The first participant in the study, Sara, was 23 years old. Sara has a medical diagnosis of autism spectrum disorder. Sara had attended the program for one year prior to the study. Sara’s weekly schedule included vocational internships at local businesses, social activities with peers, vocal lessons, leisure building activities, and regular exercise at the recreation center. Sara’s Individualized Service Plan (ISP) included goals that focused on finding community employment, and communicating her wants and needs to a variety of people. Sara received a core language score of 45 of the CELF-5.
Table 1

_Sarah CELF-5 Scores_

<table>
<thead>
<tr>
<th>Test</th>
<th>Standard Score</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Language Score</td>
<td>45</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Receptive Language Index</td>
<td>48</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Expressive Language Index</td>
<td>55</td>
<td>.01</td>
</tr>
<tr>
<td>Language Content Index</td>
<td>51</td>
<td>.01</td>
</tr>
<tr>
<td>Language Memory Index</td>
<td>50</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Per these results, Sarah is significantly below the average range for her core language skills, receptive language skills, expressive language skills, language content index, and language memory index.

**John.** The second participant in the study, John, was 26 years old. John has a medical diagnosis of autism spectrum disorder and obsessive compulsive disorder. John had attended the program for 10 months prior to the study. John’s programming included vocational internships on campus, social activities with peers, leisure building activities, and regular exercise at the recreation center. John’s ISP included goals that focused on finding community employment. John received a core language score of 40 on the CELF-5.
Table 2

*John CELF-5 Scores*

<table>
<thead>
<tr>
<th>Test</th>
<th>Standard Score</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Language Score</td>
<td>40</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Receptive Language Index</td>
<td>45</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Expressive Language Index</td>
<td>45</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Language Content Index</td>
<td>40</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Language Memory Index</td>
<td>40</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Per these results, John is significantly below the average range for his core language skills, receptive language skills, expressive language skills, language content index, and language memory index.

**Molly.** The third participant in the study, Molly, was 21 years old. Molly has a medical diagnosis of autism spectrum disorder, epilepsy, and obsessive compulsive disorder. A component of Molly’s behavioral profiles is explosive and aggressive behavior towards program staff. Molly had attended the program for 4 months prior to the start of the study. Molly’s programming included vocational internships on campus, social activities with peers, leisure building activities, and regular exercise at the recreation center. Molly received a core language score of 40 on the CELF-5.
Table 3

*Molly CELF-5 Scores*

<table>
<thead>
<tr>
<th>Test</th>
<th>Standard Score</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Language Score</td>
<td>40</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Receptive Language Index</td>
<td>44</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Expressive Language Index</td>
<td>45</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Language Content Index</td>
<td>45</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Language Memory Index</td>
<td>45</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Per these results, Molly is significantly below the average range for her core language skills, receptive language skills, expressive language skills, language content index, and language memory index.

**Staff.** A third-year educational studies doctoral student, conducted this research in partial fulfillment of her dissertation requirement, oversaw all recruitment, consent, and assent procedures, conducted record reviews, and designed and oversaw assessment and intervention procedures. Graduate students from the school psychology and speech and language program at the university, along with adult service staff assisted with data collection for assessment and intervention procedures.

**Settings**

The setting was an adult services program for individuals with ASD located on a large Midwestern college campus. The adult service program specialized in vocational, social, communication, and behavioral programming for adults with ASD.
Intervention Setting. All three participants demonstrated a preference for art activities. The intervention was implemented during a leisure art group that was a part of their daily schedule. Art group was visually represented on their daily schedule. The art activity took place at a rectangular table in an office cubicle on campus. The art materials were set up and accessible to the participants when they sat down at the table. The art materials included markers, paints, and beads.

Generalization Setting. Generalization sessions were conducted in different settings, with different staff, at a different time of day, and with different materials (Krantz & McClannahan, 1993). Four generalization sessions were conducted with each participant. The varied people included program staff that the participants knew indirectly. The novel activity in which the script was introduced was a vocational assembly task that the participants were familiar with that occurred at another part of their day. During the generalization sessions, a single piece of paper was displayed in the individual’s work space that said “______” and “Talk a lot,” (Krantz & McClannahan) along with the blank or partially faded script. Prompting of the directions were used as needed. The staff and observers then moved to the periphery of the room without any further prompting.

Independent Variable

The independent variable in this study was a treatment package targeting initiations. Specifically, the independent variable included a treatment package of written scripts and systematic fading. A full list of scripted phrases is contained in table 5.

As in the Krantz and McClannahan study, scripts were constructed that reflected relevant activities and materials to the adults. Blank sections of the scripts were completed by the staff.
immediately before each session so the scripts reflected relevant material. The scripts were individualized to include other peer’s names. Three different versions of the script were created by randomly assigning the 10 questions and statements to Positions 1 through 10. The versions were systematically rotated across the participants.

Table 4

<table>
<thead>
<tr>
<th>Full Script</th>
<th>Scripted Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“______________, where do you want to eat lunch on Friday?”</td>
</tr>
<tr>
<td>2</td>
<td>“How is your family?”</td>
</tr>
<tr>
<td>3</td>
<td>“Did you watch TV last night?”</td>
</tr>
<tr>
<td>4</td>
<td>“What’s your favorite song?”</td>
</tr>
<tr>
<td>5</td>
<td>“__________, I like your______________”</td>
</tr>
<tr>
<td>6</td>
<td>“How was work today?”</td>
</tr>
<tr>
<td>7</td>
<td>“Do you want to use one of my_________?”</td>
</tr>
<tr>
<td>8</td>
<td>“This weather is so ______________.”</td>
</tr>
<tr>
<td>9</td>
<td>“I can’t wait to ______________ when I get home.”</td>
</tr>
<tr>
<td>10</td>
<td>“What are you doing this weekend?”</td>
</tr>
</tbody>
</table>

**Dependent Variables**

The dependent variables in this study included (a) scripted initiations, (b) unscripted initiations, (c) novel initiations, (d) responses, and (e) changes in the topic that deviated from the scripted topic. Utilizing Krantz and McClannahan’s operational definition, initiation was defined as an understandable statement or question that are unprompted by a staff member, directed to a peer by using his or her name or by facing him or her and are separated from the speaker’s previous vocalizations by a change in topic or a change in recipient interaction.

Scripted Initiations were those that matched the written script, except for conjunctions, articles, prepositions, or pronouns could be altered or deleted and the verb tense could be changed
Unscripted Initiations were defined by Krantz and McClannahan as verbal productions that differed from the script by more than conjunctions, articles, prepositions, pronouns, or changes in verb tense. Novel initiation was defined as the first occurrence of a specific unscripted initiation and was scored only the first time a participant emitted a unique unscripted initiation (Wichnick, Vener, Keating, et al., 2010). Future occurrences of the same utterance were scored as an unscripted utterance. A response was defined as any contextual utterance (word, phrase, or sentence) that was not prompted by a staff member and that occurred within 5 s of a statement or question directed to a target peer (Krantz & McClannahan, 1993). Changes in topic were utterances (initiations or responses) not concerning the activity at hand but were directed to a peer and were age and context appropriate (Ledbetter-Cho, et al., 2015).

**Research Design**

A multiple baseline across subjects’ design best answered the research questions. In a multiple baseline design, two or more baselines are concurrently established and the independent variable is sequentially introduced across the baselines (Kennedy, 2005). In this study, one targeted behavior (e.g. increased conversational skills), was selected for three participants in the same setting. After a steady rate of responding had been achieved under a baseline condition, the independent variable, a visual script, was applied to one of the subjects while baseline conditions remain in effect for the other subjects (Cooper, Heron, & Heward, 2007). This design is beneficial because it allows all study participants to take part in the intervention.

**Intervention Procedures**

All intervention procedures were conducted in the participant’s day program across typical settings the participant is exposed to.
**Staff Training.** Staff members were trained in data collection and the script intervention procedure with at least 90% adherence during training. Training consisted of a 45-minute session including an overview of procedures, modeling the procedures, data collection practice and opportunities to practice with another adult behaving like the target participant.

**Baseline.** The baseline phase replicated the baseline phase in the Krantz and McClannahan (1993) study. Three leisure art activities were systematically rotated across sessions. The space was shared space on campus with a rectangular table and several chairs. Upon entering the room, each participant found leisure materials (e.g. adult coloring books, paint, markers, and beads) at their space as well as a single sheet of written with the directions, “It is leisure time. Talk a lot.”. After prompting reading of the written directions, all staff and observers moved to the periphery of the space. Interactions with the participants only occurred if they were directed to the staff (Krantz & McClannahan).

**Scripting Phase.** The scripting phase was also a replication of the scripting phase in the Krantz and McClannahan study. Art activities were rotated across sessions with the two written instructions presented during baseline. Written scripts were chosen because all study participants are readers and have experience with written daily schedules. Scripts consisting of 10 statements and questions were introduced. See Table 5 for a full description of scripts used in the study.

**Script Fading.** Script fading began for an individual participant when the visual analysis indicated that the improvements over baseline were stable for 3-5 data points. Scripts were faded in steps (Krantz & McClannahan). In Script Fade 1, the last word on the script was removed. In Script Fade 2, the last 2-3 words of the script were removed. In Script Fade 3, all the words but the last word were removed. In the full fade, all the words were removed from the card but the card remained with 10 checkoff boxes to prompt 10 initiations.
Table 5

Script Fading Procedure

<table>
<thead>
<tr>
<th>Fading Level</th>
<th>Remaining Script Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Script</td>
<td>Full script on small card</td>
</tr>
<tr>
<td>Script Fade 1</td>
<td>Last word removed</td>
</tr>
<tr>
<td>Script Fade 2</td>
<td>Last two-three words removed</td>
</tr>
<tr>
<td>Script Fade 3</td>
<td>All but the first word removed</td>
</tr>
<tr>
<td>Full Fade</td>
<td>All words removed; card remains</td>
</tr>
</tbody>
</table>

**Generalization.** Generalization sessions were conducted in different settings, with different staff, at a different time of day, and with different materials (Krantz & McClannahan). In the first three generalization sessions, a single piece of paper was displayed in the individual’s work space that says “______” and “Talk a lot.”. Prompting of the directions was used as needed. The staff and observers then moved to the periphery of the room without any further prompting.

**Maintenance.** Maintenance sessions were conducted to assess whether the participants maintained the conversational skills learned during the training. The maintenance probes were taken for all three participants 6 weeks from the last maintenance session.

**Data Collection**

Data was collected 4-6 times a week for 15 weeks in a multiple baseline design across 3 subjects. Each observation period began as soon as the last young adult was seated at the table and lasted 10 consecutive minutes. An observer kept frequency data on (a) scripted initiations, (b) unscripted initiations, (c) novel initiations, (d) responses, and (e) changes in topic that deviated
from the script topic. Approximately 30% of the observations were recorded via an Apple i-pad. Frequency data was defined as the number of occurrences in a period of time (Kennedy, 2005).

**Effect Size**

There are many measures to describe intervention effects from single subject designs. In visual analysis of single subject data, it is examined for three changes in the data: trend, variability, and level. Using trend analysis, the direction of the data is examined for an increasing (i.e., upward) or decreasing (i.e., downward) trend. Data is also inspected for change in data variability or bounce. Finally, data is examined for changes in level or mean performance. Several nonparametric methods have been used to analyze the results of single case design studies. For this study, the method of Percent Exceeding the Median (PEM) was used to approximate the size of the effect of the intervention.

**Percentage Exceeding the Median.** For intervention studies focusing on increasing behaviors that include baseline and floor scores across all conditions, the approach of percentage of data points exceeding the median of the baseline phase (PEM; Ma, 2006) is appropriate. To calculate PEM, Ma (2006) suggested that reviewers draw a median line for the baseline data and calculate the percentage of data points in intervention that fall above the median line. There are many benefits to using the PEM approach. First, there have been no reports of situations where PEM could not be used. Second, PEM has been shown to be correlated with author judgments of intervention effectiveness (Ma, 2006). However, a drawback is that this measure failed to show sensitivity to the magnitude of intervention data points above the median line.

For PEM, the steps were as follows:

1. Identify the intended change.
2. Identify the median of the data in Condition 1.

3. Draw a horizontal line through all the data at the Condition 1 median.

4. Count the number of data points in Condition 2 above or below the line (on the therapeutic side) drawn in Step 3.

5. Divide the count from Step 4 by the total number of data points in Condition 2.

**Interpreting Treatment Effect Size**

Scruggs and Mastropieri (1998) provided a rubric for interpreting effect sizes yielded from non-overlap data analysis procedures such as PEM. Higher scores represent greater treatment effects and lower scores represent less effective treatments. Scruggs and Mastropieri (1998) suggested that effect sizes of .90 and greater are indicative of very effective treatments, those ranging from .70 to .89 represent moderate effectiveness, those between .50 to .69 are debatably effective, and scores less than .50 are regarded as not effective.

**Inter-observer Agreement**

Collecting inter-observer agreement data permits the researcher to monitor and assess the reliability of the data being recorded (Kennedy, 2005). All observers were trained on the use of the behavioral codes and recoding system. The frequency-ration approach will be used to calculate inter-observer agreement. In this approach, the researcher sums the total number of responses recorded by each observer, divides the smaller total by the larger total, and multiples by 100% (Kennedy, 2005). The formula for total agreement is:

\[
\frac{S}{L} \times 100\% \text{ where } S \text{ is the smaller and } L \text{ is the larger total}
\]

The inter-observer agreement data is reported in the results section of this paper.
Procedural Fidelity

Procedural fidelity refers to the extent to which the independent variable is implemented as intended (Cooper, Heron, & Heward, 2007). A fidelity checklist was kept by all trained observers to collect treatment integrity data. The percentage of treatment integrity for each condition and phase of the study was calculated by dividing the number of steps done correctly by the number of steps completed (Cooper, Heron, & Heward, 2007). The results for the procedural fidelity are reported in the results section of this paper.

Social Validity

Social validity is the extent to which key stakeholders such as staff, families, and participants, view the social significance of the target behavior, the appropriateness of intervention procedures, and the social importance of the results (Wolf, 1978). Social validity was collected during the study in the form of a Likert scale questionnaire. Participants and direct support staff of participants were asked to complete the questionnaire to rate the intervention. In order to measure social validity of school personnel a social validity measure based on the Intervention Rating Profile (IRP-15; Martens, Witt, Elliott & Darveaux, 1985; Witt & Elliott, 1985) was administered to the program manager. Results for the social validity measure are reported in the results section of this paper.

Data Analysis

Visual Analysis. A multiple baseline design across participants was employed. In this design, after a steady state of responding was achieved under a baseline condition, the independent variable, a visual script, was applied to one of the subjects while baseline conditions remain in effect for the other subjects (Cooper, Heron, & Heward, 2007). As data were collected, the
information was graphed and analyzed on a continuous basis until the experiment was complete (Kennedy, 2005).

The visual inspection of the graphs analyzed the dimensions of level, trend, and variability (Kennedy, 2005). The dimension of level allows for estimation of the central tendency of the data which allows for comparison between the data (Kennedy, 2005). The last few data points prior to a phase change were the most crucial in regards to the dimension of level (Kennedy, 2005).

The second dimension visually inspected was the trend data (Kennedy, 2005). Trend data utilized the best fit line that can be placed over the data within a phase (Kennedy, 2005). Trend must be evaluated for slope and magnitude. Slope is the upward or downward slant of the data within the phase (Kennedy, 2005). Slope can be upward, downward, or flat within a phase (Kennedy, 2005). Magnitude refers to the size or extent of the slope which can be estimated as high, medium, or low (Kennedy, 2005).

The third dimension used in visual analysis is variability. Variability can be defined as, “the degree to which individual data points deviate from the overall trend” (Kennedy, 2005, p. 201). With low variability, the data points are close to a best fit line, with high variability, the data points are scattered widely around the best fit line (Kennedy, 2005).

In addition to level, trend, and variability data, the immediacy of effect between phases was assessed (Kennedy, 2005). The more rapid the immediacy of effect, the more convincing it is of a functional relationship between the variables (Kennedy, 2005).
Results

The following section presents the results of the script fading intervention with adults with significant ASD and ID in a multiple baseline design. The intent of the script fading intervention was to increase the conversational skills of the individuals with ASD. The section includes individual participant data, inter-observer agreement and social validity data.

Research Questions

In this study, visual analysis was used to answer the research questions: (a) will the adults with significant ASD and ID increase target conversation skills (most specifically initiations) using written scripts? (b) will the script fading procedure be effective for adults diagnosed with significant ASD? (c) can the adults generalize the skills to different settings and people after the scripting intervention is faded?

Will the adults with significant ASD increase target conversation skills (most specifically initiations) using written scripts?

Using visual analysis to answer this research question clearly demonstrated that the behavior changed in a meaningful way and the change in behavior can be attributed to the independent variable (Cooper, Heron & Heward, 2007). In the analysis, attention was focused on (a) the extent and type of variability in the data (b) the level of the data, and (c) the trends in the data. Variability, level, and trend were assessed both within and across different conditions and phases of this experiment.

Baseline data across all three participants reflected a stable trend of little to no conversational skills within the observed sessions. Variability was low suggesting that the data were reliable reflection of their conversational skills.
Level Change. Once the stable baseline was established, experimental manipulation was engaged in for one data series (Sarah), while baseline was maintained for the other two participants. The script was then introduced to Molly and ended with John. With the introduction of the written script, all three adults showed systematic and marked increases in the rate of scripted interactions. There was a clear level change once the intervention was introduced reflecting that the dependent variable, the written script, demonstrated experimental control.

Trend. Baseline data across all three participants reflected a stable trend of little to no conversational skills within the observed sessions. Upon introduction of the independent variable, there was an immediate change in level and trend. There is a change from a stable no response baseline to an accelerating-improving trend during intervention.

Variability. It is noted that there was variability within the phases for both Molly and John. Variability is the extent to which multiple measures of behavior produce different outcomes is called variability (Cooper, Heron, & Heward, 2007). If there is a high level of variability within a condition, it typically suggests that the researcher has attained little control over the behavior. In examining the data, it is hypothesized that there were setting events and identified variables that contributed to the variability of the data.

Molly. Variability was first observed with a significant drop in scripted initiations in the first fade. Due to drop of scripted interventions and the lack of variety in unscripted responses, the decision was made to reintroduce the full script. When the full script was reintroduced, scripted initiations returned to averaging 10 per session. After a stable trend was established, the script fading procedure was implemented and variability significantly decreased excluding the maintenance phase.
It is also noted that Molly had two sessions across the study with zero scripted initiations after an upward trend was established. On both session dates, Molly demonstrated aggressive physical behavior prior to or after the intervention session. It is hypothesized that this decrease in self-regulation due to unknown setting events interfered with her ability to attend to the intervention and perform successfully. As noted in the participant profiles, Molly demonstrates an increased amount of explosive behavior than the other two participants.

*John.* John also demonstrated variability within the script fading phase of the intervention. When the script was faded, John’s scripted initiations dropped to 4. Due to the significant drop in scripted initiations in the first fade, the decision was made to reintroduce the full script. In the first session, John used all ten scripted initiations. However, in the next three sessions, John only read the last word of all the scripts. A gestural prompt was added to all words for sessions 45 and 46 and the removed for session 47. In sessions 47 to 50, John appropriately used the script to initiate with peers. Across this phase, scripted initiations averaged 8.11 and the upward trend continued.

A new, and highly preferred art activity was introduced during these sessions. It is hypothesized that the script intervention had difficulty competing with the reinforcing nature of the art activity. Fortunately, John responded to the additional gestural prompt and it could be faded quickly.

In summary, experimental control was demonstrated when the data show marked changes that correspond with the introduction of the scripting intervention while baseline levels remain stable. Replication occurred across persons as the experimental manipulation was implemented in a staggered incremental time frame for each successive data series. These characteristics demonstrate experimental control and rule out various threats of internal validity. Visual analysis
of the data clearly demonstrated that the dependent variable, the script fading intervention, clearly increased conversational skills, specifically initiations, for adults with ASD and ID.

**Will the script fading procedure be effective for adults diagnosed with significant ASD?**

In visual analyzing the data, the script fading procedure was effective for the adults in the study. With Sarah, the script could be faded to a blank checklist without any increase in variability and a stable trend of increased scripted initiations. Molly and John demonstrated increased variability once the script was faded, however by considering the other variables (explosive behavior highly preferred activity) the variability can be explained.

While the script fading procedure was successful, it is noted that the fading procedure took more time with longer phases than most of prior studies reviewed for this study. It is hypothesized that this if due to the profile, significant ASD with comorbid ID, of the participants.

**Can the adults generalize the skills to different settings and people after the scripting intervention is faded?**

As demonstrated in the visual analysis, all three adults could generalize initiating scripted initiations to other people during different activities in their day. Four generalization session were conducted with each participant. The varied people included program staff that the participants knew indirectly. The novel activity in which the script was introduced was a vocational assembly task that the participants were familiar with that occurred at another part of their day.

Sarah averaged 9.5 scripted initiations in the generalization phase. Molly averaged 8.5 scripted initiations in the generalization phase. John averaged 9.5 scripted initiations in the generalization phase.
The maintenance phase took place 8 weeks after the last generalization session. Three maintenance sessions were conducted with each study participant. In the maintenance phase, Sarah and John maintained high levels of initiation. Sarah averaged 8 scripted initiations per maintenance session. John averaged 8 scripted initiations per maintenance session. Molly demonstrated a significant drop in the maintenance session, averaging 1.3 scripted initiations per session.

**Individual Participant Data**

The dependent variables in this study included (a) scripted initiations, (b) unscripted initiations, (c) novel initiations, (d) responses, and (e) changes in the topic that deviated from the scripted topic. Data was collected on the dependent variables during each session.

**Sarah**

**Baseline.** In baseline, Sarah produced 0 scripted initiation. She produced 0 unscripted initiations. Sarah produced 0 novel initiations. Sarah averaged less than 1 response (.75) in the baseline sessions. Sarah had 0 changes in topic. Sarah averaged 1 inappropriate vocalization per baseline session.

**Full Script.** When the script was introduced, Sarah averaged 6 scripted initiations. It is noted in the visual analysis that there was a fair amount of variability in the scripted initiation data. She averaged 0 unscripted initiations. She averaged 0 novel initiations. She had an average of .22 responses. She demonstrated no changes in topic. She averaged 1.8 inappropriate vocalizations.

**Script Fade 1.** In the first script fade, Sarah averaged 10 scripted initiations per session. She had an average of .16 novel initiations. She averaged 0 responses and 0 changes in topic. She did not demonstrate any inappropriate vocalizations.
Script Fade 2. In the second script fade, Sarah averaged 10 scripted initiations per session. She averaged .16 unscripted initiations. She averaged .5 novel initiations. Sarah averaged .16 responses. She had 0 topic changes and 0 inappropriate vocalizations.

Script Fade 3. In the third fade of the script, Sarah averaged 9.8 scripted initiations per session. She averaged .22 novel initiations per session. She had an average of .33 responses per session.

Full Fade. In the full fade of the script, Shannon averaged 9.8 scripted initiations. She had an average of .20 unscripted initiations. She averaged .26 novel initiations. She had an average of .2 responses. She did not demonstrate any changes in topic. There was an increase in inappropriate vocalizations to an average of .46 per session.

Generalization. During generalization, Sarah averaged 9.5 scripted initiations. She demonstrated an average of .22 unscripted initiations and .22 novel initiations. She averaged .33 responses. The average for change in topic was 0 and inappropriate vocalizations were 1.75.

Maintenance. In the maintenance phase, Sarah produced an average of 8 scripted initiations, and .33 unscripted initiations. She had an average of 0 for novel initiations, responses, changes in topic, and inappropriate vocalizations.
Table 6

Sarah Conversation Skill Averages

<table>
<thead>
<tr>
<th></th>
<th># of Sessions</th>
<th>Scripted Initiations</th>
<th>Unscripted Initiations</th>
<th>Novel Initiations</th>
<th>Responses</th>
<th>Changes in Topic</th>
<th>Inappropriate Vocalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>.75</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Full Script</td>
<td>9</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>.22</td>
<td>0</td>
<td>1.8</td>
</tr>
<tr>
<td>Fade 1</td>
<td>8</td>
<td>10</td>
<td>.16</td>
<td>.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fade 2</td>
<td>6</td>
<td>10</td>
<td>.16</td>
<td>.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fade 3</td>
<td>9</td>
<td>9.8</td>
<td>.22</td>
<td>.22</td>
<td>.33</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Full Fade</td>
<td>16</td>
<td>9.8</td>
<td>.20</td>
<td>.26</td>
<td>.2</td>
<td>0</td>
<td>.46</td>
</tr>
<tr>
<td>Generalization</td>
<td>4</td>
<td>9.5</td>
<td>0</td>
<td>0</td>
<td>1.25</td>
<td>0</td>
<td>1.75</td>
</tr>
<tr>
<td>Maintenance</td>
<td>3</td>
<td>8</td>
<td>.33</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Molly

**Baseline.** During the baseline session, Molly averaged 0 scripted initiations. She had an average of 2.09 unscripted initiations. She averaged .86 novel initiations and .59 responses. She had an average of 0 changes in topic and 19.5 inappropriate vocalizations.

**Full Script.** In the full script session, Molly averaged 8.57 scripted initiations. She had an average of 5.57 unscripted initiations. In regards to novel initiations, Molly averaged 1.14. She had an average of 1.57 responses. She did not use any change in topics. Inappropriate vocalizations decreased to an average of 9 per session.

**Fade 1.** When the script was faded, Molly’s scripted initiations dropped to 4. The average for the unscripted initiations were 8. It should be noted that many of Molly’s unscripted initiations were initiations she had used in the past and rarely varied. They were often short utterances that commented on the art activity (i.e. “draw” “color” “more” “all done”). An intent of the
intervention was to increase her repertoire of scripts as well as length of utterance. Her novel initiations averaged 1.3. Her response average was 2.3. There were no changes in topic. She averaged 13.3 inappropriate vocalizations.

**Full Script.** Due to the significant drop in scripted initiations in the first fade, and lack of variety in unscripted responses, the decision was made to reintroduce the full script. When the script was reintroduced, scripted initiations averaged 10 per session. Unscripted initiations averaged 2.3. Novel initiations were at 0. Her responses averaged 2.6 per session. The average the changes in topic remained at 0. Inappropriate vocalizations averaged 8 per session.

**Fade 1.** After establishing a stable trend, the script was once again faded. During this phase, scripted initiation averages remained high at 9.3. The average for unscripted responses was 6 per session. Her average for novel initiations was at .66. The response average was .5. Changes in topic remained at 0 and inappropriate vocalizations were at an average of 7.83 per session.

**Fade 2.** After a stable trend was established, fade 2 was implemented. In this phase, Molly averaged 9.8 scripted initiations. She had an average of 4.14 unscripted initiations. Novel initiations averaged .42 per session. She had an average of 1.71 responses per session. Changes in topic remained at 0 and inappropriate vocalizations were at an average of 4 per session.

**Fade 3.** In this phase, Molly averaged 9.8 scripted initiations. She had an average of 1.8 unscripted initiations. Novel initiations averaged .4 per session. She had an average of .2 responses per session. Changes in topic remained at 0 and inappropriate vocalizations were at an average of 4 per session.

**Full Fade.** In this phase, the script was completely faded other than the yellow card to serve as a descriptive stimulus. In this phase, Molly averaged 8.5 scripted initiations. She had an
average of 1.16 unscripted initiations. Novel initiations averaged .16 per session. She had an average of .33 responses per session. Changes in topic remained at 0 and inappropriate vocalizations were at an average of 1.75 per session.

**Generalization.** During the generalization sessions, Molly averaged 8.5 scripted initiations. She had an average of 1 unscripted initiation. She averaged .25 novel initiations and .50 responses. She had an average of 0 changes in topic and 1.75 inappropriate vocalizations.

**Maintenance.** During the maintenance sessions, Molly averaged 1.3 scripted initiations. She had an average of 0 unscripted initiation. She averaged .0 novel initiations and 0 responses. She had an average of 0 changes in topic and 3 inappropriate vocalizations.

It should be noted that a component of Molly’s behavioral profile is explosive behavior. In sessions 26 and 58, Molly exhibited aggressive behavior either prior to or after the scripting intervention session. Another significant change that was noted in Molly’s data was a significant decrease in inappropriate vocalizations as the intervention proceeded. Please see figure 2.
Table 7
Molly Conversation Skill Averages

<table>
<thead>
<tr>
<th></th>
<th># of Sessions</th>
<th>Scripted Initiations</th>
<th>Unscripted Initiations</th>
<th>Novel Initiations</th>
<th>Responses</th>
<th>Changes in Topic</th>
<th>Inappropriate Vocalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>22</td>
<td>0</td>
<td>2.09</td>
<td>.86</td>
<td>.59</td>
<td>0</td>
<td>19.5</td>
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<tr>
<td>Full Script</td>
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<td>5.57</td>
<td>1.14</td>
<td>1.57</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Fade 1</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>1.3</td>
<td>2.3</td>
<td>0</td>
<td>13.3</td>
</tr>
<tr>
<td>Full Script</td>
<td>3</td>
<td>10</td>
<td>2.3</td>
<td>0</td>
<td>2.6</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Fade 1</td>
<td>6</td>
<td>9.3</td>
<td>6</td>
<td>.66</td>
<td>.5</td>
<td>0</td>
<td>7.83</td>
</tr>
<tr>
<td>Fade 2</td>
<td>7</td>
<td>9.8</td>
<td>4.14</td>
<td>.42</td>
<td>1.71</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Fade 3</td>
<td>5</td>
<td>9.8</td>
<td>1.8</td>
<td>.4</td>
<td>.2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Full Fade</td>
<td>6</td>
<td>8.5</td>
<td>1.16</td>
<td>.16</td>
<td>.33</td>
<td>0</td>
<td>4.16</td>
</tr>
<tr>
<td>Generalization</td>
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<td>8.5</td>
<td>1</td>
<td>.25</td>
<td>.5</td>
<td>0</td>
<td>1.75</td>
</tr>
<tr>
<td>Maintenance</td>
<td>3</td>
<td>1.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 1: Molly’s Decrease in Inappropriate Vocalizations

Figure 2: Molly demonstrated a clear decrease in inappropriate vocalizations as the intervention progresses.
John

**Baseline.** During the baseline session, John averaged 0 scripted initiations. He had an average of 0 unscripted initiations. He averaged 0 novel initiations and 0 responses. He had an average of 0 changes in topic and 8.03 inappropriate vocalizations.

**Full Script.** In the full script session, John averaged 8.3 scripted initiations. He had an average of 0 unscripted initiations. In regards to novel initiations, John averaged 0. He had an average of .16 responses. He did not use any change in topic statements. Inappropriate vocalizations decreased to an average of 6.83 per session.

**Fade 1.** When the script was faded, John’s scripted initiations dropped to 4. The average for the unscripted initiations was 0. Novel initiations averaged .25 per session. The responses remained at 0. There were no changes in topic. Inappropriate vocalizations averages dropped again to 5.8 per session.

**Full Script.** Due to the significant drop in scripted initiations in the first fade, the decision was made to reintroduce the full script. In the first session, John used all 5 scripted initiations. However, in the next three sessions, John only read the last word of all the scripts. A gestural prompt was added to all words for sessions 45 and 46 and the removed for session 47. In sessions 47 to 50, John appropriately used the script to initiate with peers. Across this phase, scripted initiations averaged 8.11. Unscripted initiations were at 0. Novel initiations averaged 0. The response average was at .11. Changes in topic averaged 0 and inappropriate vocalizations dropped again to 5.44.

**Fade 1.** After establishing a stable trend, the script was once again faded. During this phase, scripted initiation averages remained high at 9.6. The average for unscripted responses was .33
per session. His average for novel initiations was at 0. The response average was 0. Changes in topic remained at 0 and inappropriate vocalizations were at an average of 6 per session.

**Fade 2.** After a stable trend was established, Fade 2 was implemented. In this phase, John averaged 9.6 scripted initiations. He had an average of 0 unscripted initiations. Novel initiations averaged 0 per session. He had an average of .83 responses per session. Changes in topic remained at 0 and inappropriate vocalizations were at an average of 2.6 per session.

**Generalization.** Due to an upcoming calendar break, John was not able to completely fade from the script by the conclusion of the study. In the generalization phase, John used the Fade 2 script. In this phase, John averaged 9.5 scripted initiations. He had an average of 0 unscripted initiations. Novel initiations averaged .25 per session. She had an average of 0 responses per session. Changes in topic remained at 0 and inappropriate vocalizations were at an average of .25 per session.

**Maintenance.** During the maintenance sessions, John averaged 8 scripted initiations. He had an average of 0 unscripted initiation. He averaged 0 novel initiations and 0 responses. He had an average of 0 changes in topic and 0 inappropriate vocalizations.
Table 8
John Conversation Skill Averages

<table>
<thead>
<tr>
<th></th>
<th># of Sessions</th>
<th>Scripted Initiations</th>
<th>Unscripted Initiations</th>
<th>Novel Initiations</th>
<th>Responses</th>
<th>Changes in Topic</th>
<th>Inappropriate Vocalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8.03</td>
</tr>
<tr>
<td>Full Script</td>
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<td>8.3</td>
<td>0</td>
<td>0</td>
<td>.16</td>
<td>0</td>
<td>6.83</td>
</tr>
<tr>
<td>Fade 1</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>.25</td>
<td>0</td>
<td>0</td>
<td>5.8</td>
</tr>
<tr>
<td>Full Script</td>
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<td>8.11</td>
<td>0</td>
<td>0</td>
<td>.11</td>
<td>0</td>
<td>5.44</td>
</tr>
<tr>
<td>Fade 1</td>
<td>6</td>
<td>9.6</td>
<td>.33</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Fade 2</td>
<td>5</td>
<td>9.6</td>
<td>.6</td>
<td>.83</td>
<td>0</td>
<td>0</td>
<td>2.6</td>
</tr>
<tr>
<td>Generalization</td>
<td>4</td>
<td>9.5</td>
<td>.25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>.25</td>
</tr>
<tr>
<td>Maintenance</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 2: John’s Decrease in Inappropriate Vocalizations

John demonstrated a decrease in inappropriate vocalizations as the intervention progressed.
Targeted Scripted Initiations and Experimental Control

Figure 3: Scripted Initiations

Figure 3. Number of scripted initiations throughout the study across three participants.

Figure 1 depicts the number of scripted initiations emitted by the participants throughout the study. In the baseline phase, direct observation was used to collect frequency data on the dependent variable, targeted conversational skills, using a written script that focused on initiation. Baseline data across all three participants reflected a stable trend of little to no conversational skills within the observed sessions.

Once a stable baseline was established, experimental manipulation was engaged in for one data series (Sarah), while baseline was maintained for the other two participants. With the introduction of the written script, all three adults showed systematic and marked increases in the
rate of scripted interactions. Furthermore, all three adults maintained the use of the scripted initiation as the written script was faded.

All three adults could generalize initiating the script with other people during different activities in their day. The maintenance phase took place eight weeks after the last generalization session. In the maintenance phase, Sarah and John maintained high levels of initiation. Molly did not maintain the conversational skills from the scripting intervention.

**Experimental Control.** “Control refers to the researcher's efforts to remove the influence of any extraneous variable (other than the independent variable itself) that might affect scores on the dependent variable” (Gay & Airasian, 2000, p. 370). The number of replications in the study and the treatment effectiveness demonstrates control (Hersen & Barlow, 1976; Parsonson & Baer, 1978; McReynolds & Kearns, 1983). A set of three to four replications is compelling in demonstrating experimental control and treatment effectiveness (Wolf & Risley, 1971). In this study, experimental control was demonstrated when the data showed marked changes that corresponded with the introduction of the scripting intervention while baseline levels remained stable. Replication occurred across three persons as the experimental manipulation was implemented in a staggered incremental time frame for each successive data series.

**Internal Validity.** When changes that occur that can be attributed to the effects of the independent variable, the study has internal validity (Poling & Grossett, 1986). Using visual analysis, there was an immediate level change when the script was introduced. This suggests the increased initiations can be attributed to the independent variable, the written scripts.
Effect Size

The mean average PEM for the study regarding scripted initiations was 93% across all participants. This score indicates that the script fading intervention was a very effective treatment intervention to increase scripted initiations for adults with significant ASD and comorbid ID.

Table 9

*Percentage of Phase B Data Points Exceeding the Median of the BL Phase*

<table>
<thead>
<tr>
<th>Participant</th>
<th>PEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarah</td>
<td>92%</td>
</tr>
<tr>
<td>Molly</td>
<td>94%</td>
</tr>
<tr>
<td>John</td>
<td>94%</td>
</tr>
</tbody>
</table>

Scruggs and Mastropieri (1998) suggested that effect sizes of .90 and greater are indicative of very effective treatments. An effect size of .93 would suggest this was an effective intervention.

Intervention Fidelity

Intervention fidelity data were collected for 40% of all sessions. A fidelity checklist was used to assess fidelity to the script intervention. Data collectors used a one (1) to signify accurate completion of the step and a zero (0) indicated an error in a step of completion. Treatment integrity scores were at 100% across all sessions. The fidelity checklist in included in the appendix of this document.
Inter-observer Agreement

Inter-observer agreement (IOA) data was collected on 23 of the 68 sessions, which accounted for of 34% of all sessions. Cooper, Heron, and Howard (2007) recommend that IOA data be collected for minimum of 20% of a study’s sessions and preferably between 25-33% of sessions.

Collecting inter-observer agreement data permits the researcher to monitor and assess the reliability with which information regarding variables is being recorded (Kennedy, 2005). All observers were trained on the use of the behavioral codes and recoding system. The frequency-ratio approach will be used to calculate inter-observer agreement.

The team collected inter-observer agreement data for 23 of the 68 sessions (including baseline, intervention, and generalization) which is an average of 34% of all sessions. IOA during sessions ranged from 94% to 98% with an average IOA accuracy of 95.7%. Participant by participant IOA was also calculated. For Sarah, IOA data ranged from 94% to 100% with an average of 98% accuracy. Molly’s IOA data ranged from 81% to 100% with an average of 95% accuracy. John’s IOA data ranged from 82% to 95% with an average of 94%.

Table 7

<table>
<thead>
<tr>
<th></th>
<th>Scripted Initiations</th>
<th>Unscripted Initiations</th>
<th>Novel Initiations</th>
<th>Responses</th>
<th>Changes in Topic</th>
<th>Inappropriate Vocalizations</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarah</td>
<td>100%</td>
<td>98%</td>
<td>99%</td>
<td>99%</td>
<td>100%</td>
<td>94%</td>
<td>98%</td>
</tr>
<tr>
<td>Molly</td>
<td>100%</td>
<td>97%</td>
<td>96%</td>
<td>96%</td>
<td>100%</td>
<td>81%</td>
<td>95%</td>
</tr>
<tr>
<td>John</td>
<td>95%</td>
<td>96%</td>
<td>95%</td>
<td>96%</td>
<td>100%</td>
<td>82%</td>
<td>94%</td>
</tr>
</tbody>
</table>
Social Validity

The social validity measure for this study was a survey intended to assess the program manager’s perception of the script fading intervention. A copy of the survey is in the appendix of the document. The survey used a Likert scale with the rating scale of “strongly agree” to “strongly disagree.” Specific statements included in the social validity measure included “was appropriate for the participant’s social goals,” “targeted many of the social challenges that the associates struggle with,” “was easy to implement,” “was an appropriate intervention for the setting,” “would use with another participant with ASD.” The program manager responded as strongly agreeing (e.g. circling the number 5) to all the questions except the question addressing an overall improvement in social skills. She responded that she agreed to the statement that the students who participated in the social scripting intervention demonstrated an improvement in social skills by circling a 4. When asked what she liked about the intervention, she responded by saying that “social scripting has built confidence in communication with our associates.”

Social validity assessments allow the study of how behavioral interventions impact a range of individuals directly and indirectly involved in the investigation. This type of assessment allows the researcher to gather data on how other individuals involved in the study perceive the appropriateness of the goals, procedures, and outcomes of the study (Kennedy, 2005).
Discussion

As the research reflects, individuals with ASD and ID tend to exhibit less positive social behaviors (e.g. attempts to communicate with others, positive non-verbal social skills) and more challenging social characteristics (e.g. isolating, disruptive) than those with similar levels of ID without ASD (Wilkins & Matson, 2009). The purpose of this study was to examine the effects of a script fading intervention with adults with significant ASD and comorbid intellectual disability.

At the start of the study, baseline data across all three participants reflected a stable trend of little to no conversational skills within the observed sessions. Variability was low, suggesting that the data were a reliable reflection of their conversational skills. With the introduction of the script fading intervention, all three participants showed systematic increases in the frequency of scripted initiations to peers. Replication occurred across persons as the experimental manipulation was implemented in a staggered incremental time frame for each successive data series. The data suggests via visual analysis that the script fading procedure was effective for the adults in the study.

It is noted that the fading procedure took more time, with longer phases, than most of prior studies reviewed for this study. It is hypothesized that this is due to the profile, significant ASD with comorbid ID, of the participants. There was also increased variability during the intervention for two of the participants, Molly and John. It is hypothesized that Molly’s significant behavioral needs (explosive behavior) impacted her ability to participate in the intervention during two sessions. A strong interest in a new activity resulted in John having difficulty attending to the intervention, which created a significant decrease in peer initiations for three sessions.
As demonstrated in the visual analysis, all three adults could generalize initiating scripted initiations to other people during different activities in their day. Thus, the results of this study suggest that a script fading intervention may be an effective intervention to increase the conversational skills of adults with significant ASD and comorbid ID. The following section presents the limitations of the study, implications for practice, and directions for future research.

Limitations

**Limited Sample Size.** A limitation to this study is the small sample size used. With only three participants, the external validity is extremely limited. Additional participants would offer further evidence of the effectiveness of script fading in adults with significant ASD and comorbid ID.

**Artificial S^P remained.** In this study, the decision was made to maintain the blank paper as a discriminative stimulus to prompt the conversational skills of the study participants. Due to the intellectual and communication profile of the study participants, it was hypothesized that some type of visual cue needed to remain in the environment to prompt initiations. It is plausible that the intervention would have higher social validity if the discriminative control for social interactions was transferred to stimuli that would be present in the natural environment.

**Qualitative improvement of communicative interactions.** Another limitation of this research that was the lack of qualitative data collected on the participant’s communicative interactions with their peers. Although there is clearly an experimental effect replicated across the three participants regarding scripted initiations, it is unclear if there were any qualitative improvement in the participants’ communicative interactions. The current findings may be
strengthened by including data collection regarding gaze, body orientation, prosody, gestures, tone of voice, affect, and proximity.

**Lack of responses and unscripted initiations.** While the scripted initiation’s clearly rose for the participants in the study, there was not a significant increase in responses and unscripted initiations. The script intervention taught the participants to initiate joint attention, yet the participants struggled to respond to another person’s bid for joint attention. Thus, the study participants did not maintain the conversational bids from their peers.

**Conversation Partners had Significant ASD.** While the intervention increased scripted initiations for the study participants, there was a lack of responses. Generally, when one participates in conversational speech, a conversational partner is likely to respond and reinforce that behavior. Due to the profile of the conversational partners in this study, there was a lack of reinforcing responses. It is possible that responses and unscripted initiations would have increased if the study included neuro-typical peers to offer responses to the participants with ASD.

**Implications for Practice**

This study supports and extends the findings in the literature that script fading interventions are effective in teaching social interactions skills to adults with ASD and co-morbid ID. While focusing on social skills for individuals with ASD from a young age is important, targeting social skills remains critical across the lifespan. Due to the unique profile of adults with ASD/ID and the lack of consideration given to this population in the research, identifying effective treatment options that result in large, generalized skill changes is of critical importance. A strength of the script fading procedure is that it diminishes the need for staff to facilitate interactions for the adults with ASD/ID.
Direct care staff. Gerhardt and Lainer (2011) emphasized the need for direct care staff in adult service programs to be trained in relevant, evidence based practices. Demonstrating competence with EBPs may decrease staff burnout. An added benefit to training successful social skills intervention would be the increased rapport between clients and staff that could also decrease burnout (Walton & Ingersoll, 2013). Interventions that improve staff-client relationships may increase the staff’s feelings of competence and belief that the individuals with ASD/ID can make progress. Script fading is a relatively simple intervention that direct care staff could implement across a range of daily activities to improve the social skills of adults with significant ASD.

Ease of intervention. The script intervention is a low cost and time effective intervention. The materials can be made simply and are easy to transport in a variety of settings. The intervention can be effectively used across a wide variety of naturalistic settings. The staff training is relatively simple and can be completed in a short amount of time.

Directions for Future Research

Adult service providers need interventions that promote increased social skills for individuals with significant ASD. While this intervention was successful in increasing scripted initiations, conversational speech requires multiple skills, both initiating, and responding appropriately. Future studies should explore interventions to simultaneously increase unscripted initiations and responses. Future studies should be done to examine teaching conversation as a complete chain of behaviors.

In this study, the discriminative stimulus remained an artificial object in the natural environment. It would be beneficial in future studies to determine if the discriminative stimulus can be transferred to a natural stimulus within in the environment for the profile of participants in
this study. This would increase the social validity of the intervention. The findings in this study indicate that script fading was an effective intervention for adults with significant ASD. However, the intervention was facilitated and implemented by a doctoral and graduate student. It would be helpful in future studies to know if direct care staff with less training and experience would find the implementation of the intervention easy and effective. It is also hypothesized that this social skills intervention would lead to increased rapport between the individual with significant ASD and the direct care staff. Assessment measure as to if this hypothesis is true would also extend the relevance of this intervention with the adult population. While the intervention increased scripted initiations for the study participants, there was a lack of responses. Generally, when one participates in conversational speech, a conversational partner is likely to respond and reinforce that behavior. Due to the profile of the conversational partners in this study, there was a lack of reinforcing responses. Future research should include neuro-typical peers in the conversational group to determine if it would result in increased responses.

Summary

The goal of this research study was to examine the effects of both the introduction of a script and a script fading procedure on social interactions on young adults with significant ASD and comorbid ID. Social scripting and script fading have proven effective interventions to expand the language skills with individuals with ASD (Brown et al., 2008; Krantz & McClannahan, 1993; Reagon and Higbee, 2009). Using visual analysis, this study clearly demonstrated that the behavior changed in a meaningful way and the change in behavior can be attributed to the written scripts. With the introduction of the written script, all three adults showed systematic and marked increases in the rate of scripted interactions.
It is imperative when targeting skills for adults with significant ASD, we choose skills that have both functional and adaptive value to the adult. A lack of conversational skills decreases the opportunities for adults with significant ASD to have extended interactions with others and expand their social realm and opportunities. Targeting skills that are valued and reinforced by others, like conversational skills, it is likely to increase the quality of life for the individual with ASD.
References


Appendix A. Assent Form

Assent Form for Research
University of Cincinnati
Department: Special Education
Principal Investigator: Kate Doyle
Faculty Advisor: Dr. Christina Carnahan

Title of Study: Social Scripts to Teach Conversation Skills to Young Adults Significantly Impacted by ASD

<table>
<thead>
<tr>
<th>We will talk.</th>
<th>![Conversation Silhouettes]</th>
</tr>
</thead>
<tbody>
<tr>
<td>You can say yes or no.</td>
<td>![Yes-No Choices]</td>
</tr>
<tr>
<td>You might learn to talk more.</td>
<td>![Speech Bubbles]</td>
</tr>
<tr>
<td>It will take about 10 minutes.</td>
<td>![10 Min Timer]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>We will talk during art or puzzles.</td>
<td></td>
</tr>
<tr>
<td>If you have any questions you can ask or Christi.</td>
<td></td>
</tr>
<tr>
<td>You do not have to be in this talking work. You may stop. No one will be mad or sad with you.</td>
<td></td>
</tr>
<tr>
<td>To stop you can tell Kate or Christi.</td>
<td></td>
</tr>
<tr>
<td>If you want to talk, write your name. If you do not want to talk, do not.</td>
<td></td>
</tr>
</tbody>
</table>

Your Name (please print) __________________________

Your Birthday ________________ (Month / Day / Year)

Your Signature ___________________________ Date ___________
Appendix B. Guardian Consent

Guardian Consent for Adult with a Developmental Disability Participation in Research
University of Cincinnati
Department: Special Education
Principal Investigator: Kate Doyle
Faculty Advisor: Dr. Christi Carnahan, Dr. Carla Schmidt

Title of Study: Social Scripts to Teach Conversation Skills to Young Adults Significantly Impacted by ASD

Introduction:
You are being asked to allow your child to take part in a research study. Please read this paper carefully and ask questions about anything that you do not understand.

Who is doing this research study?
The person in charge of this research study is Kate Doyle of the University of Cincinnati (UC) Department of Special Education. Dr. Christina Carnahan and Dr. Carla Schmidt are guiding her in this research. There may be other people on the research team helping at different times during the study.

What is the purpose of this research study?
The purpose of this study is to help young adults with Autism Spectrum Disorder (ASD) improve their conversational skills.

Who will be in this research study?
Up to 8 individuals will take part in this study. Your child may be in this study if he or she:
- Has a diagnosis of ASD
- Is in the Advancement and Transition Services (ATS) program
- Is between the ages of 18-30 years old

What will your child be asked to do in this research study, and how long will it take?
- Your child will be asked to participate in a special conversation program
- The special program gives written instructions to help conversations. As the program continues, the written instructions are slowly removed. At the end of the program your child may be able to remember and use the instructions easily.
- It will take about 20 minutes a day, 2-3 times a week.
- The research will take place on UC Campus within the normal IMPACT Innovation routine.
- Data will be collected for 12-15 weeks.

Are there any risks to being in this research study?
The risk is not expected to be more than your child would have in daily life.

Are there any benefits from being in this research study?
There may not be any direct benefit for participating in this research study. However, the extra practice with conversations might help your child.

**What will your child get because of being in this research study?**
Your child will not be given anything to take part in this study.

**Does your child have choices about taking part in this research study?**
If you do not want your child to participate in this research study, he or she may simply not participate. Records will be reviewed for all participants. If you do not want your child’s records reviewed, do not participate in the study. The intervention sessions will be videotaped. If you do not want your child videotaped, do not have your child participate in the study.

**How will your child’s research information be kept confidential?**
Information about your child will be kept private by using a numerical identifier instead of your child’s name on research forms. In addition, I will not include your child’s name on typed transcripts. All computer files will be stored on a password-locked computer.

Your consent form and your child’s assent form will be kept in a locked cabinet in the faculty researcher’s campus office for three years. Your signed consent form will be stored separately from identifiable data about your child.

A number and a fake name will be assigned to each research participant. They will be used instead of real names on all research data that are collected. The list that matches real names, numbers, and fake names will be kept separately from research and consent forms. The list we be destroyed 3 years after the study is finished.

The data from this research study may be published; but your child will not be identified by name.

Agents of the University of Cincinnati may inspect study records for audit or quality assurance purposes.

The identity of participants and information about them will be kept confidential, unless the authorities have to be notified about abuse or immediate harm that may come to the participant or others.

Agents of the University of Cincinnati may inspect study records for audit or quality assurance purposes.

**What are your and your child’s legal rights in this research study?**
Nothing in this consent form waives any legal rights you or your child may have. This consent form also does not release the investigator, the institution, or its agents from liability for negligence.

**What if you or your child has questions about this research study?**
If you or your child has any questions or concerns about this research study, you should contact Kate Doyle at 513.368.5022. Or, you may contact Dr. Christina Carnahan at 513.678.8116.
The UC Institutional Review Board reviews all research projects that involve human participants to be sure the rights and welfare of participants are protected.

If you have questions about your child's rights as a participant, complaints and/or suggestions about the study, you may contact the UC IRB at (513) 558-5259. Or, you may call the UC Research Compliance Hotline at (800) 889-1547, or write to the IRB, 300 University Hall, ML 0567, 51 Goodman Drive, Cincinnati, OH 45221-0567, or email the IRB office at irb@ucmail.uc.edu.

**Does your child HAVE to take part in this research study?**
No one has to be in this research study. Refusing to take part will NOT cause any penalty or loss of benefits that you or your child would otherwise have.

You may give your consent and then change your mind and take your child out of this study at any time. To take your child out of the study, you should tell Kate Doyle at 513.368.5022.

Your child will be asked if he or she wants to take part in this research study. Even if you say yes, your child may still say no.

**Agreement:**
I have read this information and have received answers to any questions I asked. I give my consent for my child to participate in this research study. I will receive a copy of this signed and dated Guardian Consent form to keep.

You Child's Name (please print) ____________________________________________

Your Child's Date of Birth _______________ (Month / Day / Year)

Parent/Legal Guardian's Signature __________________________________ Date _______

Signature of Person Obtaining Consent _____________________________ Date _______
Appendix C. Fidelity Checklist

FIDELITY CHECKLIST

Baseline

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set up space with three leisure art choices at spaces (adult coloring books, markers, crayons, water colors, and blank paper)</td>
</tr>
<tr>
<td>2.</td>
<td>Place single sheet of written with the directions, “It is leisure time. Talk a lot.” at each space</td>
</tr>
<tr>
<td>3</td>
<td>Once every participant is seated, start the timer for 10 minutes.</td>
</tr>
<tr>
<td>4</td>
<td>Prompt each study participant to read the directions.</td>
</tr>
<tr>
<td>5.</td>
<td>After prompting reading of the written directions, all staff and observers will move to the periphery of the space</td>
</tr>
<tr>
<td>6.</td>
<td>Interactions with the participants by observers will only occur if they are directed to the staff</td>
</tr>
<tr>
<td>7.</td>
<td>Observers will collect communication data</td>
</tr>
<tr>
<td>8.</td>
<td>When the timer goes off, the session is over. Stop collecting data. Tell study participant’s it is time to clean up and check their schedule.</td>
</tr>
</tbody>
</table>

Scripting Phase

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set up space with three leisure art choices at spaces (adult coloring books, markers, crayons, water colors, and blank paper)</td>
</tr>
<tr>
<td>2.</td>
<td>Place single sheet of written with the directions, “It is leisure time. Talk a lot.” at each space</td>
</tr>
<tr>
<td>3</td>
<td>Place the written script visual prompt at each space. Make sure each script is rotated among participants.</td>
</tr>
<tr>
<td>4</td>
<td>Once every participant is seated, start the timer for 10 minutes.</td>
</tr>
<tr>
<td>5.</td>
<td>All staff and observers will move to the periphery of the space</td>
</tr>
<tr>
<td>6.</td>
<td>Interactions with the participants by observers will only occur if they are directed to the staff</td>
</tr>
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<td>8.</td>
<td>When the timer goes off, the session is over. Stop collecting data. Tell study participant’s it is time to clean up and check their schedule.</td>
</tr>
</tbody>
</table>
Appendix D. Social Validity Measurement Tool

Social Scripting Intervention

Social Validity Measurement Tool – Program Manager

Please mark the box that best describes your agreement or disagreement with each statement utilizing the scale below.

1. The social scripting intervention was appropriate for the associate’s social goals.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

2. The social scripting intervention targeted many of the social challenges that my associates struggle with.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

3. The social scripting intervention was easy to implement.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

4. The associates who participated in social scripting intervention demonstrated improvements in social skills.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

6. I would recommend the social scripting intervention to other practitioners.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>
7. The social scripting intervention is an appropriate intervention for the adult setting.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

8. I would use the social scripting intervention with other adults with autism spectrum disorders.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

9. The social scripting intervention was a useful intervention.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

10. I plan to continue to use the social scripting intervention with my associates.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

Other Comments:
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

The following scale will be utilized for data interpretation:
1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree
Appendix E. Data Collection Form

<table>
<thead>
<tr>
<th>Name:</th>
<th>Date:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initiation:</strong> An understandable statement or question that are unprompted by a staff member, directed to a peer by using his or her name or by facing him or her and are separated from the speaker’s previous vocalizations by a change in topic or a change in recipient interaction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Scripted Initiations</strong></th>
<th><strong>Unscripted Initiations</strong></th>
<th><strong>Novel Initiations</strong></th>
<th><strong>Responses</strong></th>
<th><strong>Changes in Topic</strong></th>
<th><strong>Inappropriate Vocalization (IV)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>those that match the written script, with the exception of conjunctions, articles, prepositions, or pronouns could be altered or deleted and the verb tense could be changed</td>
<td>verbal productions that differed from the script by more than conjunctions, articles, prepositions, pronouns, or changes in verb tense.</td>
<td>the first occurrence of a specific unscripted initiation and was scored only the first time a participant emitted a unique unscripted initiation. Future occurrences of the same utterance will be scored as an unscripted utterance.</td>
<td>any contextual utterance (word, phrase, or sentence) that was not prompted by a staff member and that occurred within 5 s of a statement or question directed to a target peer</td>
<td>not concerning the activity at hand but were directed to a peer and were age and context appropriate</td>
<td>any audible vocalization not related to context (i.e. humming, singing parts of songs, delayed echolalia, and repeating text/narrative fragments from previously viewed videos or previously read books).</td>
</tr>
</tbody>
</table>

| Frequency Count | Comments/ Notes/ Examples |