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The Generalization of Clinic-Based CBT Intervention Improvements to the Home for Children
with Autism

A thesis submitted in partial satisfaction of the requirements for the degree of Masters of Arts in
Education

by

Samara Merav Wolpe

2022

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ABSTRACT OF THE THESIS

The Generalization of Clinic-Based CBT Intervention Improvements to the Home for Children
with Autism

by

Samara Merav Wolpe

Masters in Education

University of California, Los Angeles, 2022

Professor Jeffrey J. Wood, Chair

Objective: Although effective interventions for children on the autism spectrum are numerous, it is often difficult to ascertain the degree to which they are generalizable to the home. Wood et al. (2021) measured the effect of a modular CBT intervention on parent-identified Youth Top Problems (YTPs) of children on the autism spectrum through examination of parent-recorded home videos. YTP scores were found to decrease significantly in the experimental condition compared with the Enhanced Standard Community Treatment (ESCT) condition. The current study examines these same home videos with three research questions in mind: **1:** What is the effect of the SEBASTIEN intervention on a broader range of social communication patterns and related behaviors of children with autism assessed via structured observations of parent-recorded home videos? **2:** How does the quality of parent-child interactions as measured by parental

behaviors change post-intervention? **3:** What is the association between children's response to the SEBASTIEN intervention and parent-child interaction quality? **Method:** Children with ASD (N=15, aged 6-13 years) were filmed by their parents pre- and post-treatment. Raters blind to condition scored videos for a broader range of autism-related behavioral challenges as well as parent-child interaction quality. **Results:** The modular CBT condition outperformed the ESCT condition from pre- to post-treatment. Parent-child interaction quality did not differ significantly between groups, but was significantly related to improvements in autism-related behavioral challenges overall. These findings provide important information about the nature of generalizability to the home for CBT interventions, as well as the relationship between autism-related characteristics and parent-child interaction quality.

The masters thesis of Samara Merav Wolpe is approved.

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2022

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The Generalization of Clinic-Based CBT Intervention Improvements to the Home for Children with Autism

Although effective interventions for children on the autism spectrum are numerous, addressing a variety of challenges through a broad array of behavioral, pharmacological, and therapeutic techniques, it is often difficult to ascertain the degree to which they are generalizable to the home. Many autism intervention studies that assess outcome measures pre- and post-treatment also include a follow-up measure to establish the durability of their effects (e.g. Rickards et al., 2009; Kasari et al., 2012; Pickles et al., 2016). However, many interventions that produce promising results in the controlled settings of the lab may not generalize to the child's home, school, or community environment. Several meta-analyses of RCTs for autism interventions targeting various behavioral and emotional challenges ranging from emotional regulation (ER) to language and communication to adaptive behavior found that the generalizability of the lab-generated results is intermittent, varying greatly between interventions (Berggren et al., 2018; Trembath et al., 2019).

The Importance of Generalizability

Although the environment of a research lab is ideal for eliminating potential confounds and delivering high fidelity treatment, it is not an environment that closely mimics the day-to-day experience of the child. As the intention of interventions for autism-related challenges is to improve the life, prospects, and experience of the child on the spectrum, understanding the degree to which interventions designed to help this population are continuing to reap positive effects outside the lab is crucial when assessing their efficacy and in making the transition from

research to implementation. As a result, there is a need for more generalizability studies to examine the effects of lab-based autism interventions in the home.

In this study, I examine the generalizability from clinic to home of a Cognitive Behavioral Therapy intervention targeting parent-identified top salient behavioral and social struggles in children on the autism spectrum, as well as the changes in parent-child interactions that may take place pre and post intervention. In the following sections, I outline the existing research into Cognitive Behavioral Therapy for children on the autism spectrum, discuss the extant literature on parent-child interactions for parents of children with autism, and discuss the specifics of this intervention as well as the subsequent plan for examining the intervention's effects on children in their home environment.

Cognitive Behavioral Therapy

Cognitive Behavioral Therapy (CBT) is one of the most well-researched, heavily implemented, increasingly relevant psychotherapy approaches currently in existence (David, Cristea, & Hofmann, 2018). It operates under the assumption that cognition affects behavior, and therefore, behavior may be affected by altering a cognitive state, combining elements of traditional behaviorism with cognitive processes intended to undermine and replace maladaptive thoughts with more helpful lines of reasoning (Dozois, Dobson, & Rnic, 2019). The rationale behind CBT practices consists of the understanding that multiple representations of memory (both positive and negative) will compete for retrieval and utilizes the mind's ability to construct and implement adaptive 'replacement' thoughts and representations that are intended to intercept the maladaptive representations and ultimately supersede them (Brewin, 2006). CBT has been demonstrated to be effective in a variety of populations, including children, in both individual

and group settings (e.g. Reaven et al., 2012; Kodal et al., 2018). In addition to its convenience in applicability to a wide range of ages, settings, and problems, CBT can be used to treat a vast array of psychological conditions, from depression and anxiety to trauma to behavioral problems (Webb et al., 2017; Sachser, Keller & Goldbeck, 2017; Cohen et al., 2018; Lovibond, 2004).

An additional advantage of CBT is the flexible nature of its implementation. Studies find that modular CBT interventions, or CBT treatments structured as free-standing modules with decision flowcharts to guide clinician or participant selection of the treatments most closely adhering to their needs, has produced greater levels of improvement for children across multiple domains of psychopathology compared with standard or separate CBT treatments with invariant protocols (Weisz et al., 2011). The ability of CBT to mold its area of focus on an individual basis depending on the user's most urgent areas of concern allows for easier use by clinicians, as well as the ability to adapt to shifting priorities on the part of the client.

CBT for Autism

Although CBT was originally implemented to improve various psychological and behavioral issues in typically developing populations, CBT has been used increasingly for children with autism and high verbal ability, in intervention and school settings (Hess et al., 2007), and has been demonstrated to be effective for children with autism in addressing emotional dysregulation, as well as co-occurring anxiety (Danial & Wood, 2013). Wood et al. (2009) conducted one of the earliest explorations of CBT for this population, developing an adapted CBT protocol 'BIACA', designed to target anxiety disorders in children with autism. 40 children with a formal diagnosis of autism, Asperger syndrome (included in the DSM at that time), or PDD-NOS and a co-occurring anxiety disorder between the ages of 7-11 years old were

randomized to either the CBT or waitlist conditions. The CBT condition outperformed the waitlist condition, with the treatment condition displaying outcomes of improved anxiety comparable to those of typically developing children receiving CBT for anxiety disorders, and remission of anxiety disorders for over half the children in the CBT condition, an effect maintained at 3-month follow-up.

These promising results were replicated in a study by Storch et al. (2013) that compared the effect of the BIACA protocol in children with autism with Treatment as Usual (TAU), defined as continuing to receive ongoing interventions as well as beginning to receive psychosocial and/or pharmacological treatment as determined by the parents with no influence from the research team. The authors found large group differences in favor of the CBT condition over TAU for child anxiety symptoms, with more children classified as treatment responders in the CBT condition than in the TAU condition. The CBT condition was also associated with larger reductions in internalizing symptoms as reported by parents. In total, 38% of the participants in the study receiving CBT no longer met the criteria for their anxiety diagnoses. Even many of those who did not improve sufficiently to move out of their anxiety diagnosis classification showed marked improvement, with the majority of participants (73%) maintaining gains in anxiety reduction at 3-month follow-up.

In a further development of the BIACA protocol, Wood et al. (2019) randomized 167 participants (144 of which completed the study) between the ages of 7-13 years with maladaptive and interfering anxiety to one of three conditions: the adapted CBT (BIACA) condition, the alternative CBT condition (Coping Cat; Kendall et al., 1997; Kendall et al., 2008) and the treatment as usual (TAU) condition. TAU consisted of usual services, with the study team providing families with referrals. Families chose to maintain the treatment approach of their

choice at 4 months, at which point they were given the choice to participate in the adapted CBT condition. While both CBT treatment conditions achieved superior results to the TAU condition, BIACA outperformed Coping Cat on Independent Evaluator (IE) measures of anxiety scores.

CBT has also demonstrated efficacy in areas of need other than anxiety for youth on the spectrum. Scarpa and Reyes (2011) explored the effects of a modified CBT protocol on emotional regulation for young children with autism, randomly assigning participants to either a CBT or delayed-treatment group. Children not only demonstrated significant improvements on a parent-reported Negativity/Liability subscale and increased scores on emotional regulation, but also responded to vignettes of stressful situations with more strategies to cope with anger and anxiety. Furthermore, parents reported higher levels of confidence in both their own ability and that of their child to deal with anger and anxiety in stressful situations. Further studies in which CBT was used to promote emotional regulation skills in children and early adolescents with autism produced similarly positive results (e.g., Thomson et al., 2015).

In addition to its usefulness in addressing specific behavioral or emotional problems, CBT has been used for multiple aspects of psychopathology related to autism (Danial & Wood, 2013; Kose, Fox, & Storch, 2018). A study exploring CBT's effects on both emotional regulation and various areas of psychopathology (e.g. dysregulation, externalizing and internalizing behaviors, adaptive functioning, and overall anxiety as measured by the Anxiety Disorders Interview Schedule (ADIS-P; Silverman & Albano, 1996) in children with autism found significant improvements in the CBT condition compared with the waitlist control condition on both emotional regulation and psychopathology (Weiss et al., 2018). This study is particularly significant, as it is the first transdiagnostic CBT trial for children on the autism spectrum that utilized an RCT design. As a heterogeneous disorder, presenting with a variety of different

associated difficulties and co-occurring conditions, transdiagnostic, flexible CBT treatments are well poised to address the various difficulties with which children on the autism spectrum may struggle. Given the frequent behavioral, emotional, and psychological problems that frequently arise in children on the autism spectrum, along with the frequent co-occurring developmental, emotional, and learning disorders found in this population (Matson & Nebel-Schwalm, 2005; Mannion, Brahm, & Leader, 2014), along with the deficit in social skills often requiring separate interventions (White, Keonig, & Scahill, 2006; Laugeson et al., 2012), the demand for affordable, safe, accessible, and versatile treatment options grows ever more pressing.

Parent Interaction Quality and Autism:

Although parent-child relationship quality is generally good in children with autism there is some variation in interaction quality, particularly in children with greater reported behavioral problems. Higher levels of autism-related maladaptive behaviors and symptoms such as poor communication skills, emotional expression, and lack of responsivity have been linked to lower quality parent-child interactions (Beurkens, Hobson, & Hobson, 2013; Danial, 2015). One study found that children with autism reported their parents with higher levels of authoritarian parenting style and qualitatively fewer positive interactions than parents of typically developing children (Riany, Cuskelly, & Meredith, 2017). Another study by Hoffman et al. (2009) found that higher levels of maladaptive behavior in children with autism were highly correlated with lower reports of closeness from mothers.

Given the high levels of parental stress and depression that are frequently noted in parents of children on the autism spectrum, even as compared to parents of children with other developmental disabilities (Cohrs & Leslie, 2017; Hayes & Watson, 2012), these findings are not

altogether surprising. However, they have serious implications for the entire family unit, particularly for the child on the spectrum, whose parents are generally their greatest advocates when navigating the school system, social relationships, and challenges they may encounter in the transition to adulthood (Stoner & Angell, 2006; Boshoff et al., 2016). Furthermore, higher relationship quality between parents and children on the spectrum have been demonstrated to have a protective effect against poor mental health for parents, suggesting additional benefits of pursuing avenues for improving parent-child interactions for this population (Weitlauf et al., 2014). Although drawing a causal link between the cause of lower parent-child interaction qualities and parental states of stress and depression is tricky due to the many potential contributing factors leading to this association, aiming to improve parent-child interactions is a worthwhile pursuit that is likely to have tangentially positive effects for both parents' mental health and children's development.

Interventions aimed at improving social skills have demonstrated some effect in producing tangentially positive parent-related effects. A study examining parent and family outcomes of PEERS, a social skills intervention for adolescents on the autism spectrum, found that the intervention was associated with a decrease in reported family chaos, decreases in parental stress, and an increase in parenting-self-efficacy, suggesting global familial benefits in improving social skills for the child on the spectrum (Karst et al., 2015). Other studies have found a similarly positive effect in parent mood, reduction in stress, and increase in feelings of empowerment upon perceiving social improvements in their children post-intervention (Weiss et al., 2013; Thompson & McFerran, 2013; Corona et al., 2019). While this is not analogous to improvement in parent-child relationships, positive changes in parents' moods and stress levels as well as their feelings of competency are likely to affect the quality of their interactions with

the child. There is also some evidence to the bidirectionality of this relationship, with warmth in the parent-child relationship and child functioning mutually affecting one another at different points during the child's development in children on the spectrum (Hickey et al., 2020). Studies have found that relationship quality as well as maternal warmth and praise are positively correlated with reductions in both internalizing and externalizing behavioral problems in their children with autism (Smith et al., 2008; Greenberg, Seltzer, & Hong, 2006).

SEBASTIEN Intervention

Most CBT interventions are designed to target one or two areas of interest. Apart from emotional dysregulation and anxiety interventions, few one-on-one CBT treatments have been designed to target all the most common clinical areas of interest to children with autism as identified by parents, including externalizing problems, internalizing problems, repetitive behavior, rigidity, hypersensitivities, peer social engagement, social communication and friendship, and self-care (Wood et al., 2015). Even fewer have the flexibility to change the target of the intervention based on the individual or family's most pressing needs using a modular design, in which therapists or clinicians can prioritize the problems most salient to their clients in order and emphasis (time spent on each module). This versatility of intervention is important due to the heterogeneity of the presentation of autism, as well as the many potential co-occurring conditions that may be causing the child or family distress, thereby leading to a great deal of individual variability in the priority of problems children and families may seek to address through CBT.

SEBASTIEN is a novel, modular Cognitive Behavioral Therapy (CBT) treatment for children with autism and focuses on YTPs (Youth Top Problems). SEBASTIEN incorporates

BIACA (Wood et al., 2019) as well as additional evidence-based interventions addressing autism-related social communication skills and behavioral issues. SEBASTIEN is a one-on-one CBT treatment developed based on the theoretical framework outlined in Wood, Fujii, and Renno (2011) which incorporates elements of the memory retrieval competition model of CBT (Brewin 2006) as well as the Koegel et al. (2001) pivotal response treatment (PRT) for the same population. Specifically, the SEBASTIEN intervention emphasized deep semantic processing when learning new adaptive thoughts vs. merely passive listening, practicing the introduction of adaptive thoughts in settings where the child typically struggles with maladaptive thoughts in accordance with the encoding specificity principle (Tulving & Thomson, 1973). This emphasis on practicing adaptive thoughts in contexts where the child might typically struggle with emotional regulation or anxiety, such as the home or at school, increases the importance of generalizability studies to ensure that the children are in fact able to practice these skills in the contexts specified by the intervention.

The primary study examining the efficacy of SEBASTIEN consisted of 107 children (6-13 years old) with a clinical diagnosis of autism spectrum disorder (ASD) who were randomly assigned to either the modular CBT condition (SEBASTIEN) or an Enhanced Standard Community Treatment (ESCT) condition, occurring simultaneously. Although 107 children began the study, the final sample consisted of 84 children, with 26 missing post-treatment scores and therefore excluded from the primary outcome analysis. Attrition was fairly evenly distributed between groups, with 14 dropping out of the CBT condition and 12 from the ESCT condition. The ESCT condition focused primarily on social skills training, but also included some CBT practices such as exposure and reframing to target anxiety and anger/frustration. The

ESCT condition was formulated with the intention of mimicking the typical treatment the child might receive at a community care clinic.

The two conditions were identical in receiving 32 weekly 90-minute sessions from graduate and postdoctoral students with prior experience with child psychotherapy and weekly supervision with a licensed clinical psychologist. Youth Top Problems (YTP) scale was administered to parents prior to the intervention, allowing parents to state in their own words the primary difficulties their child was experiencing, with an additional scale where parents could rate how severe the problem was, from 0 (not at all) to 10 (very, very much). Their responses were subsequently synthesized into one of 43 YTP descriptive symptom categories fitting into commonly observed autism-related social communication and behavioral difficulties as measured by instruments such as the Autism Diagnostic Observation Schedule-Generic (ADOS-G; Lord et al., 2000). The most common YTP category parents cited by far were social communication problems (56.4%), with other frequently cited categories including externalizing symptoms (20.9%), restricted/repetitive behavior (18.1%), and internalizing problems (3.7%). Parents rated YTPs weekly, allowing for the modules to be tailored to the problems emphasized by the parents to be the most salient issues week to week.

SEBASTIEN consisted of six clinical modules that could be implemented in a flexible and modular format, so that each participant received only the modules that targeted the areas identified by their parents as top clinical areas of interest (YTPs). Clinicians then decided which module would be most suitable for each session depending on an algorithm and the child's individual needs. SEBASTIEN utilized many forms of stimuli (e.g. drawing, writing, toys), as well as guided Socratic questioning to involve the child in creating metaphors that were meaningful and interesting to them. Wood et al. (2021) found that the children with autism

randomized to SEBASTIEN demonstrated greater improvement in YTPs, social communication, clinical problem areas often experienced by children on the autism spectrum and identified as most concerning by their parents, and emotion regulation as compared with the participants in the simultaneously implemented ECST condition (Wood et al., 2021). SEBASTIEN's robust effects appear even more practically significant, considering that effect sizes tend to be higher in studies using waitlist control groups (Weisz et al., 2017).

The vast majority of autism intervention research examines children's responses to treatment in the lab and not in their home environments, with a few exceptions (Fusaro et al., 2014). This gap in the literature raises concerns about whether the positive effects that intervention studies report are indeed generalizable across settings and individuals who are meaningful in the lives of children on the autism spectrum. Wood et al. (2021) conducted the SEBASTIEN intervention and gathered assessments in the lab. However, during the data collection phase of the examination of SEBASTIEN (Wood et al., 2021), researchers asked parents to record their child performing everyday tasks, such as playing games, eating dinner, doing homework, and interacting with family and friends, both prior to and post intervention. Although this addition to the lab-based measures was initially implemented to assess the degree to which parent rated YTP scores and blind rater YTP scores aligned, this glimpse into the child's home life provides a unique opportunity to obtain a clearer and broader picture of the real-world ecological relevance of the intervention, as well as the social and relational ramifications of its effects. In an examination of these home videos, Wood et al. (2021) found that gains in YTPs as measured in the lab were generalizable to the home, with independent evaluator (IE) ratings converging with parent ratings of YTPs reliably. This study was particularly salient in that it was the first time that the investigators were able to observe the

child in their natural environment without conducting home-based assessments to see if the effects of the intervention were generalizable.

The Current Study:

While Wood et al. (2021) established that the effects of the SEBASTIEN intervention were generalizable to the home, the only measure that was examined was parent rated YTPs, meaning that only a few (typically three) top problems were assessed per child. It did not address the checklist measures of autism-related problems typically used in clinical research trials to assess improvement in CBT interventions. Given the fact that youth on the spectrum typically have a wide array of needs that are important to address through intervention (as addressed by the original SEBASTIEN intervention; Wood et al., 2021), investigating the generalizability of broader effects of the SEBASTIEN intervention to the home is critical in determining its applicability in real world settings and in proceeding to effectiveness trials.

Danial (2015) used his dissertation to examine the pre-treatment videos recorded by parents to pilot the measures used to code the videos, as well as to examine the relationship between autism-related behaviors and parental responsiveness. In his investigation of the SEBASTIEN videos, he found that positive parental behaviors were significantly associated with lower autism-related behavioral issues and better social skills. Given these findings in this dataset, and given the improvement demonstrated in the lab in the SEBASTIEN intervention, it is important to investigate whether improvements in autism-related behavioral issues and social communication that may be observed in the parent-recorded home videos pre- to post-treatment is correlated with changes in parental responsiveness.

Research Questions:

This study examines two potential effects of the SEBASTIEN intervention through examination of the pre and post home videos gathered by parents. First, I examined how children's social communication skills and related behavioral problems change pre and post intervention. Second, I investigated the change in quality of interactions between parents and children as measured by the Social Interaction Rating Scales (SIRS; Ruble et al., 2008), a measure designed to measure parent responsiveness. Thus, the proposed research questions:

Research Question 1: What is the effect of the SEBASTIEN intervention on a broader range of social communication patterns and related behaviors of children with autism assessed via structured observations of parent-recorded home videos?

Research Question 2: How does the quality of parent-child interactions as measured by parental behaviors change post-intervention?

Research Question 3: What is the association between children's response to the SEBASTIEN intervention and parent-child interaction quality?

Based on the promising results from the YTP paper as well as the efficacy of SEBASTIEN in addressing YTPs and other autism-related behavioral and social difficulties as measured in the lab setting, I expected that the effects found in the YTP study would be generalizable to broader measures of autism-related behaviors and social communication in the parent-recorded home videos as measured by Independent Evaluators (IEs). Furthermore, I expected to find that the SEBASTIEN condition would be associated with more improvement in parent-child interactions compared with the ESCT condition. Lastly, I expected that given the findings by Danial (2015), as autism-related behavioral and social communication difficulties improve pre- to post- treatment, parental responsiveness would improve accordingly.

These research questions were addressed through examination of the home videos parents recorded prior to and post intervention. The coding process consisted of two home environment measures focused on a broader range of autism-related behavioral and social communication difficulties and quality of parent-child interactions. Coding was conducted for autism-related measures on an interval scale (10-minute increments), allowing for examination of behavioral trends that arise regularly as well as behaviors that tend to arise in specific situations or during social interaction (or lack thereof). Parent-child interaction quality was coded on a two-hour (or length of video) global scale, in order to get a general sense of the rapport between parent and child, and with the aim of observing the parent and child interacting in multiple contexts (e.g., doing homework, having dinner, playing a game). As parents were instructed to record their child performing a variety of activities, the videos provide a variety of scenarios in which coders would be able to view the child's behavior and how it changes depending on the situation. The coder was blind to the treatment or control condition of the participant during coding to ensure that there was no bias influencing the coding process. In addition to centering the environmental context and lived experience of children on the spectrum of their families, this project allows greater insight into the generalizability of promising autism-related interventions such as SEBASTIEN and helps to illuminate the effects of these types of interventions on parent-child relationships.

Method

Table 1	
<i>Participants' Demographic Characteristics</i>	
Measure	<i>n (%)</i>
Child's sex (female)	3/15 (20%)
Child's ethnicity/race:	
Latino/a	2/15 (13%)
Asian/Pacific Islander	2/15 (13%)
White	8/15 (53%)
Mixed/Multiracial	3/15 (20%)
Caucasian, Mexican/Latino, Asian/Taiwanese	1/15 (6.6%)
White/Mexican/American Indian	1/15 (6.6%)
Other	1/15 (6.6%)
Total household income	
<\$40,000	0/15 (0%)
\$50,001-\$89,999	3/15 (20%)
\$90,000+	9/15 (60%)
Declined to state	2/15 (13%)
Primary parent's education	
High school degree or less	0/15 (0%)
4-year college degree or more	0/15 (0%)
Parents currently married	14/15 (93%)
Child's age in months	M=114.93, SD=22.16

Participants

Participants in the original Wood (2021) study included 68 children (59 boys and 9 girls ages 6-13 years old) with a formal diagnosis of autism spectrum disorder (ASD) living in a major metropolitan area of the western United States and were drawn from the sample of the Wood et al. (2021) SEBASTIEN study. Due to various factors (participants failing to return the whole course of videos, technical errors rendering videos unopenable or unwatchable), the total number of participants eligible for inclusion in the final analysis is 30. For the current analysis, 15 participants (whose demographic information is displayed in **Table 1**) were randomly selected from the total 30 and were evenly split between the CBT and ESCT conditions due to time

constraints in coding. Analyses were run in Wood et al. (2021) that confirmed there were no significant pretest or demographic differences from families that completed the full series of video recordings and those who did not, meaning this high attrition rate is likely due to the burden placed upon families to complete a series of two-hour videos for five days a week for two total weeks (one week before treatment and one week after).

Participants were screened for an IQ>85 based on the Weschler Intelligence Scale for Children-IV (WISC-IV; Weschler, 2003) and had to meet criteria for autism based on the Autism Diagnostic Interview-Revised (ADI-R; Le Couteur, Lord, & Rutter, 2003) and the Autism Diagnostic Observation Schedule-Generic (ADOS-G. Lord et al., 2000). Participants had to establish that they had no concurrent psychotic episodes and had to agree to not receive additional treatments beyond what they were already receiving during the course of the study.

Participants were recruited through local medical centers, Regional Centers, schools, and parent support groups. Each family received \$50 for their participation in the lab-based assessments. Participants completed baseline measures and were randomized via a computerized random number generator to either the SEBASTIEN or Enhanced Standard Community Treatment (ESCT; social skills training enhanced with CBT practices) in a parallel study design with a 1:1 allocation ratio. Participants were matched on age, IQ, and ADOS-2 algorithm score. Each participant was recorded by their parent or guardian for two hours a day, for ten days (both five days pre-intervention and five days post-intervention).

Procedure

Eligible participants were invited to UCLA and were subsequently assessed on the ADI-R and the ADOS. If participants met the inclusion criteria stated above, they then proceeded to

participate in a second intake assessment consisting of watching videos, identifying emotions, recalling personal experiences, completing a theory of mind task, and a reward-sensitivity paradigm. During this time, parents were given an iPhone 4 and taught how to use the streaming-video application, “USTREAM”. Once parents had demonstrated proficiency in using this software, they were instructed to record their child for two-hour blocks of time after school for five consecutive school days. Parents were instructed to influence their children’s behavior as little as possible and to proceed with their everyday routines as if the cameras were not present to capture the most accurate picture possible of their family home life. While they were asked to present as naturalistic a picture as possible, they were asked to prevent their child from participating in activities other than electronics for at least some of the time during the two-hour interval.

Parents were asked to provide a contact number in case the lab needed to get in touch with them to correct technical problems. The video was live streamed to the lab and monitored by a staff member on a secure server to quickly address technical issues should they arise. In several instances, video recording devices were knocked over or not connecting, in which case study staff contacted the families via phone and informed them of the issue and talked them through resolving it. If a family forgot the recording session or if the recorded footage was not usable, they were scheduled for a follow-up recording session.

Design

This study utilizes an experimental design. The independent variables are the presence of treatment (CBT or ESCT) and the timepoint (pre- or post-treatment). The dependent variables

are autism-related behavioral and social communication challenges and parent responsiveness. This study examines the association between the implementation of the CBT treatment and changes in autism-related social communication and behavioral problems and parental responsiveness as measured by at-home videos recorded by parents.

Measures

Three measures were utilized by IEs to analyze pre- and post-treatment changes in autism-related behavioral, social, and emotional challenges, parent-child interaction quality, and child engagement in the SEBASTIEN home videos.

Social Interaction Rating Scale

The Social Interaction Rating Scale (*SIRS*; Ruble, McDuffie, King, & Lorenz, 2008) is designed to measure parent affect using a 5-point Likert scale along six measures of parental responsiveness. These measures include Level of Affect, Maintenance of Interaction, Directiveness, Contingency, Initiation, and Level of Movement/Participation. *SIRS* coding uses a global approach, with each *SIRS* parent behavior rated on a 5-point scale of 1-3 at .5 midpoints at the end of each video. The authors of this measure reported a concordance correlation coefficient (CCC) of .85. For the purposes of analysis, the six parental responsiveness scores were summed to give an overall score, with a higher score indicating improved parent-child interaction quality.

Severity of Observed Autism-Related Symptoms (SOARS)

The *SOARS* scale was designed by Dr. John Danial, a previous graduate student in Dr. Jeffrey Wood's lab, for the purposes of the SEBASTIEN project through a review of autism

literature, autism questionnaires, the ADI-R and the ADOS. In the piloting of this measure, the raters achieved a minimum of moderate reliability levels (ICC's >.50; Koo & Li, 2016). This measure includes 22 items of commonly identified problems displayed by children on the autism spectrum. SOARS is coded in 10-minute intervals, with coders adding one point if the behavior occurred during that interval. Each item is coded on a binary 0-1 coding scheme, with 0 indicating that the behavior was not present during that interval, and 1 indicating the behavior was observed. At the end of each interval, the total number of observed behaviors marked '1' is tallied so that each 10-minute interval receives a final global score, which is used in the primary analysis.

Children's Household-Environment Engagement Rating Scale (CHEERS)

CHEERS was specifically designed by Dr. John Danial for this project and was influenced by *Playground Observation of Peer Engagement* (POPE; Kasari et al., 2005). CHEERS is coded to rate a child's social engagement level as well as their activity in two-minute intervals using five possible levels of engagement. Coders piloting this coding system were required to reach adequate reliability levels (ICC's >.5) on practice videos before proceeding to the coding process. These engagement codes include Engaged Cooperatively (engaged with someone else in an activity or full-on conversation), Engaged Non-Cooperatively (child is not participating in a joint activity but still may be responding to questions or talking), Non-Engaged (child is doing a solitary activity but someone else is still in the room), or Engaged Solitary (child is alone). These codes also have homework counterparts (e.g. Engaged Cooperative Homework, Engaged Non-Cooperative Homework, etc.) At each two-minute interval, a single point is given for the state of engagement the coder observes the child in the

majority of the interval. As the intervals are 10 minutes long, the child gains five engagement 'points' by the end of the interval, distributed across these engagement codes. For the purposes of this study, only the Engaged Solitary was used in the primary analyses, since excessive time spent alone without motivation to engage with others falls into the category of autism-related social behaviors being examined pre- to post-treatment.

Rater Training and Reliability

Independent Evaluators (IEs) were trained by coding pre-treatment videos, which had been coded previously by Danial (2015). At the beginning of coding, IEs were encouraged to compare line by line the codes they obtained each interval with the codes Danial (2015) provided for the pre-treatment videos. However, once raters became more confident in their skills, they were encouraged to code entire videos without comparison. Reliability was assessed via ICC ratings throughout the coding process. Once raters achieved an ICC rating of $>.5$ (Koo & Li, 2016) with the previously coded pre-treatment video coders as well as with one another, they were allowed to proceed to coding the post-treatment videos, with occasional returns to pre-treatment video coding to prevent rater reliability drift over time.

Analytic Plan

Hierarchical Linear Modeling (HLM; Raudenbush & Byrk, 2002) using IBM SPSS Statistics (Version 27) was used for the primary analysis. Descriptive statistics and histograms were run and provided for use in the primary analysis. The primary analysis describes pre- to post-treatment changes in the SOARS and CHEERS ratings and the SIRS parental responsiveness ratings in the two intervention conditions (CBT and ESCT).

My hypotheses are as follows:

Hypothesis 1: The effects found in the YTP study will be generalizable to measures of autism-related behaviors and social communication in parent-recorded home videos as measured by Independent Evaluators (IEs).

Hypothesis 2: The SEBASTIEN condition will be associated with more improvement in parent-child interactions compared with the ESCT condition.

Hypothesis 3: As autism-related behavioral and social communication difficulties improve pre- to post-treatment, parental responsiveness will improve accordingly.

To test these hypotheses, Hierarchical Linear Modeling was used for the primary analyses. HLMs are beneficial in that they take into account dependencies in data collected at different times and conditions and nested within each participant (Woltman et al., 2012). For the first research question, HLM models were used to examine the relationship between the intervention condition and autism-related behavioral and social communication items measured by the SOARS as they change from pre- to post-treatment by comparing the frequency of autism-related behavioral and social communication difficulties observed per video both pre and post treatment. The CBT to the ECST conditions were compared to one another in order to ascertain whether the changes observed are significantly different between the two conditions. I also used an HLM model to explore the impact of intervention condition on parental responsiveness as measured by the SIRS from pre- to post-intervention by comparing the average level of parental responsiveness pre- and post-treatment. The HLM models are estimated with fixed effects for treatment condition (Level 2) and time nested within each child (at Level 1). A treatment condition by time interaction was used.

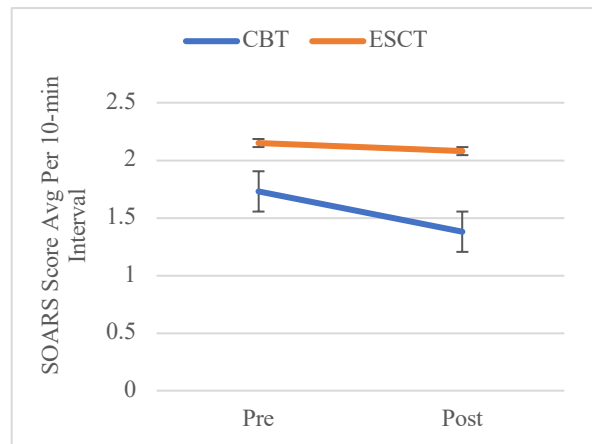
Results

Scale	Pre-Treatment		Post-Treatment	
	CBT	ESCT	CBT	ESCT
Observed SOARS Scores (Avg'd across 5 days and 22 SOARS items)				
<i>M</i>	1.73	2.15	1.38	2.08
<i>SE</i>	.21	.19	.22	.21
Parent 2-h Responsiveness Scores (Avg'd across 5 days and 6 items)				
<i>M</i>	12.20	11.80	13.34	13.23
<i>SE</i>	.44	.40	.57	.52
Observed Solitary Engagement Score (Avg'd across 5 days)				
<i>M</i>	.63	.95	-.09	.23
<i>SE</i>	.22	.20	.23	.21

In the sample of 15 participating families, the effects of the modular CBT intervention alongside the control group ESCT and time were examined to assess sensitivity to treatment for the SOARS broad autism-related challenges, as well as parent-child interaction quality (SIRS). For both the SOARS and the SIRS variables, an HLM model was estimated with fixed effects for treatment condition (at Level 2) and time nested within child (at Level

Figure 1

HLM Model-Based Score Estimates for CBT vs. ESCT on the summed 10-minute interval SOARS measure from pre-treatment to post-treatment



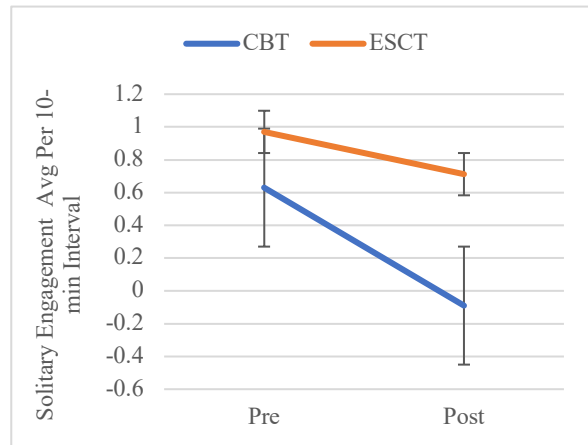
1) a treatment condition by time interaction, and a random intercept. For the SOARS score (an aggregate of the 20 SOARS items), the treatment condition by time interaction was $-.323$ ($SE=.10$, $t = -3.26$, $p < .01$), indicating that the CBT group made significantly greater gains in reducing autism-related behavioral, social, and emotional challenges relative to the ESCT group. The ESCT group made numerical but not statistically significant gains in the SOARS score from pre- to post-treatment.

From pre- to post-treatment, the Solitary Engagement treatment condition by time interaction was $-.72$ ($SE = .09$, $t = -7.6$, $p < .001$). Participants in the CBT condition decreased significantly in time spent alone compared with participants in the ESCT condition.

From pre- to post-treatment, as parent-child quality interaction scores (measured via SIRS) (as demonstrated in **Table 2**), there was a corresponding decrease in the SOARS score ($B = -.12$, $SE = .04$, $p < .01$). This effect was present across both groups. However, improvement in SIRS score was not significantly associated with one condition over another.

Figure 2

HLM Model-Based Score Estimates for CBT vs. ESCT on the Solitary Engagement measure from pre-treatment to post-treatment



Discussion

The examination of the parent-recorded home videos by Independent Evaluators yielded similar results to the Wood et al. (2021) study of YTPs. Scores of autism-related social and behavioral challenges improved significantly in the CBT condition relative to the ESCT

condition. This finding is significant and, through its use of a measure that captures a more widespread and commonly used set of behavioral, social, and emotional difficulties, demonstrates the potential generalizability of the modular CBT intervention to a larger subset of autism-related challenges. Although the modular intervention was designed in such a way that targets specific top parent-identified autism-related challenges, these findings may indicate that even targeting specific behaviors may prove effective in improving aspects of the child's behavior, social skills, and emotional regulation outside of the target areas. For instance, if one of a child's YTPs is that they rarely cooperate the first (or even second or third) time when a parent asks them to begin their homework, and this quality of flexibility improves, it is not surprising that they might display corresponding reductions in tantrums, or a reduction in rude comments. While this finding suggests a more generalized improvement, future research may examine which groups of autism-related challenges covary pre- to post-treatment, and investigate the extent to which a specific observable behavior may be linked to or influence another.

Parent-child interaction quality improved significantly across both groups from pre- to post-treatment, although interestingly, this difference was not observed between groups. There are several reasons why this may be the case—for example, this may be due to the heavy amount of parent-skills training emphasized in the ESCT group. The lack of difference between groups may also be due to the small post-treatment sample size included in this study.

However, greater parent affect was significantly correlated with fewer child autism-related behavioral and social challenges from pre- to post-treatment. This finding lends credence to the Danial (2015) findings at pretreatment and broadens the field's understanding of the potential tangential effects of similar interventions targeting autism-related social and behavioral challenges. The finding that this effect holds constant from pre- to post-treatment—that parent-

child interaction quality improves and does not remain stagnant across time regardless of a child's behavioral improvement—is striking. This indicates that, even if negative patterns have formed in parent-child interactions, there is potential to reform these connections. While these findings cannot posit a causal link between parent-child interaction quality and child autism-related emotional, social, and behavioral challenges, it is not unreasonable to suspect that the two may have a mutual influence on one another that can be utilized in an intervention or treatment setting to mutual improvement.

Another interesting finding that emerged from analysis was that participants in the CBT condition spent significantly less time alone compared with the ESCT condition and compared with their pre-treatment behaviors. This may be due to increased social motivation on the part of the child, but could equally be a result of the parents newly gained strategies in involving their children on the spectrum in family activities, as well as putting restrictions on preferred solitary activities (e.g. watching TV, video games, or playing outside alone). Either explanation is interesting and could be a topic of further exploration in future examinations of this CBT intervention. While this author does not decry alone time for children as a symptom of poor social skills, excessive time alone engaging in a special interest activity (for instance, three hours after school every day where the child does nothing but play video games and ignores their parents whenever they try to interact) may be detrimental to the child's chances to interact with the family, develop social skills, or even cultivate other solitary interests. This also becomes a problem when being forced to miss this activity causes a meltdown, or other negative reactions, even if the shift is just for an hour. Whether this shift is due to the child's response to the intervention, or in parents' implementation of learned strategies, this is a noteworthy effect of the SEBASTIEN intervention.

Implications

The results of this study provided important evidence on the potential generalizability of the CBT intervention designed by Wood et al. (2021). The additional information on how the intervention is affecting children outside of the lab will do much to inform best practices as well as next steps in moving to effectiveness trials for this and similar interventions. The insight on the part of researchers and clinicians into the child's home environment may allow professionals to tailor a more individualized and relevant intervention for the individual child with the use of modular CBT protocols. Furthermore, future interventions can explore home videos as a possible avenue of measuring effectiveness in a more ecologically valid way alongside their in-lab measurements.

The additional examination of parental responsiveness contributes to the field's understanding of the relationship between autism-related behavioral struggles and associations with parent-child interaction quality. While many interventions involve some component of parent training, few interventions focusing on the child's struggles fully take into account the covarying nature of autism-related behavioral, social, and emotional regulation challenges and potential changes in parent-child interaction quality. The awareness of this association may be an important consideration for future researchers in the design of similar interventions.

While these findings may be useful in both informing future research and best practices for clinicians working with youth on the autism spectrum, there are limitations of this study. Attrition is a concern, since the participants were reduced from the study's original 68 to only 30 participants due to the heavy burden placed on parents to return a full five-day course of two-hour videos, as well as technical issues that prevented videos from being correctly recorded.

Additionally, this 30-participant number was further reduced to 15 total participants included in this analysis due to random sampling of participants by the study author to make coding feasible. Furthermore, while Danial (2015) found that IE ratings of autism-related social and behavioral challenges had good convergent validity with parent-reported levels of autism-related behaviors, there are certain limitations to the perspective of anyone evaluating from a relatively small snapshot of a child's life without knowing more context about their home lives, not to mention the potential subtleties missed from the viewpoint of a camera.

Lastly, while this study attempts to frame the areas targeted by the intervention as areas of need or high priorities for the families, the original language used by studies before this one and by the measures used were not developed with this perspective in mind, leading to potential bias on the part of the coders by pathologizing certain behaviors as “autism-related problems” that may also be construed through a certain lens as neutral or even positive behaviors. For instance, repetitive body movements, or stimming, is listed in SOARS as a measure to be counted as an ‘autism-related symptom’, with the implication being that this is a behavior worthy of being targeted for improvement (Danial 2015). However, the emerging neurodiversity movement has brought up the issue that behaviors such as these, while not socially acceptable, may be beneficial to the individual in self-soothing, and has raised the issue that individuals should be able to choose whether they want to engage in such behaviors without intervention (Kapp et al., 2019). This is a worthwhile and interesting argument. Future explorations of this and other CBT interventions have the potential to pivot their lens to a more neurodiverse and inclusive framework. While this process was begun in this paper, there is still a long way to go before the world of autism intervention research aligns with the neurodiversity movement.

Despite the limitations of this study, the findings provide information about CBT interventions for children on the spectrum. Future research in this area may consider incorporating a home environment measure such as parent-recorded home videos or home visits to observe the child. This will enhance both our understanding of the context of the child and the child's individual needs, as well as clarifying the areas the intervention is doing well at addressing and those the intervention needs to focus on more intensely. Furthermore, the examination of parental responsiveness in relation to the improving autism-related behavioral and social communication struggles of children on the spectrum provides an added layer to the intervention, given the importance of the parent-child relationship. While all children rely heavily on their parents, children on the autism spectrum depend even more on their parents for support. For children on the spectrum, parents are often primary advocates, interpreters, and cheerleaders. Any intervention for children on the spectrum should consider the parent-child relationship while addressing the child's behavioral, social, or emotional issues to promote a more holistic, context-rich approach to improving the child's life.

This study provides an important step in considering the contextual validity of interventions for children on the autism spectrum. When conducting outpatient interventions, it is rare for the clinical team to gain a higher understanding of the child's home environment, as well as their behavior when they are not in the presence of researchers. Asking parents to record home videos allows researchers to ascertain the effects of their intervention in a more naturalistic environment and subsequently to glean additional insights into the external validity of the lab-based intervention. In addition to the ability to observe the child out of the lab, these videos give researchers the ability to observe the parents in their daily lives and interactions with their child, without them modulating their behaviors to accommodate for an external setting. As the goal of

intervention research is to create a protocol that is applicable to families and useful in improving the lives of children and their families outside of the lab, this is a crucial step in incorporating the environmental context and lived experience of the participants to guide effectiveness studies as well as future intervention development.

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