

Stimulants, Neuroleptics, and Children's Friendship Training for Children with Fetal Alcohol Spectrum Disorders

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ABSTRACT

Background: Peer relationship problems are a significant part of the clinical presentation of children with Fetal Alcohol Spectrum Disorders (FASD). Many of these children have been prescribed psychotropic medications by community practitioners. The present study reports on the interaction between medication status and parent and teacher-reported outcomes for parent-assisted Children's Friendship Training (CFT).

Methods: Seventy seven children (40 boys and 37 girls, age range was 71–139 months) diagnosed with FASD were given 12 sessions of CFT. Parent- and teacher-reported social outcomes were compared across four subgroups of children who were prescribed either stimulant or neuroleptic medication, neither or both types of medications.

Results: According to parent and teacher reports, children prescribed neuroleptic medication showed greater improvement on all outcome measures when compared to children not prescribed neuroleptics. In contrast, children prescribed stimulant medication either failed to show improvement or showed poorer outcomes when compared to children not prescribed stimulants.

Implications: Children with FASD frequently present with symptoms of inattention and hyperactivity. The present results suggest physicians routinely ask about prenatal alcohol exposure as part of history taking to treat children more effectively who appear to be displaying attention-deficit/hyperactivity disorder symptomatology but who may have FASD.

INTRODUCTION

IN 1996, THE INSTITUTE OF MEDICINE (IOM; Stratton et al. 1996) released a report containing broadly defined diagnostic criteria for Fetal Alcohol Syndrome (FAS), partial FAS, alcohol-related birth defects (ARBD), and alcohol-re-

lated neurodevelopmental disorders (ARND). These diagnostic categories represent a continuum of effects and are subsumed under the term Fetal Alcohol Spectrum Disorders (FASD; Streissguth and O'Malley 2000). It is estimated that, in the United States, about 1 in 100 children born each year has FASD, resulting in

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This research was supported by Centers for Disease Control and Prevention Grant # U84CCU920158 awarded to M. O'Connor.

substantial life-long impairments in neurocognitive and socioemotional development (May and Gossage 2001).

Studies indicate that children with FASD have neurocognitive deficits affecting multiple areas of functioning including hyperactivity, attention deficits, problems in executive functioning, and memory (for review, see Mattson and Riley 1998). Because of these deficits, children with FASD are often diagnosed as having attention-deficit/hyperactivity disorder (ADHD) and are placed on stimulant medications. However, research evidence suggests that children with FASD have different attentional and behavioral profiles from those of children with ADHD (Coles 2001). Available clinical evidence suggests that psychostimulants have variable effects on children with prenatal exposure to alcohol (O'Malley et al. 2002). The only controlled studies published regarding psychostimulant intervention for ADHD symptomatology in patients with FASD obtained mixed results, indicating some improvement in activity level but little improvement in attention (Synder et al. 1997; Oesterheld et al. 1998). No research to date has examined the effect of other psychotropic medications on the activity level and sustained attention of children with FASD. Given that prenatal alcohol exposure is linked to dopamine and noradrenaline neurotransmitter disturbance (Hannigan and Randall 1996; O'Malley and Hagerman 1998), it is reasonable to speculate that neuroleptic medications may be helpful in improving the behavior of these children.

One area of behavioral functioning that is particularly difficult for children with prenatal alcohol exposure is the development of positive peer relationships. Clinical reports have described children with FASD as showing poor social judgment and failure to consider the consequences of their actions. Additionally, problems understanding social cues, indiscriminant social behavior, and difficulty communicating in social contexts are reported (Streissguth 1997). Both caregivers (Roebuck et al. 1999) and teachers (Brown et al. 1991) have rated children with prenatal alcohol exposure as having poorer social skills than unexposed children, even after controlling for differences

in cognitive functioning (Thomas et al. 1998; Whaley et al. 2001). Furthermore, studies of adolescents and adults with FASD indicate that social skills deficits continue into adulthood (LaDue et al. 1992; Carmichael-Olson et al. 1998a; Carmichael-Olson et al. 1998b) and thus represent a particularly important area for early intervention. It has been speculated that impaired social development is likely related to primary neurocognitive and behavioral difficulties experienced by individuals with FASD, and therefore may be helped with the combination of behavioral and pharmacologic interventions.

Social skills training programs are designed to improve the skills of children with learning disorders, ADHD, or Autism Spectrum Disorders who are rejected by their peers. The most common intervention setting has been the child's school. However, results of social skills training have not been encouraging. Forness and Kavale (1996) in a meta-analysis of social skills programs, found that the mean effect size [effect size = (Treatment group mean—Control group mean) / Control group S.D.] for all studies was 0.199. Effect sizes were similar in a recent meta-analysis of children with high incidence developmental disabilities (for review, see Gresham et al. 2001). Researchers do not find compelling evidence that social skills learned in treatment generalize to the home, classroom, or playground (DuPaul and Eckert 1994).

One reason for the failure of social skills to generalize to naturalistic settings may be because most treatments do not include parents in the social skills training programs (Ladd and Asher 1985; Budd 1986; Sheridan et al. 1996). It is reasonable to expect that such involvement would enhance treatment generalization, especially because parents typically play a large role in scheduling and supervising children's play experiences (Ladd et al. 1992; Lollis et al. 1992; Frankel 1996). Available evidence suggests that parent involvement is essential in helping children develop positive peer relationships (Parke et al. 1994). For example, young children exhibit higher rates of cooperation, turn taking, and longer play encounters when actively supervised by an adult than when playing without assistance (Bhav-

nagri and Parke 1991). Children whose parents arrange contact with peers have more consistent play partners outside of school than children of parents who are less active in initiating peer contacts (Ladd and Hart 1991; Ladd et al. 1992; Frankel et al. 1997a; Frankel et al. 1997b). Treatment facilitated by parents is especially important for children with FASD to help them to generalize skills learned to naturalistic settings. Clinical reports from parents reveal that these children often have poor strategies for entering and maintaining successful play interactions. Problems in impulse control and low frustration tolerance make it difficult for them to ignore teasing and avoid conflict situations (Streissguth and O'Malley 2000).

In contrast to many social skills training programs, work by Frankel and colleagues (Frankel et al. 1995a; Frankel et al. 1995b; Frankel et al. 1997b; Frankel 2005) has demonstrated that a social skills program that included concurrent parent sessions (Children's Friendship Training, CFT) resulted in significant treatment gains reported by parents and generalization to the school setting for children with and without ADHD. In a recent controlled study, parent report scales for children with FASD revealed that children receiving CFT showed significant improvement on both social skills scores and problem behavior scores when compared to a delayed treatment group. Children in the CFT group continued to improve on both measures during a 16 week follow-up period (O'Connor et al., 2006).

Hypotheses

It was hypothesized that: (1) Currently prescribed psychotropic medication would moderate the outcome of CFT for children with FASD, as reported by teachers and parents, and (2) outcome would be influenced differently by type of psychotropic medication.

METHODS

Prior to the initiation of the study, the University of California–Los Angeles (UCLA) and the Centers for Disease Control and Prevention Institutional Review Boards approved all

procedures, and a Certificate of Confidentiality was obtained from the National Institute of Alcohol Abuse and Alcoholism. Subjects were recruited through letters mailed to local health-care providers (e.g., pediatricians, psychologists) and community agencies (e.g., YMCA, schools) and flyers posted within the Medical Center and the community. Interested families contacted the project coordinator, who conducted a screening interview by telephone to determine initial eligibility. Informed consent was obtained from the parent(s) and assent was obtained from children 7 years of age or older.

FASD diagnosis

Every child received a physical examination to assess for the presence of the diagnostic features of FASD using the Diagnostic Guide for Fetal Alcohol Syndrome and Related Conditions (Astley and Clarren 1999; Astley 2004). This system uses a four-digit diagnostic code reflecting the magnitude of expression of four key diagnostic features of FAS: (1) Growth deficiency; (2) the FAS facial phenotype, including short palpebral fissures, flat philtrum, and thin upper lip; (3) central nervous system (CNS) dysfunction; and (4) gestational alcohol exposure. Using the four-digit diagnostic code, the magnitude of expression of each feature was ranked independently on a four-point Likert scale with 1 reflecting complete absence of the FAS feature and 4 reflecting the full manifestation of the feature. The study child psychiatrist administered this examination after achieving reliability with the senior study clinician who was trained by Astley and Clarren.

History regarding prenatal alcohol exposure was obtained from the biological mothers using the Health Interview for Women (O'Connor et al. 2002) and/or through collateral reports by caregivers who had observed the biological mother drinking during pregnancy. The interview yields standard alcohol measures of average number of drinks per drinking occasion, maximum drinks per occasion, and the frequency of both. One drink was considered to be 0.60 ounces of absolute alcohol. All alcohol levels obtained were consid-

ered estimates of actual exposure because they were based on maternal self-report. Criteria for alcohol exposure was ≥ 7 drinks per week or ≥ 3 drinks per drinking occasion. In a recent study by Barr and Streissguth (2001), a cut point of ≥ 7 drinks/week had 100% sensitivity and 83% specificity for diagnosis of FASD.

Medical or legal records documenting known exposure were obtained for adopted and foster children. Although detailed information regarding exact quantity and frequency of maternal alcohol use was not always available from the records, the records did provide sufficient information that documented the child's exposure to maternal drinking during pregnancy. Examples of such documentation included medical records that indicated the biological mother was intoxicated at delivery, or records indicating that the mother was observed to drink heavily during pregnancy by a reliable collateral source (i.e., grandparent, spouse). Because many children with prenatal alcohol exposure are either adopted or in foster care, it is often necessary to rely on such records to assess the child's history of exposure (CDC, 2002). On the basis of documentation obtained for study subjects, all children except for three were assigned ratings of 3 ("some risk") or 4 ("high risk") in the prenatal alcohol exposure category.

After the four-digit code for each subject was calculated, the code was converted to fit the IOM diagnostic criteria according to the guidelines developed by Astley (personal communication). Using this conversion, 7 children were diagnosed with FAS, 37 with partial FAS, and 33 with ARND. No child met criteria for ARBD.

Medication status

Thirty five children were not prescribed any medication throughout the study. Forty two children entered the study and were prescribed a wide variety of medications by community physicians. Because of this, children were grouped together by class of psychotropic medication prescribed, with some children prescribed more than one medication. Twenty eight children were prescribed stimulants, 13 were prescribed neuroleptics, 10 were prescribed an-

tidepressants, 8 were prescribed nonstimulant medications commonly used to treat ADHD, and 4 were prescribed mood stabilizers. Because there were only 4 subjects prescribed mood stabilizers, the effects of this type of medication could not be assessed and the subjects were deleted from further analyses.

Eligibility measures

Children had to score -1 standard deviation below the mean on the Socialization Scale of the Vineland Adaptive Behavior Scales, Survey Form (VABS); Sparrow et al. 1984) to qualify for the study. The VABS was designed to be used for individuals from birth through 18 years, 11 months, to measure the parent's assessment of adaptive functioning in communication and self-help, social, and motor skills. For children 6 years and older, the motor scale is not scored. The median split-half coefficient for the Socialization Scale is 0.89 for 6–12 year olds and test retest reliability is 0.89.

The Kaufman Brief Intelligence Test (K-BIT) is a brief, individually administered measure of verbal and nonverbal intelligence (Kaufman and Kaufman 1990). The test is composed of two subtests: Vocabulary and Matrices. The Vocabulary subtest was used as an eligibility criterion to ensure that study subjects could understand the verbal components of the treatment. The split-half reliability coefficients for the Vocabulary IQ score for children aged 6 to 12 averages 0.91 with test retest reliability of 0.86 and construct validity with the Wechsler Intelligence Scale for Children-Revised of 0.78. Only children with Vocabulary IQ scores of ≥ 70 were included in the study. On the basis of research reported by Sampson et al. (2000) on the IQ score distribution of a large sample of children with prenatal alcohol exposure, this cut point would allow 73% of children with FAS and 91% of children with Partial FAS and ARND to participate in the study.

The Alcohol Use Disorders Identification Test (AUDIT) was used to assess the high-risk drinking status of parents or caregivers desiring participation in the study. The AUDIT was developed by the World Health Organization to identify problem drinkers in primary care settings (Babor et al. 1989). The AUDIT con-

tains 10 items and has been shown to have high sensitivity and specificity (with a weighted score >8) in a six-nation validation trial using heavy drinking as the criterion (Saunders et al., 1993). No parent in the study attained a score of >8 on the AUDIT.

Outcome measures

The Social Skills Rating System (SSRS; Gresham and Elliott 1990) is a questionnaire consisting of 55 items rated as either "Never," "Sometimes," or "Very often." Social skills were evaluated with the parent and teacher forms. The parent form was completed by the child's primary caregiver. Among the seven scales that compose this instrument, only Assertion, Self-Control, and Problem Behavior scales measure attributes relevant to friendships. The Assertion scale measures making friends and playing well with them, (e.g., "Makes friends easily."). The Self-Control scale measures appropriate response to provocation by others (e.g., "Responds appropriately when hit or pushed by other children."). Lower scores on these scales represent poorer functioning. The Problem Behaviors scale measures internalizing, externalizing, and hyperactivity. Higher scores on the Problem Behavior scale represent greater problem behaviors. The SSRS has high criterion related

validity, correlating significantly with other established measures of child social and problem behaviors (Gresham and Elliott 1990). The SSRS has high internal consistency (Cronbach's $\alpha = 0.87-0.94$) and test-retest reliability for parent (0.65-0.87) and teacher (0.84-0.87) ratings. Mean raw baseline scores for the scales are presented in Table 1.

Participants

Subjects were recruited over a 2-year period from February, 2003, to February, 2005. Children were not admitted to the study if they had medical conditions that might preclude study participation, major sensory or motor deficits, or a diagnosis of pervasive developmental disorder. Recruitment efforts yielded 126 children who met initial eligibility requirements. Failure to meet initial eligibility requirements included alcohol exposure levels too low, no reliable documentation of alcohol exposure, or a previous diagnosis of mental retardation or a pervasive developmental disorder. Of the 126 children who were scheduled for final eligibility, 20 families failed to keep their appointments. These families did not differ from the final sample families on variables of child age, gender, or ethnicity. Of the 106 who came in for final eligibility assessment, 6 children were deemed ineligible for participation. Of the 100

TABLE 1. DEMOGRAPHIC CHARACTERISTICS (STANDARD DEVIATIONS) AND BASELINE RAW SCORES FOR EACH GROUP

Group:	Neither	Neuroleptics	Stimulants	Both	P _{neur}	P _{stim}
n:	43	6	21	7		
Demographics						
Number of boys	23	4	9	4	NS	NS
Child age in months	101.7 (19.2)	107.3 (23.2)	101.1 (16.8)	114.1 (15.7)	NS	NS
Number of children in the home	2.3 (1.3)	2.0 (1.1)	2.2 (1.2)	2.3 (1.3)	NS	NS
Number of years of education	12.2 (2.7)	12.1 (1.2)	11.9 (1.8)	12.1 (1.2)	NS	NS
Number of sessions attended	10.4 (1.5)	10.5 (1.4)	10.6 (1.5)	10.9 (1.1)	NS	NS
KBIT Composite IQ	95.4 (16.3)	104.5 (8.2)	100.9 (11.4)	97.4 (19.5)	NS	NS
Vineland Social Age (months)	63.0 (12.6)	65.8 (10.5)	64.0 (11.9)	69.1 (15.5)	NS	NS
Parent SSRS						
Self-control	9.8 (3.5)	6.5 (3.6)	7.4 (3.8)	6.1 (2.8)	<.05	NS
Assertion	12.0 (3.6)	10.3 (2.0)	11.5 (3.0)	12.3 (1.8)	NS	NS
Problem Behaviors	19.7 (6.1)	25.8 (2.4)	22.7 (6.1)	29.9 (2.9)	<0.0005	0.05
Teacher SSRS						
Self-control	11.7 (4.4)	9.3 (2.9)	10.3 (3.4)	10.9 (4.8)	NS	NS
Assertion	10.9 (3.2)	10.7 (2.9)	9.9 (3.3)	11.6 (5.5)	NS	NS
Problem Behaviors	14.5 (7.7)	19.5 (5.7)	15.5 (7.7)	15.9 (9.4)	NS	NS

NS = not significant; KBIT = Kaufman Brief Intelligence Test; SSRS = Social Skills Rating System.

eligible children, 81 completed all phases of the study, including at least seven sessions of the intervention. As mentioned above, the 4 subjects prescribed mood stabilizers were not included in final analyses. In all, 77 children composed the final sample, 46 children received CFT immediately, and 31 children, in the delayed condition, received CFT after a 3-month waiting period. There were 40 boys and 37 girls in the final sample. The 23 subjects who began the study but were not included in the analyses favored no medication status.

Procedures

Each consecutive set of eligible children formed a cohort. After completing all pretreatment assessments, the children within a cohort were randomly assigned to one of the two study conditions CFT or Delayed CFT, with an attempt to equate groups across cohorts on gender and ethnicity. In addition, families having two children in the study were allowed to have both children in the same condition ($n = 8$ in immediate CFT and $n = 4$ in delayed CFT). Each cohort averaged approximately 7–8 children in each condition. Subjects received 12 sessions, 90 minutes in length, delivered over the course of 12 weeks. Parents attended separate concurrent sessions in which they were instructed on advocacy issues related to FASD (first 30 minutes) and on key social skills being taught to their children (CFT for the last 60 minutes). On completion of the 12-week intervention, subjects completed a post treatment assessment. The results of the between group comparison are reported elsewhere (O'Connor et al., 2006).

CFT procedure

CFT has been described in detail in Frankel and Myatt (2003). Content included how to have a two-way conversation, how to join other children at play, how to be a good sport, how to be a good host on a play date, and how to handle being teased. Several modifications were made to adapt the program to children with FASD, taking into consideration their problems in memory, language comprehension, and executive functioning, and are described in more detail elsewhere (Laugeson et

al., submitted). The following briefly describes this manualized intervention.

Each child session was composed of four segments. During the first segment children reported the results of the homework assignment given in the previous session. The second segment consisted of a didactic presentation, behavioral rehearsal between children, and coaching in the classroom. The third segment consisted of coached play. In the fourth segment, parents and children were reunited and contracts for homework were finalized.

During the didactic part of each session, subjects were given stars on the blackboard and verbal reinforcement for quietly listening in seat, raising hands before talking, and class participation. During coached play, coaches dispensed token and verbal reinforcement immediately after instances of good sportsmanship and demonstrated mastery of the social skills being taught. Coaches also provided consequences for misbehavior.

Parent sessions

Session 1 was devoted to goals and limitations of the program (with an accompanying handout) and arrangements for calling other class members. Sessions 2–11 were broken into four segments. During the first segment, the session leader reviewed parent and child performance on the previous socialization homework assignment and discussed any barriers to implementation. During the next segment, the parent handout was read with the parents and relevant questions were answered. In the third segment, the next socialization homework was assigned. During the last 10 minutes of each session, parent and child were reunited and contracts were made between them for completion of the next socialization homework assignment.

Therapist training

Group leaders (5 clinical psychology interns) were instructed about the challenges faced by children with FASD. Using the manual developed by Frankel and Myatt (2003), the CFT training began with didactic instruction on the developmental literature on children's friendships, the theoretical and empirical rationale

underlying the treatment protocol, and a review of the elements of the CFT. Next, group leaders learned how to apply specifically the CFT protocol to assist children with FASD, taking into account the children's primary neurocognitive deficits. Group leaders were integrated into the delivery of the treatment by assisting more experienced group leaders. Group leaders subsequently delivered either the child or parent component of the treatment.

Treatment fidelity

Treatment fidelity was insured in three ways, suggested by the guidelines of Moncher and Prinz (1991): (1) As indicated above, the study employed trained and qualified group leaders, (2) a standardized manual (Frankel and Myatt 2003), with adaptations for children with FASD was adhered to, and (3) group leaders met weekly with the study investigators for supervision to discuss issues that arose during the treatment sessions. Fidelity checklists covering the primary content of the protocol were created for each treatment session.

Undergraduate psychology students served as coders and coded all sessions live. If a group leader failed to cover any primary content, the coder reminded them during the sessions. Using this method, no substantial deviations from the treatment protocol were noted.

Statistical approach

Baseline and change scores for all variables were evaluated using two-tailed tests. Mean values and their standard deviation (SD) were provided as descriptive statistics. All statistical analyses were performed using SAS (version 6.12; SAS Institute Inc, Cary NC). Newman-Kuels *post hoc* statistics were used to test mean cell differences for statistically significant interactions (Winer 1971).

RESULTS

Preliminary analyses

Twenty eight subjects were prescribed stimulants (amphetamine salts, $n = 7$; ampheta-

mine salts XR, $n = 4$; methylphenidate, $n = 2$; methylphenidate XR, $n = 8$; methylphenidate and methylphenidate XR, $n = 2$; methylphenidate extended release, $n = 4$; dextroamphetamine sulfate, $n = 1$), 13 were prescribed neuroleptics (risperdone, $n = 11$; olanzapine, $n = 2$); 10 were prescribed antidepressants (paroxetine, $n = 2$; fluoxetine, $n = 3$; mirtazapine, $n = 2$; sertraline, $n = 2$ and imipramine, $n = 1$); 8 were prescribed nonstimulant medications commonly used to treat ADHD (clonidine, $n = 2$; atomoxetine, $n = 4$; guanfacine, $n = 2$), and 4 were prescribed mood stabilizers (Carbatrol, $n = 1$; lithium carbonate, $n = 3$). Because the added effects of mood stabilizers could not be assessed (many cells were 0) these subjects were deleted from analyses.

Preliminary analysis to examine the association between medication and treatment outcome employed all four classes of remaining medications in a $2 \times 2 \times 2 \times 2$ fixed-effects analysis of variance (ANOVA). The absence or presence of antidepressants or nonstimulant medications for ADHD did not produce statistically significant main effects or interactions with other variables. Removing subjects prescribed these medications did not alter the direction of effects but substantially decreased the cell n values and left some cells at 0. Therefore, these classes of medication were not included as factors in the foregoing analyses, but subjects prescribed these medications remained in the analyses (since some were also prescribed stimulant or neuroleptic medication). Preliminary analyses that included child gender or treatment delay as a factor did not yield any significant main effects or interactions. Therefore these factors were also not included in the final analysis. The final analysis included presence\absence of stimulant and neuroleptic medications as 2×2 fixed-effects ANOVAs.

Demographic and baseline measures

Table 1 presents the mean demographic characteristics and baseline means for all outcome variables for each medication factor. Overall mean child age was 103.1 months and ranged from 101.1 months for the subjects prescribed stimulants without neuroleptics to

107.3 for the subjects prescribed neuroleptics without stimulants. The mean KBIT IQ was 97.7, ranging from 95.4 for subjects prescribed neither stimulants nor neuroleptics to 104.5 for the subjects prescribed neuroleptics without stimulants. The mean VABS social age was 64.0 months, ranging from 63.0 for subjects prescribed neither stimulants nor neuroleptics to 69.1 for the subjects prescribed both medications. Caretakers completed a mean of 12.1 years of education (range: 11.9 for subjects prescribed stimulants without neuroleptics to 12.2 for children prescribed neither medication) and attended a mean of 10.5 sessions (range: 10.4 for children prescribed neither medication to 10.9 for the subjects prescribed both medications). The ethnic composition of children was 43 white non-Hispanic, 12 Black, non-Hispanic, 1 Asian, 16 Hispanic, 2 Native American, and 3 other.

Two-way 2×2 (Stimulant \times Neuroleptic) fixed-effects ANOVAs, using the presence or absence of prescribed neuroleptics and/or stimulants as the two factors, failed to reveal any significant effects of child age, years of education for the caretaker, number of children in the home, VABS social age, KBIT IQ, or number of sessions attended ($p > 0.17$). Chi-square analyses failed to find significant effects of medication status with respect to the distribution of gender, biological mothers, single mothers, non-white caregivers, or subjects placed in special education classes ($p > 0.5$).

Means for parent- and teacher-rated social skills for each medication group are also presented in Table 1. Inspection of means for parent-reported scales indicate that Problem Behavior means were above the 98th percentile (Neuroleptics and Both conditions), the 93rd percentile (Stimulants condition), or the 84th percentile (Neither condition). Means for parent-reported Self Control were below average (Neuroleptics, Stimulants, and Both conditions) or average (Neither condition). Means for parent-reported Assertion were below average for all conditions. Inspection of teacher-reported scales indicated that Problem Behavior means were at the 79th percentile (Stimulants and Both conditions), the 78th percentile (Neuroleptics condition), or at the 75th percentile (Neither condition). Means for

teacher-reported Self-control and Assertion were in the average range for all conditions (Gresham and Elliot 1990).

Two-way 2×2 (Neuroleptic \times Stimulant) fixed-effects ANOVAs were also performed on baseline values of all outcome variables, using the presence or absence of prescribed neuroleptics and/or stimulants as the two factors. Inspection of Table 1 reveals that only three of the 12 main effects reached statistical significance. The main effect for neuroleptics reached significance for parent-reported Self-control [$F(1,73) = 4.43, p < 0.05$]. This indicated that the mean on this scale for subjects prescribed neuroleptics (9.0) was significantly lower than for subjects not prescribed neuroleptics (6.0). The main effect of parent-reported Problem Behaviors was marginally significant [$F(1,73) = 3.89, p = 0.05$], suggesting a trend toward more problem behaviors in subjects prescribed neuroleptics (28.0 for subjects prescribed neuroleptics versus 20.7 for subjects not prescribed neuroleptics). The main effect for stimulants was highly significant for Problem Behaviors [$F(1,73) = 14.17, p < 0.0005$], indicating more problem behaviors for subjects prescribed stimulants (24.5 for subjects prescribed stimulants versus 20.5 for subjects not prescribed stimulants). No other main effects or interactions reached significance for baseline outcome variables ($p > 0.20$).

Outcome analysis

To simplify presentation and take into account baseline differences, difference scores were used for all outcome measures. The difference scores were computed so that positive scores always indicated improvement (computed as post-test – baseline scores for Self-control and Assertion and baseline – post-test scores for Problem Behaviors). Outcome variables were submitted to 2×2 (Neuroleptic \times Stimulant) fixed-effects ANOVAs. Tables 2 and 3 present the results of these analyses.

Inspection of Table 2 reveals that children prescribed neuroleptics showed significantly greater improvement after 12 weeks of CFT on four of six outcome variables: parent-reported Self-control [$F(1,73) = 10.52, p < 0.005$], Assertion [$F(1,73) = 8.79, p < 0.005$], Problem Be-

TABLE 2. MEAN DIFFERENCE SCORES (STANDARD DEVIATIONS) FOR SIGNIFICANT MAIN EFFECTS ON PARENT AND TEACHER SCALES

<i>Neuroleptic medication:</i>			
<i>n:</i>	<i>Absent</i> 64	<i>Present</i> 13	<i>p</i>
Parent Self-control	+1.1 (3.2)	+4.5 (3.8)	<0.005
Parent Assertion	+1.1 (3.0)	+3.8 (4.1)	<0.005
Parent Problem Behaviors	+1.9 (5.4)	+5.2 (4.5)	<0.05
Teacher Self-control	-0.1 (3.7)	+2.9 (4.5)	<0.05
Teacher Assertion	-0.6 (3.5)	+1.5 (5.0)	=0.05
<i>Stimulant medication:</i>			
<i>n:</i>	<i>Absent</i> 49	<i>Present</i> 28	<i>p</i>
Teacher Problem Behaviors	+1.0 (4.7)	-0.6 (5.9)	<0.05

aviors [$F(1,73) = 4.36, p < 0.05$], and teacher-reported Self-control [$F(1,73) = 6.66, p < 0.05$]. The advantage of being prescribed neuroleptics was marginally significant for teacher-reported Assertion [$F(1,73) = 3.81, p = 0.05$]. In contrast, being prescribed stimulants was not associated with significant advantage on any outcome measure but was associated with significantly worse outcome on teacher-reported Problem Behaviors [$F(1,73) = 5.72, p < 0.05$].

However these results were more complex for two outcome variables, which are presented in Table 3. The Neuroleptic \times Stimulant interaction was significant for parent-reported Self-control [$F(1,73) = 4.13, p < 0.05$] and teacher-reported Problem Behaviors [$F(1,73) = 4.12, p < 0.05$]. Interactions were further analyzed using Newman-Kuels *post hoc* tests. Results indicated that parent-reported Self-control improved most when neuroleptics alone were prescribed than when both neuroleptics and stimulants were prescribed to-

gether ($q_2 = 6.33, p < 0.01$), which resulted in greater improvement than when stimulants were prescribed alone ($q_2 = 3.31, p < 0.05$), which was greater than when neither medication was prescribed ($q_2 = 4.68, p < 0.01$). *Post hoc* tests of teacher-reported Problem Behaviors confirmed that the best outcome occurred when neuroleptics were used alone ($q_2 = 8.3, p < 0.01$), and the worst outcome was when both stimulants and neuroleptics were prescribed together ($q_3 = 3.6, p < 0.05$). Outcome for children prescribed stimulants alone or neither medication did not differ significantly from each other.

DISCUSSION

The present study was intended to assess the role of community psychopharmacological management of children with FASD in moderating treatment outcome for CFT. Previous research has found positive synergistic effects of stimulants upon treatment outcome of children with ADHD participating in CFT (Frankel 1995a). Other findings have pointed to negative effects of medication upon outcome of CFT of children with Autism Spectrum Disorders (Frankel, in press). However, to our knowledge, the present study is the first to examine the interaction between medication type and an empirically validated, manualized social skills intervention on treatment outcome for children with FASD. Results revealed that children prescribed neuroleptic medication by community physicians showed significantly greater improvement on virtually every parent- and teacher-rated scale reported in this study. The effects of stimulant medication, which was the single most common type of medication prescribed for children with FASD,

TABLE 3. MEAN DIFFERENCE SCORES (STANDARD DEVIATIONS) FOR SIGNIFICANT INTERACTIONS ON PARENT AND TEACHER SCALES

<i>Group:</i>	<i>Neither</i>	<i>Neuroleptics</i>	<i>Stimulants</i>	<i>Both</i>	<i>P_{ns}</i>
<i>n:</i>	43	6	21	7	
Parent Self-control	+0.5 (3.2)	+5.7 (2.4)	+2.2 (2.8)	+3.4 (4.6)	<0.05
Teacher Problem Behaviors	+0.4 ^a (4.1)	+5.2 (6.7)	-0.2 ^a (6.0)	-1.7 (5.7)	<0.05

^aMeans were not significantly different.

either failed to reach significance, or when reaching significance was associated with poorer outcome. This was found when stimulants were used alone or in combination with neuroleptics.

Limitations

It could be argued that part of these effects were due to higher mean baseline values for the children prescribed neuroleptics and thus attributable to ceiling or floor effects. However, this applied only to three of six outcome measures, and mean values at baseline generally hovered around the lower ranges of the scales.

Another limitation of the present study was that information regarding dosing of medication was not obtained and that the children were prescribed medication by their own private physicians prior to beginning the intervention. Previous research (Firestone 1982) indicated that parents tend to decrease administration of prescribed stimulants as time elapses from the prescribing visit. However, all parents of subjects in the present study indicated that medication was administered as prescribed. Parent report seemed to be reliable in this regard, because study staff was not associated with the prescribing physician and parents lacked motivation to distort these reports. However, study investigators did not formally verify medication compliance or verify that the prescribed dosage was optimal (e.g., by teacher checklist), in terms of the best therapeutic response for each child. However, there are no checklists developed specifically for children with FASD. To be clinically useful, a checklist must focus upon core symptoms of FASD. Checklists developed for children with ADHD may not be adequate for this purpose, because research has identified components of attention and behavior unique to children with FASD (Coles 2001). Future research should explore this issue and determine if there is an optimal dosage of neuroleptics to produce beneficial effects of social skills training for this population of children.

Finally, the unavailability of peer sociometric assessment to assess more directly peer ac-

ceptance made it difficult to judge how improvements in teacher-reported measures translated to better peer acceptance. Collection of peer sociometrics might enable a clearer interpretation of the effect of medication upon outcome.

CONCLUSIONS

In a previous study (O'Connor et al., 2006), it was reported that children with FASD receiving CFT exhibited improved social skills compared to a delayed treatment group. The present results suggest that the efficacy of this program may be further enhanced by the use of neuroleptic medication with these children. In contrast, the results suggest that stimulant medication may have limited usefulness in facilitating the social skills treatment of children with FASD. The results of this study suggest that physicians should routinely ask about prenatal alcohol exposure as part of their regular and customary history taking to treat more effectively children who appear to be displaying ADHD symptomatology but who may also have FASD (cf. Sokol et al. 2003).

DISCLOSURES

Drs. Fred Frankel, Blair Paley, Renee Marquardt, and Mary O'Connor have no conflicts of interest or financial ties to disclose.

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