



ORIGINAL ARTICLE

# Treatment effects of combining social skill training and parent training in Taiwanese children with attention deficit hyperactivity disorder



Yu-Hsin Huang<sup>a,b,c,f</sup>, Chao-Ying Chung<sup>b</sup>, Hsing-Yi Ou<sup>b</sup>, Ruu-Fen Tzang<sup>b,c</sup>, Kuo-Yang Huang<sup>d</sup>, Hui-Ching Liu<sup>b,f</sup>, Fang-Ju Sun<sup>c,e</sup>, Shu-Chin Chen<sup>f</sup>, Yi-Ju Pan<sup>g</sup>, Shen-Ing Liu<sup>a,b,c,e,f,\*</sup>

<sup>a</sup> Department of Medicine, Mackay Medical College, Taipei, Taiwan

<sup>b</sup> Department of Psychiatry, Mackay Memorial Hospital, Taipei, Taiwan

<sup>c</sup> Mackay Medicine, Nursing and Management College, Taipei, Taiwan

<sup>d</sup> Department of Psychiatry, Taiwan Adventist Hospital, Taipei, Taiwan

<sup>e</sup> Department of Medical Research, Mackay Memorial Hospital, Taipei, Taiwan

<sup>f</sup> Suicide Prevention Center, Mackay Memorial Hospital, Taipei, Taiwan

<sup>g</sup> Department of Psychiatry, Far Eastern Memorial Hospital, Taipei, Taiwan

Received 2 May 2012; received in revised form 14 August 2012; accepted 30 October 2012

## KEYWORDS

attention-deficit disorder with hyperactivity; behavior therapy; child; combined modality therapy; group psychotherapy

**Background/Purpose:** Children with attention-deficit/hyperactivity disorder (ADHD) often have problems in social interactions. We investigated the social and behavioral effects of providing both social skill training and parent training to school-aged children with ADHD in Taiwan.

**Methods:** Seven consecutive 8-week behavioral-based social skill training (SST) group sessions were held for 48 children with ADHD; parallel 8-week parent group sessions were provided simultaneously. Fifty-five children with ADHD were recruited as a control group. All children took medication as prescribed by their doctors. The effects were assessed using the teacher and parent version of the Chinese version of Swanson, Nolan, and Pelham, version IV scale (SNAP-IV), the Chinese version of the Child Behavior Check List (CBCL-C), child and teacher version of the modified Social Skill Rating System (SSRS-C and SSRS-T), at baseline, post-treatment, and 4 months from baseline. The doses of methylphenidate and drug compliance were controlled during the analysis.

\* Corresponding author. Department of Psychiatry, Mackay Memorial Hospital, Number 92, Chung-Shan North Road, Section 2, Taipei 10449, Taiwan.

E-mail address: [maryliuyip@gmail.com](mailto:maryliuyip@gmail.com) (S.-I. Liu).

**Results:** The mixed-effects model demonstrated the main effect of group sessions on the Oppositional subscale of SNAP-P, the Anxious/Depressed subscale of CBCL-C, the Self Control subscale of SSRS-C, and the Active Participation subscale of SSRS-T, all in favor of the experimental group. However, the improvement on the Oppositional subscale of SNAP-P and the Self Control subscale of SSRS-C were noted only between baseline and post-treatment period and were not sustained at the end of the follow-up period.

**Conclusion:** Our study demonstrated that children with ADHD could benefit from this low intensity psychosocial program, although some improvements were not maintained at follow-up assessment.

Copyright © 2012, Elsevier Taiwan LLC & Formosan Medical Association. All rights reserved.

## Introduction

Children with attention-deficit/hyperactivity disorder (ADHD) often have problems in social interactions with peers, and suffer from peer rejection and social isolation.<sup>1,2</sup> Their problems include frequent shifts in conversation, not listening to others, initiating conversations at inappropriate times, and clowning around. In addition, they display noisy and rule-violating behavior making them at risk of social rejection.<sup>2</sup> The social problems in children with ADHD are still highly prominent in adolescence.<sup>3</sup> In general, social impairment is a significant predictor of an adverse long-term outcome in adolescence.<sup>4</sup>

Social skills training (SST) has been proven to be effective in aggressive and antisocial children.<sup>5</sup> Recent studies have shown some positive effects of SST in children with ADHD,<sup>6–10</sup> two of which were randomized-controlled studies.<sup>8,10</sup> In addition, sustained improvement with behavior treatment was observed in the National Institute of Mental Health (NIMH) Collaborative Multisite Multimodal Treatment Study (MTA).<sup>11</sup> However, another randomized-controlled trial found that a combination of medication and psychosocial treatment did not lead to superior functioning compared to medication alone.<sup>12</sup>

In Taiwan, the prevalence of ADHD is around 7.5% of the school-aged population.<sup>13</sup> Previous studies in Taiwan have shown the benefits of group therapy in school-aged children<sup>14</sup> and behavioral parent training in preschool-aged children with ADHD.<sup>15</sup> The aim of this study was to investigate the treatment effects on social skills and behavior problems after providing both social skill training group sessions and parent training group sessions for school-aged children with ADHD in Taiwan.

## Materials and methods

### Criteria for subject participation

This study was approved by the Human Investigations Committee of the hospital. The study included boys and girls, aged 7–10 years in grades 1–4, who met the criteria for ADHD. Diagnosis was confirmed by board-certified child psychiatrists using the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision, (DSM-IV-TR, 2000)*.<sup>16</sup> Children with autism and mental retardation were excluded. Both parents and children signed informed consent forms.

## Intervention

Seven consecutive 8-week behavioral-based SST group sessions were held for 45 children with ADHD from November 2007 to November 2008. The patients were either referred or responded through advertisements. At least one of the parents of each of the 45 children attended a consecutive 8-week parent training group held at the same time as the SST group. A further 52 children with ADHD were recruited from referral as a control group. They had motivation for the group therapy but we could not find a mutually available time. In the experimental group (SST and parent training), children took medication as prescribed by their doctor. In the control group, the children received treatment as per their usual care, such as medication and counseling at the outpatient department.

The children who attended the SST groups received eight 80-minute group sessions during consecutive weeks. The group leader was a board-certified child psychiatrist with 6 months of pilot group experience. A board-certified clinical psychologist with a master's degree and several years of experience with children served as the co-leader from November 2007 to March 2008. A board-certified occupational therapist with a master's degree served as the co-leader from April 2008 to November 2008. During each session, the leaders taught social skill modules using didactic instructions, modeling, role-play activities, behavior rehearsal, and methods that have been used successfully in previous SST programs.<sup>17</sup> The leaders used a token system to reinforce positive social behavior and extinguish socially inappropriate behavior. In addition to the group-offered activities, feedback was provided by the leaders and group members. Homework was assigned for each week. Seven modules were covered during the 8-week group: (1) how to introduce yourself and basic social skills; (2) how to listen to others; (3) self-expectations; (4) learn to know how I feel; (5) learn to know how people feel and how to empathize; (6) how to control anger and solve conflicts with peers or siblings; and (7) how to give a compliment.<sup>18–20</sup> The group process was videotaped and supervised by a master-level board-certified clinical psychologist with more than 20 years of clinical experience working with parents and children.

The parent group was led by therapists with a clinical psychological master-level background and supervised once per week by a master-level board-certified clinical psychologist with more than 15 years of clinical experience working with parents and children. Eight modules were

covered during the 8-week group sessions: (1) education on ADHD disease concepts; (2) concept of behavioral treatment; (3) clarify parenting attitudes; (4) how to manage children's misbehavior and emotions; (5) how to relieve the parent's own emotional stress; (6) how to empathize and give children compliments; (7) feedback on children's performance by the leader of the child group; and (8) consultation on issues regarding medication.<sup>18,21</sup> The parents were encouraged to generalize the children's positive social behavior at home.

## Outcome measures

Basic demographic data, socioeconomic status, methylphenidate dosage, and drug compliance were collected at baseline. Socioeconomic status was classified according to Hollingshead index into stages I–V.<sup>22</sup> We further classified stage I and II as high, stage III as middle, and stage IV and V as low social class. According to a Taiwan study about methylphenidate adherence,<sup>23</sup> poor compliance was defined as missing 2 or more days per week for 4 weeks. We collected the dates they visited clinics and recorded the number of drugs prescribed, and classified them as good or poor compliance.

The treatment effects were assessed by parent and teacher versions of the Chinese Version of the Swanson, Nolan, and Pelham, version IV scale (SNAP-IV),<sup>24–26</sup> the Chinese version of the Child Behavior Check List (CBCL-C),<sup>27,28</sup> child and teacher version of the modified Social Skill Rating System (SSRS),<sup>19,29</sup> at baseline, post-treatment (2 months from baseline), and at the end of the follow-up period (4 months from baseline).

The SNAP-IV parent and teacher forms have been proven to be a reliable and valid instrument when used in Taiwanese children.<sup>24–26</sup> The parent form consisted of three subscales: Inattention; Hyperactivity/Impulsivity; and Oppositional. The teacher form consisted of four subscales: Inattention; Hyperactivity; Impulsivity; and Oppositional. The CBCL-C has also been proven to be a reliable and valid instrument in Taiwanese children and adolescents.<sup>27,28</sup> It consisted of eight subscales: Withdrawn; Somatic Complaints; Anxious/Depressed; Social Problems; Thought Problems; Attention Problems; Delinquent Behavior; and Aggressive Behavior. The child and teacher versions of the modified SSRS (SSRS-C and SSRS-T) have also been proven to be a reliable and valid instrument in Taiwanese children.<sup>19</sup> A higher score indicates more positive social skills. The child version consisted of five subscales: Cooperative Behavior; Positive Assertion; Empathy; Negative Assertion; and Self Control. The teacher version also consisted of five subscales: Cooperative Behavior; Active Participation; Self Assertion; Self Control; and Conflict Coping.

## Statistical analysis

All analyses were performed on an intention-to-treat (ITT) basis ( $n = 97$ ), even if the intervention was not delivered as planned. Baseline differences between the groups were investigated using independent  $t$  and Chi-square tests using Fishers' examination. The intervention effects on the changes observed post-treatment and

at the end of the follow-up period were assessed using linear mixed model analysis, which accounted for missing data. This model considered repeated measures over different time periods and two groups entered as fixed factors. Additionally, the crossover effect of group and time period was entered as an interaction term. Within the model, drug compliance and baseline methylphenidate dosage were entered as covariates to account for differences between groups for the participant characteristics at baseline.

The data were analyzed using the Statistical Package for Social Sciences software package version 12.0 (SPSS Inc., Chicago, IL, USA). Differences between groups were considered significant if the  $p$  value was less than 0.05.

## Results

Ninety-seven children were recruited: 45 in the experimental group and 52 in the control group. The mean age was 8.4 years old (standard deviation, SD 0.9), and 17 (17.5%) of the patients were girls. Nineteen (19.6%) were diagnosed as ADHD, inattentive type (ADHD-I), and the remaining 78 (80.4%) were diagnosed as combined type (ADHD-C). Thirty-three children (34%) had the co-morbidity of oppositional defiant disorder (ODD). According to chart review, there were three persons with anxiety disorder in the experimental group and four in the control group. The children attended a mean of 6.2 sessions (SD 2.2), and the parents 5.9 sessions (SD 2.5). As shown in Table 1, there were no differences between groups except for baseline methylphenidate dosage (lower in the experimental group,  $p = 0.014$ ), drug compliance (poorer in the experimental group,  $p = 0.019$ ), and some subscales. Baseline methylphenidate dosage and drug compliance were controlled during longitudinal linear mixed-effects model analysis.

Overall retention was good. The response rate of completing follow-up assessments was 89.7% post-treatment and 88.7% at the end of the follow-up period. There was no difference between the two groups in dropout rate. The baseline characteristics of those lost to follow-up at 4 months compared with those who completed the assessment at 4 months did not differ.

As shown in Table 2, the mixed-effects model analysis demonstrated a main effect of group on the Oppositional subscale of SNAP-P, the Anxious/Depressed subscale of the CBCL-C, the Self Control subscale of the SSRS-C, and the Active Participation subscale of the SSRS-T, all in favor of the experimental group. This means the social skill training and parent training did benefit the ADHD children in reducing parent-reported oppositional behaviors, anxiety, and depression and increasing self-reported self-control skills and teacher-reported active participation. As also shown in Table 2, a test of the group by time interaction effect indicated a statistically significant difference on the score of change in the Oppositional subscale of the SNAP-P and the Self Control subscale of the SSRS-C at the end of the follow-up period, in favor of the control group. This means that the improvements in Oppositional subscale of the SNAP-P and the Self Control subscale of the SSRS-C were noted only post-treatment, but were not sustained at the end of the follow-up period.

**Table 1** Descriptive statistics for the study population ( $N = 97$ ).

| Variable                                                   | Experimental group | Control group | $\chi^2/t$ test |
|------------------------------------------------------------|--------------------|---------------|-----------------|
| Sex, $N$ (%)                                               |                    |               |                 |
| Male                                                       | 40 (88.9)          | 40 (76.9)     | NS              |
| Female                                                     | 5 (11.1)           | 12 (23.1)     |                 |
| Age (y), mean (SD)                                         | 8.2 (0.9)          | 8.5 (0.9)     | NS              |
| Socioeconomic status, $N$ (%)                              |                    |               |                 |
| High                                                       | 18 (40.0)          | 14 (26.9)     | NS              |
| Medium                                                     | 14 (31.1)          | 21 (40.4)     |                 |
| Low                                                        | 13 (28.9)          | 17 (32.7)     |                 |
| Treatment sessions received, mean (SD)                     |                    |               |                 |
| Children                                                   | 6.2 (2.2)          |               |                 |
| Parent                                                     | 5.9 (2.5)          |               |                 |
| Baseline estimated MPH dose (mg), mean (SD)                | 17 (11.3)          | 23.3 (12.4)   | $p = 0.014$     |
| Drug compliance, $N$ (%)                                   |                    |               |                 |
| Good                                                       | 24 (53.3)          | 40 (76.9)     | $p = 0.019$     |
| Poor                                                       | 21 (46.7)          | 12 (23.1)     |                 |
| Subtypes of ADHD, $N$ (%)                                  |                    |               |                 |
| Inattentive type (ADHD-I)                                  | 6 (13.3)           | 13 (25.0)     | NS              |
| Combined type (ADHD-C)                                     | 39 (86.7)          | 39 (75.0)     | NS              |
| Comorbid with oppositional defiant disorder (ODD), $N$ (%) | 13 (28.9)          | 20 (38.5)     | NS              |
| Baseline SNAP-P, mean (SD)                                 |                    |               |                 |
| Inattention                                                | 14.4 (5.5)         | 14.5 (5.0)    | NS              |
| Hyperactive/Impulsivity                                    | 13.5 (5.9)         | 13.0 (6.5)    |                 |
| Oppositional                                               | 13.2 (5.3)         | 10.9 (6.3)    |                 |
| Baseline SNAP-T, mean (SD)                                 |                    |               |                 |
| Inattention                                                | 15.1 (6.4)         | 15.5 (7.1)    | NS              |
| Hyperactivity                                              | 10.5 (6.4)         | 8.6 (6.3)     | NS              |
| Impulsivity                                                | 9.0 (4.7)          | 7.5 (4.6)     | NS              |
| Oppositional                                               | 9.9 (6.8)          | 6.4 (5.8)     | $p = 0.008$     |
| CBCL-C                                                     |                    |               | NS              |
| Withdrawn                                                  | 5.6 (2.2)          | 4.8 (1.7)     |                 |
| Somatic Complaints                                         | 3.0 (3.4)          | 3.2 (3.6)     |                 |
| Anxious/Depressed                                          | 7.4 (4.8)          | 5.9 (4.8)     |                 |
| Social Problems                                            | 5.7 (2.7)          | 5.6 (2.8)     |                 |
| Thought Problems                                           | 3.4 (3.3)          | 2.8 (2.0)     |                 |
| Attention Problems                                         | 9.5 (3.7)          | 9.2 (3.4)     |                 |
| Delinquent Behavior                                        | 5.2 (2.6)          | 4.7 (2.7)     |                 |
| Aggressive Behavior                                        | 18.0 (7.2)         | 15.0 (7.4)    |                 |
| SSRS-C <sup>a</sup>                                        |                    |               | NS              |
| Cooperative Behavior                                       | 14.8 (3.4)         | 15.7 (2.5)    |                 |
| Positive Assertion                                         | 20.4 (4.3)         | 21.7 (4.2)    |                 |
| Empathy                                                    | 8.4 (2.3)          | 8.4 (2.2)     |                 |
| Negative Assertion                                         | 13.9 (3.2)         | 14.3 (3.1)    |                 |
| Self Control                                               | 9.7 (2.7)          | 10.4 (2.9)    |                 |
| SSRS-T <sup>a</sup>                                        |                    |               |                 |
| Cooperative Behavior                                       | 18.4 (3.7)         | 19.2 (3.8)    | NS              |
| Active Participation                                       | 13.7 (3.1)         | 15.9 (2.7)    | $p < 0.001$     |
| Self Assertion                                             | 12.7 (3.2)         | 12.7 (3.1)    | NS              |
| Self Control                                               | 16.2 (4.3)         | 19.6 (4.3)    | $p < 0.001$     |
| Conflict Coping                                            | 18.8 (4.4)         | 20.9 (4.4)    | $p < 0.001$     |

CBCL-C = Chinese Version of Child Behavior Check List; MPH = methylphenidate; NS = non-significant; SD = standard deviation; SNAP-P = SNAP-IV questionnaire-parent form; SNAP-T = SNAP-IV questionnaire-teacher form; SSRS-C = child version of modified social skill rating system; SSRS-T = teacher version of modified social skill rating system.

<sup>a</sup> A higher score indicates increased ability.

**Table 2** Mean differences (mean, SD) and linear mixed model analysis in ADHD outcomes between experimental and control groups post-treatment and at 4-month follow-up, adjusted for drug compliance and baseline methylphenidate dosage.

| Outcome measures              | Time of assessment               |                               |                                  |                             | General linear mixed model results $\beta$ and $p$ |               |       |      |               |
|-------------------------------|----------------------------------|-------------------------------|----------------------------------|-----------------------------|----------------------------------------------------|---------------|-------|------|---------------|
|                               | Post-treatment                   |                               | 4-month follow-up                |                             | $\beta$ (95% CI) <sup>a</sup>                      |               | Group | Time | Group by time |
|                               | Experimental group Mean $\pm$ SD | Control group Mean $\pm$ SD   | Experimental group Mean $\pm$ SD | Control group Mean $\pm$ SD |                                                    |               |       |      |               |
| Change in SNAP-P              |                                  |                               |                                  |                             |                                                    |               |       |      |               |
| Inattention                   | -2.99 $\pm$ 6.1                  | -1.89 $\pm$ 5.8               | -1.73 $\pm$ 4.8                  | -1.61 $\pm$ 5.1             | -1.36                                              | -3.82 ~ 1.1   | 0.28  | 0.77 | 0.41          |
| Hyperactive/Impulsivity       | -3.58 $\pm$ 6.4                  | -2.42 $\pm$ 5.3               | -1.96 $\pm$ 4.6                  | -2.47 $\pm$ 5.1             | -1.84                                              | -4.23 ~ 0.55  | 0.13  | 0.90 | 0.18          |
| Oppositional                  | -4.26 $\pm$ 5.6                  | -2.08 $\pm$ 4.7               | -2.33 $\pm$ 5.0                  | -2.18 $\pm$ 5.8             | -2.45                                              | -4.85 ~ -0.06 | 0.04* | 0.75 | 0.03*         |
| Change in SNAP-T              |                                  |                               |                                  |                             |                                                    |               |       |      |               |
| Inattention                   | 0.51 $\pm$ 5.9                   | -1.74 $\pm$ 6.4               | -1.61 $\pm$ 5.1                  | -2.47 $\pm$ 7.0             | 1.59                                               | -1.31 ~ 4.48  | 0.28  | 0.43 | 0.45          |
| Hyperactivity                 | -0.25 $\pm$ 5.7                  | -1.48 $\pm$ 5.4               | -1.02 $\pm$ 4.9                  | -1.88 $\pm$ 5.8             | 0.68                                               | -1.84 ~ 3.20  | 0.59  | 0.46 | 0.99          |
| Impulsivity                   | 0.04 $\pm$ 4.4                   | -0.82 $\pm$ 4.1               | -0.18 $\pm$ 3.9                  | -1.47 $\pm$ 4.1             | 0.64                                               | -1.25 ~ 2.53  | 0.50  | 0.22 | 0.46          |
| Oppositional                  | -0.63 $\pm$ 7.6                  | -0.95 $\pm$ 5.8               | -0.53 $\pm$ 6.4                  | -1.46 $\pm$ 5.6             | -0.39                                              | -3.28 ~ 2.51  | 0.79  | 0.53 | 0.46          |
| Change in CBCL-C              |                                  |                               |                                  |                             |                                                    |               |       |      |               |
| Withdrawn                     | -0.63 $\pm$ 2.4                  | -0.06 $\pm$ 2.0               | -0.84 $\pm$ 2.3                  | -0.28 $\pm$ 1.6             | -0.79                                              | -1.72 ~ 0.14  | 0.10  | 0.50 | 0.84          |
| Somatic Complaints            | -0.88 $\pm$ 3.3                  | -1.27 $\pm$ 3.1               | -0.14 $\pm$ 2.7                  | -1.42 $\pm$ 3.7             | 0.56                                               | -0.90 ~ 2.01  | 0.45  | 0.75 | 0.14          |
| Anxious/Depressed             | -2.05 $\pm$ 3.2 <sup>ab</sup>    | -0.51 $\pm$ 3.7 <sup>ab</sup> | -2.19 $\pm$ 4.0                  | -0.89 $\pm$ 3.7             | -1.70                                              | -3.36 ~ -0.04 | 0.04* | 0.42 | 0.79          |
| Social Problems               | -1.29 $\pm$ 2.3                  | -0.56 $\pm$ 2.2               | -1.40 $\pm$ 2.3                  | -0.92 $\pm$ 2.2             | -0.97                                              | -1.97 ~ 0.02  | 0.06  | 0.16 | 0.57          |
| Thought Problems              | -1.03 $\pm$ 2.8                  | -0.77 $\pm$ 2.2               | -1.02 $\pm$ 2.8                  | -1.06 $\pm$ 2.1             | -0.85                                              | -1.91 ~ 0.20  | 0.11  | 0.28 | 0.60          |
| Attention Problems            | -2.20 $\pm$ 3.1                  | -1.35 $\pm$ 2.6               | -1.26 $\pm$ 2.8                  | -1.72 $\pm$ 3.2             | -1.28                                              | -2.58 ~ 0.02  | 0.05  | 0.31 | 0.04*         |
| Delinquent Behavior           | -0.72 $\pm$ 1.9                  | -0.62 $\pm$ 2.0               | -0.76 $\pm$ 2.2                  | -0.60 $\pm$ 1.9             | -0.39                                              | -1.26 ~ 0.48  | 0.38  | 1.00 | 0.91          |
| Aggressive Behavior           | -4.48 $\pm$ 6.0                  | -2.71 $\pm$ 5.0               | -4.00 $\pm$ 7.1                  | -2.37 $\pm$ 5.9             | -2.23                                              | -4.92 ~ 0.45  | 0.10  | 0.68 | 0.94          |
| Change in SSRS-C <sup>c</sup> |                                  |                               |                                  |                             |                                                    |               |       |      |               |
| Cooperative Behavior          | 1.12 $\pm$ 3.8                   | 0.49 $\pm$ 2.3                | 1.47 $\pm$ 4.1                   | 0.15 $\pm$ 2.3              | 1.18                                               | -0.16 ~ 2.52  | 0.08  | 0.38 | 0.22          |
| Positive Assertion            | 0.47 $\pm$ 4.9                   | -0.35 $\pm$ 4.2               | 0.80 $\pm$ 4.1                   | -0.33 $\pm$ 4.8             | 1.52                                               | -0.44 ~ 3.48  | 0.13  | 0.84 | 0.61          |
| Empathy                       | 0.29 $\pm$ 2.1                   | 0.06 $\pm$ 2.3                | 0.13 $\pm$ 2.3                   | 0.00 $\pm$ 2.5              | 0.48                                               | -0.55 ~ 1.51  | 0.36  | 0.82 | 0.84          |
| Negative Assertion            | 0.37 $\pm$ 4.8                   | -0.15 $\pm$ 3.2               | -0.79 $\pm$ 3.7                  | 0.23 $\pm$ 3.7              | 0.91                                               | -0.78 ~ 2.61  | 0.29  | 0.49 | 0.09          |
| Self Control                  | 1.24 $\pm$ 3.6 <sup>ab</sup>     | -0.06 $\pm$ 2.9 <sup>ab</sup> | 0.32 $\pm$ 3.5                   | 0.50 $\pm$ 3.0              | 1.56                                               | 0.15 ~ 2.98   | 0.03* | 0.26 | 0.048*        |
| Change in SSRS-T <sup>c</sup> |                                  |                               |                                  |                             |                                                    |               |       |      |               |
| Cooperative Behavior          | 0.54 $\pm$ 3.9                   | 0.18 $\pm$ 3.3                | 1.46 $\pm$ 4.3                   | 0.80 $\pm$ 4.0              | 0.90                                               | -0.90 ~ 2.70  | 0.34  | 0.30 | 0.98          |
| Active Participation          | 0.63 $\pm$ 3.1 <sup>ab</sup>     | -0.60 $\pm$ 2.7 <sup>ab</sup> | 0.89 $\pm$ 3.4                   | 0.04 $\pm$ 2.6              | 1.47                                               | 0.11 ~ 2.84   | 0.03* | 0.17 | 0.49          |
| Self Assertion                | 0.52 $\pm$ 2.4                   | 0.33 $\pm$ 2.9                | -0.57 $\pm$ 3.0                  | 0.56 $\pm$ 3.2              | 0.08                                               | -1.30 ~ 1.46  | 0.91  | 0.58 | 0.08          |
| Self Control                  | 1.17 $\pm$ 4.6                   | -0.08 $\pm$ 3.1               | 0.69 $\pm$ 5.2                   | 0.60 $\pm$ 4.0              | 1.61                                               | -0.34 ~ 3.56  | 0.10  | 0.25 | 0.14          |
| Conflict Coping               | 0.88 $\pm$ 5.4                   | 0.42 $\pm$ 3.8                | 0.47 $\pm$ 5.7                   | 0.38 $\pm$ 4.9              | 1.01                                               | -1.25 ~ 3.27  | 0.38  | 0.95 | 0.70          |

\* $p < 0.05$ .

CBCL-C = Chinese Version of Child Behavior Check List; CI = confidence interval; SNAP-P = SNAP-IV questionnaire-parent form; SNAP-T = SNAP-IV questionnaire-teacher form; SSRS-C = child version of modified social skill rating system; SSRS-T = teacher version of modified social skill rating system.

<sup>a</sup> The unstandardized  $\beta$  regression coefficient represents the mean difference in the outcome value seen between those who received the intervention versus those who were in the control group.<sup>b</sup> Using independent  $t$  test.<sup>c</sup> A higher score indicates increased ability.

## Influence of drug compliance

A previous study showed that medication was a strong mediator of social skills of ADHD children.<sup>2</sup> As shown in Table 3, we found children who had good drug compliance had better outcome on some behavior subscales and social skill subscales. They had decreased scores on Thought Problems and Delinquent Behavior subscales of the CBCL-C ( $p = 0.02$  and  $0.009$ , respectively), and increased scores on Cooperative Behavior ( $p = 0.006$ ), Positive Assertion ( $p = 0.014$ ), Negative Assertion ( $p = 0.015$ ), and Self Control ( $p = 0.032$ ) subscales of the SSRS-C.

## Discussion

To the best of our knowledge, this is the first intervention study on school-aged ADHD children combining SST and parent training published in English in Asia. The present study demonstrates the effectiveness of SST combined with parent training. Compared with usual care, children who received the intervention had significantly greater reductions on the Oppositional subscale of the SNAP-P, the Anxious/Depressed subscale of the CBCL-C, improved on the Self Control subscale of the SSRS-C, and improved on the Active Participation subscale of the SSRS-T. The benefits in these domains are consistent with the aims of our interventional approach. Children who had good drug compliance had a lower score on the Delinquent Behavior subscale of the CBCL-C and improvement on the four subscales of the SSRS-C.

The results of this study support the efficacy of combining SST and parent training in decreasing oppositional behavior in the home setting, but not in the school setting. The MTA study reported that medication combined with behavioral treatment offered greater benefits than community care for oppositional/aggressive behavior and parent–child relations.<sup>30</sup> The MTA study also found that only in combination treatment (and not in behavior treatment alone) was decreased negative/ineffective discipline associated with a reduction in children's disruptive behavior at school.<sup>31</sup> The aim of our parent training program was to enhance positive parenting and release parenting stress in order to decrease negative and ineffective discipline. This may explain why our combination program had similar effects to the MTA study in decreasing oppositional behavior at home. However, our results do not support its efficacy in the school setting. We considered possible reasons for the lack of efficacy in the school setting. It is possible that the parents were more sensitive at the time of assessing immediate changes due to the program because of frequent and intense parent–child conflicts at home. It is also possible that the benefits of our combined treatment were not generalized to the school setting because we did not implement active intervention at school. Besides, some children and parents did not participate in the program regularly, and this may reduce the treatment effects as well.

An improvement in the Self Control subscale of the SSRS-C was also noted in a previous SST study.<sup>8</sup> Self-control skills were one of the targets of our SST program. Improvements in self-control may result in

**Table 3** Linear mixed model analysis to examine the effect of drug compliance (only significant results are listed).

| Independent variables             | Dependent variable: $\Delta$ Thought Problem subscale of CBCL-C |        |  | Dependent variable: $\Delta$ Delinquent Behavior subscale of CBCL-C |        |  | Dependent variable: $\Delta$ Cooperative Behavior subscale of SSRS-C <sup>a</sup> |        |  | Dependent variable: $\Delta$ Positive Assertion subscale of SSRS-C <sup>a</sup> |        |  | Dependent variable: $\Delta$ Negative Assertion subscale of SSRS-C <sup>a</sup> |        |  | Dependent variable: $\Delta$ Self Control subscale of SSRS-C <sup>a</sup> |        |  |
|-----------------------------------|-----------------------------------------------------------------|--------|--|---------------------------------------------------------------------|--------|--|-----------------------------------------------------------------------------------|--------|--|---------------------------------------------------------------------------------|--------|--|---------------------------------------------------------------------------------|--------|--|---------------------------------------------------------------------------|--------|--|
|                                   | $\beta$                                                         | $p$    |  | $\beta$                                                             | $p$    |  | $\beta$                                                                           | $p$    |  | $\beta$                                                                         | $p$    |  | $\beta$                                                                         | $p$    |  | $\beta$                                                                   | $p$    |  |
| Intercept                         | 1.287                                                           | 0.052  |  | 0.257                                                               | 0.605  |  | -1.430                                                                            | 0.081  |  | -2.680                                                                          | 0.031  |  | -1.298                                                                          | 0.203  |  | -0.762                                                                    | 0.367  |  |
| Group                             | -0.854                                                          | 0.111  |  | -0.388                                                              | 0.378  |  | 1.182                                                                             | 0.083  |  | 1.521                                                                           | 0.127  |  | 0.915                                                                           | 0.287  |  | 1.562                                                                     | 0.031* |  |
| Time                              | -0.269                                                          | 0.283  |  | 0.001                                                               | 0.996  |  | -0.373                                                                            | 0.383  |  | 0.103                                                                           | 0.838  |  | 0.395                                                                           | 0.488  |  | 0.572                                                                     | 0.255  |  |
| Group $\times$ time               | 0.201                                                           | 0.595  |  | -0.056                                                              | 0.910  |  | 0.794                                                                             | 0.216  |  | 0.391                                                                           | 0.605  |  | -1.442                                                                          | 0.093  |  | -1.495                                                                    | 0.048* |  |
| Drug Compliance (reference: poor) | -1.369                                                          | 0.020* |  | -1.120                                                              | 0.009* |  | 1.963                                                                             | 0.006* |  | 2.667                                                                           | 0.014* |  | 2.147                                                                           | 0.015* |  | 1.552                                                                     | 0.032* |  |
| Baseline MPH dose                 | -0.415                                                          | 0.080  |  | 0.001                                                               | 0.940  |  | 0.015                                                                             | 0.612  |  | 0.007                                                                           | 0.877  |  | -0.0260                                                                         | 0.466  |  | -0.025                                                                    | 0.401  |  |

\* $p < 0.05$ .

CBCL-C = Chinese Version of Child Behavior Check List; CI = confidence interval; MPH = methylphenidate; SSRS-C = child version of modified social skill rating system.

<sup>a</sup> A higher score indicates increased ability.

a lower score in the Oppositional subscale of the SNAP-P. In addition, improvements in both the Oppositional and Self Control subscales were found post-treatment, but this was not sustained at the end of the follow-up period, which may be due to the brief treatment sessions and the poor attendance rate of some children/parents. The group and time interaction indicated that the improvements on parent-reported oppositional behaviors and self-reported self-control skills post-treatment did not sustain to the end of follow-up. It may be attributed to the poor drug compliance of the experimental group. Also, the experimental group may be more problematic in social behaviors than the control group because the baseline teacher-reported oppositional behaviors and social skills were worse in the experimental group than in the control group. Future studies are needed to determine whether tailored booster/maintenance treatment would enhance the sustainability of the effects. Also, better study design such as randomized-control can help us to evaluate the treatment effects more clearly.

The MTA study revealed that in children with ADHD plus anxiety, behavior treatment surpasses community care, and that combined treatment (medication with behavior treatment) is superior to medication alone.<sup>32</sup> This may explain the improvement on the Anxious/Depressed subscale of the CBCL-C in our study. The improvements observed were maintained at the 2-month follow-up stage of the assessments. It can be argued that the improvements were due to parent expectancy; however, the teachers did not know whether the children attended group psychotherapy and may therefore be viewed as blind raters. The teachers reported significant improvements on the Active Participation subscale of the SSRS-T, which is the focus of our coaching program for children. In addition, there was no significant difference on the Externalizing subscale of the CBCL-C. It is also unlikely that the improvement on the Anxious/Depressed subscale was due to an expectancy effect.

Although our behavioral treatment intervention was not delivered in a school setting, the teacher-rated active participation did reveal significant effects. The improvement of active participation noted by the teachers may be a clue that some pro-social behavior was generalized into the school setting. It is possible that the parents learned strategies to assist and encourage the children to practice the newly learned skills and provided direct reinforcements for adaptive social behavior outside the therapy room. A previous study also showed similar generalization effects.<sup>9</sup>

Medication has a great impact on decreasing inattention, hyperactivity, and impulsivity, and thus is a strong mediator for outcomes of SST.<sup>2</sup> We found that good drug compliance helped in decreasing parent-reported delinquent behavior and improved self-reported social skills. However, some confounding factors such as parents' attitude toward medication and the conflict while parents ask children to take medication are not addressed here and may need further survey in future studies.

Our study participants included diagnostic heterogeneous groups (i.e., ADHD-C and ADHD-I). Some studies have reported that social skill deficits vary across ADHD subtypes, and that treatment effects differ between these subtypes.<sup>8</sup> One randomized-controlled study found that

children in diagnostic heterogeneous groups (i.e., ADHD-C and ADHD-I) had greater improvements in parent reports of their child's cooperation and assertion abilities as well as children's reports of their own empathy skills.<sup>8</sup> In addition, diagnostic homogenous groups in that study lead to greater decreases in externalizing behavior post-treatment but not at follow-up. Our study was designed to have diagnostic heterogeneous groups, which may explain why there were some similar results in improvement in the Social Skill Rating Systems, but no improvement in externalizing behavior. It has been postulated that diagnostic heterogeneous groups are promising for children with ADHD-C, yet may be contraindicated for children with ADHD-I.<sup>8</sup> We did not find this if we put subtype into our analysis as a covariate (data not shown), however, clinically we did find that some children with ADHD-I imitated the bad behavior of children with ADHD-C. We modified them by behavior therapy. Clinicians should be aware of this phenomenon.

Generally speaking, our study showed that SST had some benefits. However, some effects were not sustained at follow-up. The short treatment period and poor attendance rate of some patients may have limited the outcomes. This highlights the fact that ADHD is a chronic disorder and that ongoing treatment often seems necessary.

The chief limitation of this study is that it was not a randomized-controlled trial; however, we tried to control the confounding factors and analyzed the data cautiously. The treatment period was short; however, this makes the parents more easier to bring the children to complete the treatment course.

In conclusion, ADHD children receiving social skill training combined with parent training showed some improvements in social skills. However, medication is still highly recommended. We found that children with ADHD and their parents could benefit from a low intensity (eight 80-minute group sessions for SST and parent training sessions) psychosocial program. Our findings may help clinicians to work with children with ADHD and their parents.

## Acknowledgments

This study was supported by a grant from Mackay Memorial Hospital (96123).

## References

1. Mrug S, Hoza B, Gerdes AC, Hinshaw S, Arnold LE, Hechtman L, et al. Discriminating between children with ADHD and classmates using peer variables. *J Atten Disord* 2009;12:372–80.
2. MdB Gerly, Pier JMP. Social incompetence in children with ADHD: possible moderators and mediators in social-skills training. *Clin Psychol Rev* 2007;27:78–97.
3. Bagwell CL, Molina BSG, Pelham WE, Hoza B. Attention-deficit hyperactivity disorder and problems in peer relations: predictions from childhood to adolescence. *J Am Acad Child Adolesc Psychiatry* 2001;40:1285–92.
4. Greene RW, Biederman J, Faraone SV, Wilens TE, Mick E, Blier HK. Further validation of social impairment as a predictor of substance use disorders. *J Clin Child Psychol* 1999;28:349–54.

5. Stratton CW, Reid J, Hammond M. Social skills and problem-solving training for children with early-onset conduct problems: who benefits? *J Child Psychol Psychiatry* 2001;**42**: 943–52.
6. Miranda A, Presentacion MJ. Efficacy of cognitive-behavioral therapy in the treatment of children with ADHD, with and without aggressiveness. *Psychol Sch* 2000;**37**:169–82.
7. Frankel F, Myatt R, Cantwell DP, Feinberg DT. Parent-assisted transfer of children's social skills training: effects on children with and without attention-deficit hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry* 1997;**36**:1056–64.
8. Antshel KM, Remer R. Social skills training in children with attention deficit hyperactivity disorder: a randomized-controlled clinical trial. *J Clin Child Adolesc Psychol* 2003;**32**: 153–65.
9. Pfiffner LJ, McBurnett K. Social skills training with parent generalization: treatment effects for children with attention deficit disorder. *J Consult Clin Psychol* 1997;**65**:749–57.
10. Tutty S, Gephart H, Wurzbacher K. Enhancing behavioral and social skill functioning in children newly diagnosed with attention-deficit hyperactivity disorder in a pediatric setting. *J Dev Behav Pediatr* 2003;**24**:51–7.
11. Langberg JM, Arnold LE, Flowers AM, Epstein JN, Altaye M, Hinshaw SP, et al. Parent-reported homework problems in the MTA study: evidence for sustained improvement with behavioral treatment. *J Clin Child Adolesc Psychol* 2010;**39**:220–33.
12. Abikoff H, Hechtman L, Klein RG, Weiss G, Fleiss K, Etcovitch J, et al. Symptomatic improvement in children with ADHD treated with long-term methylphenidate and multimodal psychosocial treatment. *J Am Acad Child Adolesc Psychiatry* 2004;**43**:802–11.
13. Gau SS, Chong MY, Chen TH, Cheng AT. A three-year panel study of mental disorders among adolescents in Taiwan. *Am J Psychiatry* 2005;**162**:1344–62.
14. Kuo PJ, Huang SY, Chen YS, Shih LS, Chung MS. Activity group for children with ADHD. *Taiwanese J Psychiatry* 2001;**15**:62–70.
15. Huang HL, Chao CC, Tu CC, Yang PC. Behavioral parent training for Taiwanese parents of children with attention-deficit/hyperactivity disorder. *Psychiatry Clin Neurosci* 2003;**57**:275–81.
16. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4th ed. Washington: American Psychiatric Association; 2000. text revision (DSM-IV-TR).
17. Elliott SN, Gresham FM. Social skills interventions for children. *Behav Modif* 1993;**17**:287–313.
18. Braswell L, Bloomquist ML. *Cognitive-behavioral therapy with ADHD children*. New York: Guilford Press; 1991.
19. Wang YF. *A study on the effects of "Social Skills Training" for the aggressive children in elementary school [MSD thesis]*. Kaohsiung: National Kaohsiung Normal University; 1997.
20. Dennison ST, Knight CM. *Activities for children in therapy: a guide for planning and facilitating therapy with troubled children*. 2nd ed. Springfield: Charles C. Thomas Publisher; 1999.
21. Barkley RA. *Taking charge of ADHD: the complete, authoritative guide for parents*. New York: Guilford Press; 2000.
22. Hollingshead A. *Two-factor index of social position*. New Haven: Yale University, Department of Sociology; 1965.
23. Gau SS, Chen SJ, Chou WJ, Cheng H, Tang CS, Chang HL, et al. National survey of adherence, efficacy, and side effects of methylphenidate in children with attention-deficit/hyperactivity disorder in Taiwan. *J Clin Psychiatry* 2008;**69**: 131–40.
24. Gau SS, Shang CY, Liu SK, Lin CH, Swanson JM, Liu YC, et al. Psychometric properties of the Chinese version of the Swanson, Nolan, and Pelham, version IV scale – parent form. *Int J Methods Psychiatr Res* 2008;**17**:35–44.
25. Gau SS, Lin CH, Hu FC, Shang CY, Swanson JM, Liu YC, et al. Psychometric properties of the Chinese version of the Swanson, Nolan, and Pelham, version IV scale – teacher form. *J Pediatr Psychol* 2009;**34**:850–61.
26. Liu YC, Liu SK, Shang CY, Lin CH, Tu C, Gau SS. Norm of the Chinese Version of the Swanson, Nolan and Pelham, version IV scale for ADHD. *Taiwanese J Psychiatry* 2006;**20**:290–304.
27. Huang HL, Chuang SF, Wang YC. Developing the multi-axial behavioral assessment of children in Taiwan. In: Chinese Assessment Association, editor. *Psychological assessment in Chinese-speaking society*. Taipei: Psychology Press; 1994. p. 259–310.
28. Yang HJ, Soong WT, Chiang CN, Chen WJ. Competence and behavioral/emotional problems among Taiwanese adolescents as reported by parents and teachers. *J Am Acad Child Adolesc Psychiatry* 2000;**39**:232–9.
29. Gresham FM, Elliot SN. *Social skill rating system*. Circle Pines: American Guidance Services; 1990.
30. The MTA Cooperative Group. A 14-month randomized clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry* 1999;**56**:1073–86.
31. Hinshaw SP, Owens EB, Wells KC, Kraemer HC, Abikoff HB, Arnold LE, et al. Family processes and treatment outcome in the MTA: negative/ineffective parenting practices in relation to multimodal treatment. *J Abnorm Child Psychol* 2000;**28**: 555–68.
32. The MTA Cooperative Group. Moderators and mediators of treatment response for children with attention-deficit/hyperactivity disorder-the multimodal treatment study of children with attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry* 1999;**56**:1088–96.