Incorporating Family Therapy into Asthma Group Intervention: A Randomized Waitlist-Controlled Trial

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Asthma psychoeducational programs have been found to be effective in terms of symptom-related outcome. They are mostly illness-focused, and pay minimal attention to systemic/familial factors. This study evaluated a novel asthma psychoeducation program that adopted a parallel group design and incorporated family therapy. A randomized waitlist-controlled crossover clinical trial design was adopted. Children with stable asthma and their parents were recruited from a pediatric chest clinic. Outcome measures included, for the patients: exhaled nitric oxide (eNO), spirometry, and adjustment to asthma; and for the parents: perceived efficacy in asthma management, Hospital Anxiety and Depression Scale anxiety subscale, Body Mind Spirit Well-being Inventory emotion subscale, and Short Form 12 health-related quality of life scale. Forty-six patients participated in the study. Attrition rates were 13.0% and 26.0% for the active and control groups, respectively. Repeated-measures ANOVA revealed a significant decrease in airway inflammation, as indicated by eNO levels, and an increase in patient’s adjustment to asthma and parents’ perceived efficacy in asthma management. Serial trend analysis revealed that most psychosocial measures continued to progress steadily after intervention. Significant improvements in both symptom-related measures and mental health and relationship measures were observed. The findings supported the value of incorporating family therapy into asthma psychoeducation programs.

Keywords: Asthma; Psychoeducation; Family Therapy; Parallel Group

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Pediatric asthma is a common disorder and it tends to run a chronic course (Lai et al., 1996; Leung et al., 1997). Apart from affecting physical well-being, chronic

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asthma can have far-reaching psychosocial effects on the patients and their caretakers (Butz et al., 1995; Fisher et al., 1993; Gustafsson, Bjorksten, & Kjellman, 1994; Rand & Butz, 1999; Wasilewski et al., 1988). On the other hand, the emotional well-being of the caretakers can have a significant bearing on the disease outcome, for example, emergency room visits and school absenteeism (Butz et al., 1995; Fisher et al., 1993; Gustafsson et al., 1994; Wasilewski et al., 1988).

Self-management has been widely recognized as a core component in the clinical care of chronic illnesses (Lorig, 2001). In the case of asthma, psychoeducational interventions in facilitating adaptation to the challenges of the chronic disease have received growing recognition. These interventions can take many forms, including simple provision of written information, single-session educational talks, structured series of seminars, and highly elaborate group interventions for patients and their caretakers (Gibson & Boulet, 2001; Hui et al., 2002; Klinnert & Bender, 2002; Wilson, Mitchell, Rolnick, & Fish, 1993). The literature shows that most of these intervention programs are driven by the theoretical frameworks of empowerment and self-efficacy (Barlow, Wright, Shaw, Luqmani, & Wyness, 2002; Jerrett & Costello, 1996; McCathy, Herbert, Brimacombe, & Hansen, 2002). These pediatric asthma management programs are individual-oriented, targeting the caretakers (usually the mothers), with the assumption that parental self-efficacy in managing the child's condition mediates the impact of children's ill health on both illness outcome and maternal well-being (Rogers, Chamberlin, Ellison, & Crean, 1997; Zimmerman & Rappaport, 1998). Studies have shown that such educational approaches are effective in terms of adherence to medical treatment, disease outcome, and self-perceived functioning (Gibson & Boulet, 2001; Hui et al., 2002; McCathy et al., 2002), but often fail to address the psychosocial aspects (Barlow & Ellard, 2004; Brown, Bakeman, & Celano, 2002; McCathy et al., 2002; Wilson & Farber, 2003). Parents with children suffering from chronic illness are at risk of having immense distress and a tense relationship with the ill child (Gustafsson et al., 1994; Hyland, Ley, Fisher, & Woodward, 1995; Klinnert, McQuaid, McCormick, Adinoff, & Bryant, 2000; Smith, Hightstein, Jaffe, Fisher, & Strunk, 2002). Relational-oriented stress is common among Chinese mothers (Shen & Xu, 2002). In particular, mothers of children with chronic disease often report frustration in "controlling" the children's behavior and a sense of failure (Hayman, Mahon, & Turner, 2002; Kazak, Rourke, & Crump, 2003; McCathy, 2002; Zhu, 2002). The educational approach not only fails to address relationship issues, but may also reinforce the parents' pursuit for absolute control, amplifying their sense of failure to control and intensifying the parent-child relationship tension (Englund, Rydstrom, & Norberg, 2001; Wilson & Farber, 2003). This is particularly true to Chinese families because Chinese parents tend to impose high expectations on children, have a strong sense of obligation to be good parents, and are concerned about whether they are seen as good parents by the others (Ho, Chan, Peng, & Ng, 2001).

Our team has over 5 years of experience in conducting conventional asthma educational group intervention with Chinese patients in Hong Kong and generally shares the criticisms of the conventional psychoeducational approach discussed above. To address these weaknesses, we revamped the program by incorporating family therapy into the intervention and subsequently ran two pilot trials between 2002 and 2003. In doing so, special attention had been paid to some prominent features of Chinese families. For example, it is common in Chinese families to have a close

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parent-child relationship. The label “enmeshed relationship” must be used with great
cautions. Chinese parents tend to be very involved in the daily activities of their
children. This characteristic should be taken into account before concluding that the
parents are “over-controlling.” The experience of the pilot trials was encouraging,
and in light of the feedback collected, the program protocol was further revised and
became the evaluation subject of this study. Adopting a parallel group design, our
program is called We Together-We Success Parallel Group for Children with Asthma
and their Parents (WTWS). The word “We” in the title reflects the program’s special
emphasis on the relational dimension, including both parent-child and worker-client
interactions. While embracing the empowerment and self-efficacy theoretical frameworks and
the conventional educational approach, the WTWS program is characterized by two strategies of change. Firstly, it utilizes a two-stage intervention model.
Stage 1 is called the Asthma Management Part, which addresses self-management
knowledge and skills in relation to asthma. Stage 2 is called the Emotion Management
Part, which adopts a systemic/familial approach and addresses the psychosocial needs of
the patients and their caretakers, and the delicate interactions between them in
response to the disease. The rationale of such a logical sequence is two-fold. Asthma
management is a good entry point as it is the primary concern for which the parents seek help (Klinnert et al., 2000). Emotional needs are usually less ready for sharing
(Gartland & Dery, 1999; Goodwin & Tang, 1996). It is more effective to have the more
personal, sensitive issues being dealt with in the later part of the program when a
trustful working relationship is in place. Secondly, the WTWS group recognizes both
individual- and relational-oriented needs of asthma children and their parents. It
incorporates individual and familial interventions by adopting a parallel group design.
In each session, a group for patients and a group for their parents are conducted in
parallel in two nearby rooms, with intermittent joint activities in which the two
groups merge together in a single room. Parallel group design has been found to be an
effective intervention modality for children and parents confronted by various family
relationship problems (Chan & Cheung, 1998; Chan, Yeung, Chu, Tsang, & Leung,
2002; Goodwin & Tang, 1996; Yeung, Cheng, Au, & Yuon, 1999). During joint activi-
ties, relational and familial issues can be more realistically assessed and dealt with
because the therapist can have a live platform to observe, enact, and modify the
parent-child interactions. Strategies such as boundary setting, circular questioning,
and various forms of enactment are powerful intervening techniques (Liebman, Mi-
nuchin, & Baker, 1974).

The finalized WTWS protocol has 5 sessions for the Asthma Management Part and
6 sessions for the Emotion Management Part. Each session usually lasts for about
2 hours. A typical session includes three parts. The first 30 minutes is for joint activity
in which parents and children share the experience of completing the take-home tasks
agreed upon in the previous session. The second part is for the parallel groups and
lasts for about an hour. Children and parents are facilitated to work separately on a
common theme. The last part is for joint activity again in which children and parents
meet to discuss and try out ways of jointly resolving some issues related to the theme.
They will then plan to transfer the new knowledge and skills into daily life and
practice them in the coming week. Detailed session themes of the WTWS parallel
group are summarized in Table 1.

Being designed for Chinese families, the intervention program differed from similar
programs in the West in a number of ways. The most notable differences are firstly


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<table>
<thead>
<tr>
<th>Session</th>
<th>Parents</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asthma management part</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1 | Ice-breaking and team building  
Basic understanding of asthma—Myths and facts | The themes for the children group synchronize with the parents’ group so as to create synergy between the two groups |
| 2 | Living with asthma—You can, I can, we can (attitude change) | Games are used as the primary intervention strategy in enhancing the children’s understanding on both “why” and “how” |
| 3 | Preventing asthma attack—Knowledge and skills | Joint activities are for enacting the parents and patients to jointly practice and implement the new techniques learned |
| 4 | Coping with attack—The good practice | |
| 5 | Traditional Chinese practice in living with asthma—Myths and facts | |
| **Emotion management part** | | |
| 6 | Multidimensional aspects of asthma—Physical, emotional, and social dimensions | Same as the parents’ group |
| 7 | Understanding and appreciating my child and myself | Understanding and appreciating my parents and myself |
| 8 | Relating with a child with asthma | Relating with parents with a child with asthma |
| 9 | Beyond being a parent of a child with asthma | Beyond being a child with asthma |
| 10 | Allowing the child to grow up | Behaving to foster parents’ endorsement for growing up |
| 11 | Enhancing hope and sense of self-efficacy  
Review and consolidation | Same as the parents’ group |

facilitation of self- and mutual appreciation, which is considerably emphasized in the group. Confucianism teaches us to be humble and self-demanding. Many Chinese parents are overly reserved in self-appreciation or appreciating their children. This is also true for Chinese children who acquire the values in the family. Secondly, somatic problems are frequently used as an entry point for addressing psychosocial issues. Chinese people tend to somatize and feel much more comfortable seeking help for somatic problems (Ustun & Sartorius, 1995, p. 285). The parents often report chronic fatigue, sleeping problems, headache, indigestion, etc., in the group. These are good opportunities to bring out the mind/body connection and deliberate on the underlying psychosocial issues. Thirdly, traditional Chinese medicine (TCM) is discussed in the group. The purpose is more than simply introducing the usage of Chinese herbal therapy and acupuncture in asthma management. Deeply influenced by the Yin-Yang Theory and Daoism, TCM adopts a systemic perspective of health (Cai, 1995). The key to good health is balance, internally as well as with the environment. This concept of balance applies in all aspects of living, and is deeply ingrained in the minds of many Chinese individuals. Discussing TCM can bring out the issue of how to strike a balance, say between caring for and letting go, intimacy and maintaining a boundary,
and being self-driven and self-acceptance. Lastly, the group emphasizes the importance of allowing the child to grow up. Over-compensation behavior is very common among Chinese parents with sick children. They blame themselves and they underestimate the ability and the growth and development of the children. They are so caring that they unintentionally encourage regression in the children. No matter whether the children accept or reject the excessive care, it is still an important issue to be addressed.

PARTICIPANTS AND METHODS

A randomized waitlist-controlled clinical trial design was adopted in this study (see Figure 1 for a graphical illustration of the procedures). Participants were children with stable asthma recruited from the Pediatric Chest Clinic of the Prince of Wales Hospital, Shatin, Hong Kong, in 2004. They were between 7 and 12 years of age and able to cooperate with the tests. The diagnosis of asthma was made on standard grounds advocated by the United States National Heart, Lung and Blood Institute (Warner, 1992). We defined stable asthma as no asthmatic exacerbation for the preceding 4 weeks necessitating oral prednisolone or an increased use of inhaled corticosteroids, the use of rescue treatment no more than three times a week, and with no clinical indication for change in treatment medication. Children who had other concomitant nonasthmatic chronic airway diseases such as bronchiectasis; those who used any prescription or over-the-counter medication that might affect the course of asthma or its treatment; and those who were currently involved in any other asthma treatment trial were excluded. Approval from the Ethics Committee of the Chinese University of Hong Kong had been obtained for this study. Written informed consent was obtained from the parents or guardians of the participants before the trial.

Measures

Measures for the children were:

C1: Exhaled nitric oxide (eNO) is a marker of airway inflammation. A higher eNO level is seen in poorly controlled asthma. In this study, eNO was measured by a rapid-response chemiluminescent method using the Sievers 280i NOA analyzer (Sievers, Boulder, CO, USA), with a sensitivity from 1 to 200 ppb, a resolution of 1 ppb, and an accuracy of ± 1 ppb, according to the American Thoracic Society guidelines (Anonymous, 1999). The participants were comfortably seated without a nose clip, and

![Figure 1: Process of the Randomized Waitlist-Controlled Clinical Trial](image)

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inhaled NO-free air from a reservoir and subsequently exhaled against a resistor. The flow rate was set at 50 ml/s. This on-line measurement was taken in triplicate and the average was recorded.

C2: Spirometry (SpirolabII, MIR, Italy) using a standard technique measured forced expiratory volume in the first second (FEV₁) and forced vital capacity (FVC). The best of three efforts obtained was compared with local age- and sex-matched reference values (Ip, Karlberg, Karlberg, Luk, & Leong, 2000). FEV₁ and FVC are markers of airway size. Poorly controlled asthma has more airway inflammation, which may lead to narrowing of the airways and thus reduced FEV₁ and FVC.

C3: A self-constructed 5-item scale was used to measure the patient’s adjustment to asthma as rated by his/her caretaker. The five areas of adjustment were emotional and behavioral well-being, general physical health, family, school life, and social life. High levels of reliability were obtained for this scale. Interitem correlations ranged from .24 to .79 (mean = .57) at pretest, and from .57 to .91 (mean = .72) at posttest. Internal consistency, as indicated by Cronbach’s α, was .87 (pretest) and .93 (posttest).

Measures for the caretakers were:

P1: Anxiety level of the caretakers was obtained with the Anxiety Subscale of the Chinese version Hospital Anxiety and Depression Scale (HADS) (Leung, Ho, Kan, Hung, & Chen, 1993; Leung, Wing, Kwong, Lo, & Shum, 1999). HADS is a 14-item self-report questionnaire that has been validated in a Chinese population in Hong Kong. It has good internal consistency, with Cronbach’s α at .81 and .74 for the anxiety and depression subscales, respectively.

P2: The Emotion Scale of the body-mind-spirit well-being inventory (BMSWBI) was used to measure caretakers’ positive and negative emotions (Ng, Yau, Chan, Chan, & Ho, 2005). The emotion scale is a 19-item self-report questionnaire. It has good internal consistency, with Cronbach’s α at .92, .88, and .92 for the whole scale, positive emotions, and negative emotions subscales, respectively.

P3: Health-related quality of life of the caretakers was measured with the Standard Short Form 12 (SF-12) Chinese (Hong Kong) Version 1, yielding two subscores: the physical and mental health components (Health Assessment Lab, 1995). SF-12 is a 12-item self-report questionnaire and a Chinese version has been validated in Hong Kong. It has been shown to have high test-retest reliability (between .86 and .89).

P4: A self-constructed 5-item scale was used to measure caretakers’ perceived efficacy in the management of the child’s asthma. The five areas included were general knowledge of asthma, management of asthma attacks, use of medication and medical equipment for asthma, prevention of asthma attacks, and general caring for a child with asthma. High levels of reliability were obtained for this scale. Interitem correlations ranged from .66 to .89 (mean = .77) at pretest, and from .79 to .92. (mean = .86) at posttest. Cronbach’s α was .94 (pretest) and .97 (posttest).

Procedures

Patients and their caretakers were recruited at the pediatric chest clinic when they returned for scheduled follow-up consultation. Recruitment was conducted about a month before the commencement of the intervention group. Sampling method was 100% consecutive sampling, that is, all patients meeting the inclusion criteria were
invited to participate in the study. Written informed consent was obtained from each participant. Recruited patients and their caretakers were randomly assigned to the active or the control group: the first recruited patient/caretaker pair was assigned to the active group, the second pair recruited to the control group, the third pair to the active group, and so on. Effectively, each patient/caretaker pair had a 50% chance of being in either group.

Baseline (pretest) measures of the children (measures C1–C3) and their caretakers (measures P1–P4) from the two groups were obtained before commencement of the intervention. The scheduled intervention lasted for 11 weeks and during this time the control group did not receive any form of active psychosocial intervention or therapy. The two groups underwent repeated assessments once the active group had completed the intervention. The process then repeated itself, whereby the initial control group underwent intervention and the original active group did not receive further psychoeducational program/therapy, allowing us to assess the maintenance effects of the intervention. The psychosocial measures (i.e., C3 on the children and P1–P4 on the parents) were taken after the second intervention period had lapsed. The lung function measures (i.e., C1 and C2) were not performed at this time point because of resource constraints. Because there was no control group when measuring the maintenance effects in a randomized waitlist-controlled trial design, it was decided that the resource-consuming lung function tests would not be pursued further.

Owing to the limited size of each group (the capacity of each group was up to 10 participants), the procedure described above was repeated once more so as to achieve a larger sample size. Mainly due to resource constraints, the target sample size of the current study was 40, which was acceptable for early-stage efficacy evaluation of a group psychosocial intervention. With about 20 participants in each group, the power was about .50 if the effect size was medium, and about .85 if the effect size was large (Cohen, 1988).

**Statistical Analysis**

Intervention effect was evaluated by comparing the active and control groups. Repeated-measures ANOVA with time (pretest and posttest) as the within-subjects variable and group (active group and control group) as the between-subjects variable was used to detect any main effects of time and group as well as Time × Group interaction of each of the outcome measures. In case of significant results, simple effect analysis was performed to examine where the differences occurred.

Maintenance effect on the active group was examined with psychosocial measures (i.e., C3 and P1–P4). Repeated-measures ANOVA was performed, with time (pretest, posttest, and follow-up) as the within-subjects variable. “Simple” and “repeated” contrast methods were used to detect any differences between time points and reveal the serial trends.

**RESULTS**

Figure 2 shows the flow of participants through each stage of the randomized trial. Forty-six children with asthma were invited to participate in the study. Nine participants dropped out before the end of the study, with 3 and 6 from the active and the control group, respectively. Attrition rates for the active and control groups were 13.0% and 26.0%, respectively. The main reason for dropping out was unavailability to attend scheduled sessions as they clashed with school activities. The higher attrition
rate in the control group was largely attributed to the fact that the participants of that group had to wait for a longer period of time for the intervention program. Attrition analysis revealed that the dropouts had a longer duration of asthma and there were more females, but otherwise had baseline demographic characteristics and respiratory measures similar to the participants (Table 2). Data from the remaining 37 children, 20 in the active and 17 in the control group, were used in the final analysis. Their mean age was 9.2 years ($SD = 1.5$) and their mean duration of illness was 5.7 years ($SD = 2.4$, range: 2–12). Nine participants had mild persistent asthma and they were using inhaled corticosteroids at a beclomethasone equivalent dosage of 100–200 $\mu$g/day. The remaining participants had mild intermittent asthma and were using an inhaled bronchodilator on an as-required basis. There were no significant differences in demography between the active and the control groups. They also had similar
baseline lung function indices. However, participants in the active group had higher baseline eNO levels than those in the control group (Table 3). The 20 participants in the active group attended at least 8 out of the total 11 sessions of the group intervention (8 sessions: four pairs; 9 sessions: seven pairs; 10 sessions: six pairs; and 11 sessions: three pairs).

### Intervention Effect

The pre- and postintervention respiratory and behavioral measures of the active and control groups are summarized in Table 4. Using repeated-measures ANOVA, significant effects were found in eNO level, patient’s adjustment to asthma score, and parents’ perceived efficacy in asthma management score. For the eNO level, there was a significant Time × Group interaction, $F = (1, 28) = 5.76$, $p = .023$. Simple analysis revealed a marginally significant decrease in eNO level at posttest in the active group, $t(15) = 1.98$, $p = .067$, and an insignificant increase in the eNO level at posttest in the control group, $t(13) = -1.46$, $p = .168$.

As for the patient’s adjustment to asthma score, the main effect of group was significant, $F(1, 31) = 13.62$, $p = .001$. Further analysis showed that the two groups had similar pretest scores, but the posttest score of the active group was significantly higher than that of the control group, $t(1, 31) = 4.55$, $p = .001$. For the total patient’s adjustment to asthma score, Time × Group interaction was not statistically significant, $F(1, 32) = 2.40$, $p = .132$. Among the five domains of child adjustment to asthma, Time × Group interaction was marginally significant in the general physical health subscore, $F(1, 32) = 3.82$, $p = .059$.

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TABLE 3
Baseline Demographic, Lung Function, and Quality of Life Data of the Active and Control Groups

<table>
<thead>
<tr>
<th></th>
<th>Active (N=20)</th>
<th>Control (N=17)</th>
<th>t</th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>9.15 (1.60)</td>
<td>9.35 (1.37)</td>
<td>−0.41</td>
<td></td>
<td>.684</td>
</tr>
<tr>
<td>Duration of illness (years)</td>
<td>5.55 (2.61)</td>
<td>5.88 (2.23)</td>
<td>−0.41</td>
<td></td>
<td>.682</td>
</tr>
<tr>
<td>Family size</td>
<td>4.05 (0.89)</td>
<td>4.00 (0.94)</td>
<td>0.17</td>
<td></td>
<td>.869</td>
</tr>
<tr>
<td>Sex (male:female)</td>
<td>12:8</td>
<td>13:4</td>
<td>1.43</td>
<td></td>
<td>.161</td>
</tr>
<tr>
<td>Parent’s age (years)</td>
<td>40.95 (6.13)</td>
<td>38.59 (3.14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent’s sex (male:female)</td>
<td>1:19</td>
<td>0:17</td>
<td>0.87</td>
<td>.350</td>
<td></td>
</tr>
<tr>
<td>Lung function</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV₁ (l/min)</td>
<td>109.83 (15.96)</td>
<td>112.07 (26.20)</td>
<td>−0.30</td>
<td></td>
<td>.767</td>
</tr>
<tr>
<td>FEV₁/FVC ratio</td>
<td>79.06 (12.08)</td>
<td>81.64 (8.89)</td>
<td>−0.67</td>
<td></td>
<td>.507</td>
</tr>
<tr>
<td>eNO (ppb)</td>
<td>87.71 (45.97)</td>
<td>50.71 (39.88)</td>
<td>2.34</td>
<td></td>
<td>.027</td>
</tr>
</tbody>
</table>

Note. eNO = exhaled nitric oxide; FEV₁ = forced expiratory volume in the first second; FVC = forced vital capacity.

Finally, a significant time effect, $F(1, 30) = 7.14$, $p = .012$, group effect, $F(1, 30) = 8.41$, $p = .007$, and Time × Group interaction, $F(1, 30) = 8.71$, $p = .006$, were found for parents’ perceived efficacy in asthma management. Simple analysis revealed that the two groups were not statistically different at pretest, $t(1, 30) = 0.03$, $p = .975$. At posttest, the active group experienced a substantial increase while the control group remained stable, resulting in a statistically significant difference between the two groups, $t(1, 30) = 4.55$, $p < .001$.

**Maintenance of Intervention Effect**

Table 5 summarizes the serial trend of outcome measures of the active group. Seven out of eight of the behavioral measures at follow-up were significantly different from that at pretest: patient’s adjustment to asthma; parents’ perceived efficacy; HADS anxiety score; BMSWBI negative emotion score and total score; and SF-12 physical component score and mental component score (all $p < .05$). The results suggested that most intervention effects were maintained and continued to progress steadily in the 11 weeks following the intervention. There was a general trend of reducing variance in most measures between pretest, posttest, and follow-up. The convergent trend seemed to be partly due to bigger improvement in clients who had a lower baseline.

Using repeated-measures ANOVA to examine the serial trend, significant results were found in five out of eight of the behavioral measures: parents’ perceived efficacy in asthma management score ($p = .003$); HADS anxiety score ($p = .003$); BMSWBI negative emotion subscore ($p = .001$); and total score ($p = .002$); and SF-12
### Table 4
Repeated-Measures ANOVA of Pretest and Posttest Measures of the Active and Control Groups

<table>
<thead>
<tr>
<th>Measures for patients</th>
<th>Active</th>
<th>Control</th>
<th>Repeated-Measures ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Adjustment to asthma*</td>
<td>18</td>
<td>7.33</td>
<td>1.49</td>
</tr>
<tr>
<td>eNO (ppb)</td>
<td>16</td>
<td>87.71</td>
<td>45.97</td>
</tr>
<tr>
<td>FEV₁ (l/min)</td>
<td>18</td>
<td>109.83</td>
<td>15.96</td>
</tr>
<tr>
<td>FEV₁/FVC ratio</td>
<td>18</td>
<td>79.06</td>
<td>12.08</td>
</tr>
<tr>
<td>Measures for parents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived efficacy</td>
<td>19</td>
<td>6.36</td>
<td>2.66</td>
</tr>
<tr>
<td>HADS anxiety</td>
<td>19</td>
<td>5.37</td>
<td>3.82</td>
</tr>
<tr>
<td>BMSWBI emotion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>20</td>
<td>47.75</td>
<td>21.66</td>
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<tr>
<td>Negative</td>
<td>18</td>
<td>31.17</td>
<td>24.10</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>124.22</td>
<td>33.95</td>
</tr>
<tr>
<td>SF-12</td>
<td></td>
<td></td>
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<tr>
<td>Physical health</td>
<td>20</td>
<td>47.14</td>
<td>7.03</td>
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<tr>
<td>Mental health</td>
<td>20</td>
<td>46.50</td>
<td>7.55</td>
</tr>
</tbody>
</table>

Note. BMSWBI = body-mind-spirit well-being inventory; eNO = exhaled nitric oxide; FEV₁ = forced expiratory volume in the first second; FVC = forced vital capacity; HADS = hospital anxiety and depression scale.

*Among the five domains of Adjustment to Asthma, general physical health subscore had marginally significant Time x Group interaction, $F(1, 32) = 3.82, p = .059$. 

<table>
<thead>
<tr>
<th>Measures for patients</th>
<th>Pretest (T0)</th>
<th>Posttest (T1)</th>
<th>Follow-Up (T2)</th>
<th>Repeated-Measures ANOVA</th>
<th>Effect Size (Partial $\eta^2$)</th>
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<tr>
<td></td>
<td>$N$</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Adjustment to asthma</td>
<td>18</td>
<td>7.33</td>
<td>1.49</td>
<td>7.79</td>
<td>1.21</td>
</tr>
<tr>
<td>eNO (ppb)</td>
<td>16</td>
<td>87.71</td>
<td>45.97</td>
<td>60.47</td>
<td>38.37</td>
</tr>
<tr>
<td>FEV$_1$ (l/min)</td>
<td>18</td>
<td>109.83</td>
<td>15.96</td>
<td>110.33</td>
<td>13.17</td>
</tr>
<tr>
<td>FEV$_1$/FVC ratio</td>
<td>18</td>
<td>79.06</td>
<td>12.08</td>
<td>81.33</td>
<td>11.89</td>
</tr>
<tr>
<td>Measures for parents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived efficacy</td>
<td>19</td>
<td>6.36</td>
<td>2.66</td>
<td>8.53$^{*}$</td>
<td>1.33</td>
</tr>
<tr>
<td>HADS anxiety</td>
<td>19</td>
<td>5.37</td>
<td>3.82</td>
<td>5.37</td>
<td>2.95</td>
</tr>
<tr>
<td>BMSWBI Emotion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>20</td>
<td>47.75</td>
<td>21.66</td>
<td>53.45</td>
<td>18.68</td>
</tr>
<tr>
<td>Negative</td>
<td>18</td>
<td>31.17</td>
<td>24.10</td>
<td>36.28</td>
<td>19.24</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>124.22</td>
<td>33.95</td>
<td>128.00</td>
<td>25.20</td>
</tr>
<tr>
<td>SF-12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical health</td>
<td>19</td>
<td>46.83</td>
<td>7.08</td>
<td>45.63</td>
<td>6.71</td>
</tr>
<tr>
<td>Mental health</td>
<td>19</td>
<td>46.59</td>
<td>7.74</td>
<td>46.37</td>
<td>6.51</td>
</tr>
</tbody>
</table>

Note. BMSWBI = body-mind-spirit well-being inventory; eNO = exhaled nitric oxide; FEV$_1$ = forced expiratory volume in the first second; FVC = forced vital capacity; HADS = hospital anxiety and depression scale.

*Mean different from the preceding time-point at the .05 level.

$^{*}$Mean different from that of pretest at the .05 level.
physical component score ($p = .002$). Medium effect size (partial $\eta^2$) was found in these measures.

**DISCUSSION**

In summary, the findings from the current study provided evidence supporting the efficacy of the WTWS program and the value of incorporating family therapy into the asthma psychoeducational program. Analyses of immediate intervention effects and serial trend revealed significant improvements in patients and their parents in both symptom-related and psychosocial outcome measures.

Similar to the conventional psychoeducational approach, improvements in symptom-related outcome measures were found. These included patients’ eNO levels and adjustment to asthma, and parent’s perceived efficacy in asthma management. It has to be noted that eNO is a validated marker of underlying eosinophilic airway inflammation, which is a predictor of asthmatic exacerbation and a precursor of airway remodeling. Monitoring eNO would indeed provide better information in terms of asthma control than simple spirometry. Therefore, despite static spirometric measures, the significant improvements in eNO levels after intervention provided highly favorable support for the efficacy of the intervention. On top of these expected improvements, there were significant improvements in measures of mental health and relationships, which were the primary reason for incorporating family therapy into the WTWS program. The adjustment to asthma scale concerned both the patient’s own well-being and the relationship with his/her significant others in coping and living with the illness. The findings seemed to support a multidimensional intervention strategy. An individual-focused psychoeducational approach and relationally-focused family therapy approach could complement each other and bring about more comprehensive benefits for patients and their parents.

Serial trend analysis revealed an interesting pattern of progress in the parents. At the end of intervention, improvement in perceived efficacy in asthma management was the most prominent among all outcome measures in parents. This phenomenon was understandable because their voluntary participation in the study suggested that these parents were likely to be keen learners. On the other hand, the changes in parental mental health measures were not statistically significant at this time point. Interestingly, however, at the 11-week follow-up, a statistically significant improvement emerged in nearly all (five out of six) of these measures. These included HADS anxiety score, BMSWBI negative emotion and total emotion scores, and SF-12 physical and mental component scores. Focus group interviews with the participants conducted at posttest and follow-up provided some cues for understanding such a phenomenon. Many parents were busy and found attending the program on 11 consecutive weekends a huge commitment. Emotional and behavioral issues brought up in the sessions could lead to temporary distress. Completing between-session home assignments could also be a source of stress as it took time and required the cooperation of the children. Nevertheless, most of the parents expressed that the effort was worthwhile. This view was echoed by the high attendance and low attrition rate. After completion of the program, most parents felt that the burden was much lessened. The newly learned knowledge and skills in managing a child’s asthma and living with the child might be gradually assimilated and applied to real-life situations. This might be a possible reason for the continuous improvement in psychosocial measures after

intervention. It also reflected the value of organizing follow-up booster and reunion sessions. It was also noted in the serial trend analysis of the active group that participants became increasingly homogenous; the standard deviations of all outcome measures decreased substantially from pretest to posttest to follow-up. This suggested that participants with poorer baseline conditions might have benefited more from the intervention program than those with better baseline conditions.

There were several limitations in the current study. Firstly, although there were advantages with a waitlist-controlled trial design, the control group did not receive any intervention during the period for comparison. Social gathering effects could not be offset. Future studies may consider adopting a social gathering control group, although it will require more resources. Secondly, the WTWS program consisted of both conventional psychoeducational intervention and the additional family therapy. The contributions of the two components to the outcome could not be differentiated from one another. This question could be addressed in future studies by setting up a comparison arm consisting of conventional asthma psychoeducation only. Thirdly, lung function measures were not pursued at the follow-up due to resource constraints. The continued improvement in psychosocial measures revealed in the current study suggests that it is worthwhile looking at lung functions at subsequent follow-ups. Fourthly, the sample size in the current study was only marginally adequate to detect significant improvements in some outcome measures. Fifthly, mainly children with mild asthma were included in this study, leaving the question as to whether the same results will be seen in cases with more severe disease unknown. Finally, the follow-up period in this current study was relatively short. It is unclear whether such positive beneficial effects would persist after, say, 6, 9, or 12 months. A longer follow-up period is suggested for future studies to examine the long-term effect.

In conclusion, the results of the current clinical trial were promising and provided preliminary support for incorporating family therapy into asthma psychoeducational group intervention. Furthermore, substantive studies addressing the limitations of the current study, as discussed above, can provide more conclusive findings on the efficacy of such an integrated approach and the value of incorporating family therapy into the program.

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