



Impacts of Online Peer Support for Children with Asthma and Allergies: “It just helps you every time you can't breathe well”

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Children with asthma and allergies experience social isolation and gaps in social support particularly from peers. The objective of this pilot study was to design and test an accessible online support intervention for these children. Support was delivered by peer mentors with asthma and allergies and a professional. Weekly support groups were conducted over 8 weeks using Go to Meeting and Club Penguin. Quantitative measures and a qualitative interview were administered. Significant increases in perceived support and support-seeking coping and trends in decreased loneliness emerged at post-test. Participants also reported increased self-confidence and satisfaction with the intervention.

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ASTHMA IS THE MOST common respiratory disease in children. Worldwide, the prevalence of asthma and severe allergies continues to rise, for reasons that are as-yet uncertain (Boulet et al., 2008; Global Initiative for Asthma [GINA] (GINA), 2008; Lieberman et al., 2006). The lifetime risk of asthma is estimated to be 33.9% (GINA, 2008; To et al., 2002). Allergies and asthma commonly co-exist; 85% of people with asthma have allergies (Ben-Shoshan & Clarke, 2010; GINA, 2008). Unlike other chronic diseases, the risk of new diagnosis of asthma and allergies is highest in infants and young children (Ben-Shoshan & Clarke, 2010; Li & Newcomb, 2009; Rosychuck et al., 2010; To et al., 2002).

Asthma and severe allergies impose major burdens on children through physical health problems, psychosocial concerns, medication costs, missed school, and poor quality of life, and health care costs (Bahadori, Quon, Doyle-Waters, Marra, & FitzGerald, 2010; Ben-Shoshan & Clarke, 2010; Cummings, Knib, King, & Lucas, 2010; McNelis, Musick, Austin, Larson, & Dunn, 2007; Mo, Robinson, Choi, & Li, 2003). Asthma is the most common cause of preventable hospitalization in children (GINA, 2008; Rosychuck et al., 2010). Over half (56%) of the population with asthma have uncontrolled exacerbations each year which result in significant direct health costs (emergency department visits, hospitalizations) and indirect costs (e.g., time off school) (Bahadori et al., 2010; Rosychuck et al., 2010; To et al., 2002). For many, asthma can be controlled by avoiding exposure to triggering stimuli and adhering to prescribed asthma plans and

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medication regimes Newcomb, McGrath, Covington, Lazarus, and Janson (2010)). About 10% of people have severe asthma that persists despite consistent medical control and self-care (GINA, 2008; Smith et al., 2005).

Recent studies reveal social isolation and significant gaps in social support for children with asthma and allergies and their parents, (Akeson, Worth, & Sheikh, 2007; Cummings et al., 2010; Flores, Abreu, Tomany-Korman, & Meure, 2005; Kastner, Harada, & Wasserman, 2010; McNelis et al., 2007; Protudjer, Kozyrskyj, Becker, & Marchessault, 2009) and limited support in the community (Boulet et al., 2008; Mandell, Curtis, Gold, & Hardie, 2005; Newcomb et al., 2010; Tsuyuki, Sin, & Sharpe, 2005). Children often hide their condition from peers, refuse to take medications in public, and are reluctant to seek assistance in trigger avoidance or managing symptoms because they lack social support (Akeson et al., 2007; Cummings et al., 2010; Flores et al., 2005; Kastner et al., 2010; McQuaid, Kopel, Klein, & Fritz, 2003; McNelis, 2007; Protudjer et al., 2009; Yang, Lunt, & Sylva, 2009). While asthma education programs can increase medication compliance and lower the risk of emergency department visits and hospital admissions, (Boulet et al., 2008; McQuaid et al., 2003) affected children and their parents report lack of support and education relevant to day-to-day management and psychosocial well-being (Kastner et al., 2010; Marklund, Ahlstedt, & Nordstrom, 2004; Penza-Clyve, Mansell, & McQuaid, 2004; Protudjer et al., 2009). Education programs often emphasize clinical control and medication compliance rather than the emotional, social, and occupational problems that influence medication adherence and quality of life (Boyd et al., 2010; Penza-Clyve et al., 2004; Smith et al., 2005; Yang et al., 2009). Moreover, education delivered in health care settings tends to concentrate on the parent's role in managing the child's asthma and allergies rather than on instilling confidence in the children to cope with their condition on their own (Cicutto et al., 2005; Houle, Leo, & Clark, 2010).

Although children with supportive families have better control of asthma and allergies (Bahadori et al., 2010; Cummings et al., 2010), they become more involved in their own care as they grow older. At school or in community activities, children must avoid triggers, identify symptoms, seek support from peers, teachers, or even strangers, and rely on other people to assist with management. As they age, children make decisions about risks and activity engagement (Boyd et al., 2010; Flores et al., 2005; Penza-Clyve et al., 2004). Recent studies reveal that children with asthma and allergies want support from others with asthma and allergies to help them cope with social isolation and stress (Akeson et al., 2007; Cummings et al., 2010; Flores et al., 2005; McNelis, 2007; Protudjer et al., 2009; Yang et al., 2009). Social support influences health status, health behaviours, and use of health services (Gottlieb, 2000; Stewart, 2000; Uchino, 2004). Yet, interventions aimed at children with asthma and allergies have typically emphasized education

aimed at behaviour modification and medication management (Boyd et al., 2010; Cummings et al., 2010; Flores et al., 2005; Penza-Clyve et al., 2004; Smith et al., 2005; Yang et al., 2009); are delivered by health professionals rather than peers (Smith et al., 2005); and are not designed to provide social support (Akeson et al., 2007, Boyd et al., 2010; Kastner et al., 2010; Smith et al., 2005). To respond to this gap, the objective of this pilot study was to design and test an online peer support intervention for children with asthma and severe allergies.

Children and adults are increasingly turning to the Internet to meet friends on social networking sites, find health information, and seek support to manage chronic health conditions (Cuijpers, van Straten, & Andersson, 2008; Gustafson et al., 2008; Han et al., 2010; Meric et al., 2002; Murray, Kerr, Stevenson, Gore, & Nazareth, 2006; Patel, 2005; Stinson, Wilson, Gill, Yamada, & Holt, 2009). However, websites typically provide only information and education not social support (Gustafson et al., 2008; Han et al., 2010). In our needs assessment study (Author xxx), parents complained that although there were websites providing information about asthma and allergies, none offer support to help them interpret the information and none provide social support to their young children with asthma and allergies. In our previous studies (Authors xxx), parents and children indicated that online support would meet affected children's needs more efficiently and be more accessible than face-to-face support. In conditions like anaphylaxis, where smaller populations are affected, there may not be children in the local area with the condition. Internet technology can increase interactions among adolescents with other chronic conditions (Patel, 2005; Stinson et al., 2009). However, no online peer support interventions have been designed for children (Patel, 2005).

Research Questions

The research questions guiding the study were: 1) What are the impacts of the online peer support intervention on children's support needs? 2) What are the impacts of the support intervention on children's support-seeking coping? 3) What are the impacts of the support intervention on loneliness and isolation? 4) What were any unanticipated impacts of the support intervention? 5) To what extent were participants satisfied with the intervention?

Hypotheses

Following the online peer support intervention, children with asthma and allergies would report: 1) increased satisfaction with support; (2) increased social support from family and friends; (3) increased support-seeking coping; and, (4) reduced loneliness and social isolation.

Design and Methods

Intervention Design and Implementation

This pilot support intervention study was designed based on the preferences articulated in interviews of 45 parents and 20 children (Author, xxx) and insights from our online support group intervention for adolescents with asthma and allergies (Author, xxx). To summarize, parents and children strongly recommended an online weekly support group, delivered by slightly older peer mentors who are assisted by a health professional. Five peer mentors with asthma and allergies (13 to 20 years old) were prepared using a training program developed initially for the online support intervention for adolescents, but adapted for the needs of younger children. A psychologist was trained to serve as consultant for peer mentors and participants. Suggested content and components for the children's support group included: strategies for coping with asthma and allergies; role playing and games to help children deal with difficult situations; fun and enjoyment; and presentations by positive role models. Two same-age children provided feedback on the prepared content and PowerPoint presentations prior to each session. Our previous research on online support groups for adolescents with chronic health conditions revealed that small groups (four to six people) matched by condition and gender were conducive to development of supportive relationships. Both children and parents were concerned about Internet safety and wanted online delivery to be private and secure. However, they thought choice of technology was less important than meeting and supporting others. Safety and security, ease of use, technical support, and capacity for children to speak to each other were priorities in selecting the appropriate technology.

After assessing varied online meeting and social networking options, the research team selected GoToMeeting® for support group sessions and Club Penguin® for the children to meet socially during support group sessions and between group meetings. GoToMeeting® is a secure online meeting platform which enables up to fifteen participants to share their computer screen or specific applications like PowerPoint, transfer keyboard and mouse control, interact on the screen using drawing tools pen, highlighter, arrow and spotlight tools, and, chat with groups or individuals. The support group sessions, including all audio, chat, and on-screen activity, were recorded for review and evaluation. In comparison with other meeting platforms, GoToMeeting was found to be most navigable by the young children involved in the study. Unlimited meetings and real-time support were available for participants and project staff for a reasonable monthly fee. Children without headsets or a microphone were provided with this equipment to enable them to talk in "real time".

Club Penguin® is a social networking website for children in which user-controlled Avatars explore and interact in an

imaginary arctic community. In their penguin Avatar, study children could chat and play games with online friends. As part of Club Penguin's® security, the website and chat were continually monitored to ensure safety and appropriate behavior. In this pilot study, GoToMeeting® and Club Penguin® interfaces were easy to set up, user friendly, and reliable. The project manager ensured that GoToMeeting® and Club Penguin® were installed and worked on the child's computer, and then helped the child become familiar with these tools.

Consistent with on children's and parents' preferences, support was provided every week over an eight week period. Participants were offered a choice of times convenient to the children's and mentor's schedules. Online support group sessions lasted 45 to 120 minutes including the time spent by the group on Club Penguin®. Children reported that they spent one to five hours a week on Club Penguin over and above the scheduled sessions. Themes discussed during the support group sessions included: children's experiences with asthma and allergies, individual differences and similarities in experiences, challenges with asthma and allergies, wishes and dreams, triggers, coping strategies, planning for sports and activities, communicating with family, friends, and the public, dealing with feelings related to asthma and allergy, and Olympic/celebrity role models with asthma and allergies.

The university ethics board approved the study. The children provided signed informed assent and their parents provided informed consent.

Data Collection

Standardized measures were administered over the telephone at pre-test and post-test by a trained graduate student. The quantitative measures and qualitative interview guides were pilot tested with four children. Minor changes were then made to the interview guide to ensure that questions were easily understood by young children. Children were given Club Penguin® subscriptions each time they completed the outcome measures. Demographic data collected at pre-test included: age of diagnosis of asthma and/or allergies; parents' level of education; ages of child, siblings, and parents; parents' employment; and family income. Participants could refuse to answer any questions.

Quantitative Data

Three quantitative measures: 1) Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988); Self-Report Support Seeking Measure: support seeking subscale (Causey & Dubow, 1992); and 3) Loneliness and Social Dissatisfaction Scale; (Cassidy & Asher, 1992) were administered by phone at pretest (one month before the first support group session) and post-test (within a month following the final online support group session).

The *Multidimensional Scale of Perceived Social Support* (Zimet et al., 1988; Zimet, Powell, Farley, Werkman, & Berkoff, 1990), a 12-item measure, was used to assess perceived social support from family, friends with a seven point Likert-type scale ranging from very strongly disagree (1) to very strongly agree (7). The maximum score on the total scale is 84 and the minimum score is 12; higher scores indicate more perceived support. On the family and friends subscales (4 items), the maximum score is 28 and the minimum is 4. This measure assesses perceived adequacy of support from family members (items 3, 4, 8, and 11), support from friends and relatives (items 6, 7, 9, and 12), and support from others. A sample item for family support is, "My family really tries to help me." A sample item for friend support is, "I can count on my friends when things go wrong." Good internal reliability has been reported. Cronbach's alpha for the total scale was .88 and the family and friends subscales ranged from .85 to .91 (Zimet et al., 1990). In this study, the Cronbach's alpha for the MSPSS total scale was .74 (pre-test) and .91 (post-test), the family subscale was .68 (pre-test) and .82 (post-test), and friends subscale was .71 (pre-test) and .76 (post-test). Good to excellent factorial validity, concurrent validity, and good construct validity have been established with a variety of diverse populations (Edwards, 2004; Fischer & Corcoran, 1994).

The "seeking support" subscale from the *Self-Report Support Seeking* (Causey & Dubow, 1992) measure was used to assess willingness and ability to seek social support. Children were asked questions such as: "When you have an argument or fight with a friend what do you usually do about it?" Eight possible responses include, "Tell a friend or family member what happened", or "Talk to somebody about how it made you feel." Answers are recorded on a 5-point Likert scale (never, hardly ever, sometimes, often, and always). The maximum possible score is 40; minimum is 8, with a higher score indicating more support-seeking coping. Cronbach's alpha for the support-seeking subscales have been reported as .84 to .88 (Causey & Dubow, 1992). In this study, the Cronbach's alpha was .84 (pre-test) and .81 (post-test). Validity for the support seeking coping scale has been demonstrated by positive relations among the problem solving, seeking social support, and emotional externalizing subscales of the self-report measure (Causey & Dubow, 1992).

The *Loneliness and Social Dissatisfaction scale* (Cassidy & Asher, 1992) was used to evaluate children's feelings of loneliness and dissatisfaction with peer relationships. The 24-item scale includes 16 questions such as, "Are you lonely at school?" and 8 filler items which focus on children's activities, "Do you like music?" Respondents are asked to rate to what extent they believe the answer is true; items are coded 1 (no), 2 (sometimes), or 3 (yes). A total score is computed by summing the 16 items which assess loneliness and social dissatisfaction. Filler items are omitted and total scores range from 16 to 48. Lower scores indicate less loneliness and social dissatisfaction. Cronbach's alpha for

the scale is .91 (Cassidy & Asher, 1992). In this study, the Cronbach's alpha was .93 (pre-test) and .86 (post-test). The authors report moderate convergent validity based on significant correlations with peer status derived from sociometric measures and teacher report of child's social behavior (Cassidy & Asher, 1992). Other authors report evidence of discriminant and excellent convergent validity (Bagner, Storch, & Roberti, 2004). Confirmatory factor analysis found LSDS to be the most reliable of the six loneliness measures for children and the only loneliness measure that measures peer-related loneliness (Goossens & Beyers, 2002).

Qualitative Data

Three post-intervention semi-structured interview guides were designed to elicit information from children, parents, and mentors on perceived impacts of the intervention on satisfaction with support, support-seeking coping, loneliness, behaviors, knowledge, continued contact with fellow participants, and other unanticipated impacts. The ten-item children's interview guide elicited children's perceptions on support type and impacts of the online support program on their day-to-day lives. Questions included: "Were your chats with other kids with allergies and/or asthma helpful?" "Were your chats with [Name of mentor] helpful? Why?" "Are you doing anything differently because of this club?" "Is it any easier for now for you to be a kid with asthma and allergies? Any difference in your life?" Three questions in the interview guide for parents sought perceptions regarding the impact of the online support program on their children and family and suggested improvements ("What was the impact of the on-line club on your children?" "What was the effect of the children's club on you and your family?") Group interviews with peer mentors were conducted to draw out information on factors influencing impacts of the intervention. The ten-item interview guide included the following questions: "Please describe the main benefits of this online support program for the children." "Please describe the impacts of this support program on the children." Interviews were conducted at post-test only with participants, parents, and peer mentors. All qualitative data were digitally recorded and transcribed.

Data Analysis

Quantitative statistical analyses involved description of participants' demographics. T-tests were employed to determine differences between pre-test and post-test means. All tests were 2-tailed and the significance level was set at $p < 0.05$.

Qualitative data was analyzed using inductive and deductive thematic content analysis (Anderson, 2004; Creswell, 2009; Denzin & Lincoln, 2005; Morse & Richards, 2002). First, inductive content analysis was used to identify common themes in the transcribed interview data. A

preliminary coding framework was developed based on the interview guide questions to inform deductive analysis. All interviews were reviewed twice by two graduate research assistants to understand participants' meanings and identify additional themes and sub-themes. These themes were discussed and refined. The research assistants achieved an inter-rater reliability of over 85% before proceeding with independent coding of the interviews. Second, new themes and categories that emerged during the analyses process were coded. Third, inductive analysis was used to explore themes not identified through deductive analysis. To maintain rigour and trustworthiness, an audit trail of research was maintained (Whittemore, Chase, & Mandle, 2001).

Sample

Twenty-seven children participated in the online support intervention. Seventeen had both asthma and allergies and ten had severe allergies. Children were recruited by email invitations distributed via relevant national associations (e.g. Lung Association of Canada, Asthma and Allergy Information Association, Anaphylaxis Canada). Participants resided in five provinces across five time zones. Twenty children lived in urban centres and seven resided in rural areas. The children's mean age was 9.26, ranging from 7 to 11 years. The modal family size was two children. The children's parents were well educated as over 90% had completed college or university. Household income was high with the majority of families having incomes over \$100,000. All 27 children completed the pre-test and post-test quantitative measures and qualitative interviews via telephone. Twenty-five parents completed individual telephone interviews at post-test and five peer mentors participated in a group interview conducted on GoToMeeting.

Results

Participation in the online peer support intervention was high with 86.3% on average over the eight weeks of the intervention. Participation in individual sessions ranged from 16 participants in week 4 (during school break) to 26 of 27 children. Three children, scheduled for Sunday sessions, participated in a maximum of four sessions because of conflicts with other activities.

Satisfaction with Social Support (Research Question 1)

Perceived support from family and friends increased following the intervention. There was a statistically significant increase from pre-test to post-test in the means from 71.03 to 79.33 ($p=.001$) on the Multidimensional Scale of Perceived Social Support total score, indicating the children

perceived more support. The perceived adequacy of support on the family sub-scale increased from 25.37 to 27.00 ($p=.004$). The increase in perceived support from families was significant for all participants and sub-groups (boys, girls, asthma and allergies, severe allergies only). At post-test, perceived support from friends increased significantly for the entire group from 20.37 to 25.29 ($p=.001$) and for all of the sub-groups except boys (See Table 1).

Children thought they were better prepared to tell people about their needs following the intervention. Children enjoyed talking with other children who have asthma and allergies.

I've learned that it makes me feel better to talk about my allergies . . . that it is not only me who feels this way, other people feel the same way about their allergies. (Boy 8 with allergies).

They believed the peer mentors and role playing helped them to become more confident to talk about their condition with their friends and parents. They thought their school peers became more supportive.

The trial was about meeting other kids with asthma and allergies and making new friends. In the trial we showed each other photos of ourselves. We learned what to do when you are at a restaurant. We learned about each other's lives and how we dealt with asthma and allergies. I felt really good and happy about the trial because I met new friends and I knew I was not the only one with asthma and allergies. I learned that there are kids all over Canada with allergies and asthma just like me. I also learned that there are lots of people that don't understand about these health problems. I had lots of fun and liked talking and sharing pictures to our new friends. (Girl aged 10 with asthma and allergies).

Parents noted that children enjoyed connecting with their peers who have asthma and allergies. Most parents said that children talked more freely with them and their friends at school following the intervention. Several parents thought their relationships improved following the intervention because children discussed problems with them (See Table 4 for other verbatim quotes from children, parents and mentors).

Support Seeking and Coping (Research Question 2)

There were statistically significant increases in support-seeking coping on the Self-Report Support Seeking measure. The mean pre-intervention score was 27.07 and increased significantly to 30.55 ($p=.002$) at post-test. Before the online support intervention, children had mean scores on this subscale (27.07, SD. 6.93) similar to a group of adolescents with spina-bifida and cerebral palsy participating in another online intervention (Author xxx) (See Table 2).

Following the intervention, children reported that they were more prepared to seek support and communicated more

Table 1 Multidimensional Scale of Perceived Social Support Results.

		Number	Mean	Min	Max	Std. Deviation	2 –tailed t-test	P. Sig. (2 tailed)
MSPSS Total Scale								
All children	Pre-test	(n=27)	71.04	12	84	6.97	−5.54	.001
	Post-test	(n=27)	79.33	12	84	6.21		
Asthma and allergies	Pre-test	(n=17)	71.47	12	84	6.53	−4.53	.001
	Post-test	(n=17)	78.65	12	84	7.21		
Anaphylaxis	Pre-test	(n=10)	70.30	12	84	7.23	−3.35	.008
	Post-test	(n=10)	80.50	12	84	8.13		
Boys	Pre-test	(n=12)	70.58	12	84	7.59	−2.38	.036
	Post-test	(n=12)	76.50	12	84	7.20		
Girls	Pre-test	(n=15)	70.88	12	84	6.80	−6.18	.001
	Post-test	(n=15)	81.75	12	84	4.20		
MSPSS Family Subscale								
All children	Pre-test	(n=27)	25.37	4	28	3.10	−3.15	.004
	Post-test	(n=27)	27.00	4	28	2.06		
Asthma and allergies	Pre-test	(n=17)	25.65	4	28	2.96	−2.34	.032
	Post-test	(n=17)	26.82	4	28	2.01		
Anaphylaxis	Pre-test	(n=10)	24.90	4	28	3.45	−2.17	.058
	Post-test	(n=10)	27.3	4	28	2.21		
Boys	Pre-test	(n=12)	25.00	4	28	3.36	−1.68	.121
	Post-test	(n=12)	26.17	4	28	2.55		
Girls	Pre-test	(n=15)	25.5	4	28	2.94	−2.99	.009
	Post-test	(n=15)	27.69	4	28	1.25		
MSPSS Friends Subscale								
All children	Pre-test	(n=27)	20.37	4	28	4.16	−5.36	.001
	Post-test	(n=27)	25.29	4	28	2.80		
Asthma and allergies	Pre-test	(n=17)	20.06	4	28	4.02	−4.83	.001
	Post-test	(n=17)	24.71	4	28	2.64		
Anaphylaxis	Pre-test	(n=10)	20.90	4	28	4.56	−2.79	.020
	Post-test	(n=10)	26.30	4	28	2.91		
Boys	Pre-test	(n=12)	20.25	4	28	4.14	−2.76	.018
	Post-test	(n=12)	24.0	4	28	2.41		
Girls	Pre-test	(n=15)	20.19	4	28	4.32	−5.15	.001
	Post-test	n=15	26.44	4	28	2.66		

openly with their families and other people about their health and social needs. They believed they had learned how to ask parents, teachers, friends, and even strangers to help them address their needs. Children who had been fearful of new experiences or social situations believed that they were more

prepared to make appropriate choices following the intervention. Some children recognized that they were too cautious before the online support program and had learned to take appropriate risks. Participants reported that other children's description of the negative consequences of

Table 2 Self-Report Coping Scale: Support Seeking Subscale Results.

		Number	Mean	Min	Max	Std. Deviation	2 –tailed t-test	P. Sig. (2 tailed)
All children	Pre-test	(n=27)	27.07	8	40	6.93	−3.44	.002
	Post-test	(n=27)	30.56	8	40	5.93		
Asthma and allergies	Pre-test	(n=17)	26.23	8	40	7.77	−2.49	.024
	Post-test	(n=17)	29.76	8	40	5.85		
Anaphylaxis	Pre-test	(n=10)	28.50	8	40	5.25	−2.44	.037
	Post-test	(n=10)	31.90	8	40	6.14		
Boys	Pre-test	(n=12)	24.25	8	40	7.49	−2.67	.022
	Post-test	(n=12)	27.41	8	40	5.55		
Girls	Pre-test	(n=15)	29.44	8	40	5.53	−2.27	.038
	Post-test	(n=15)	32.88	8	40	4.99		

asthma and allergen triggers, reinforced the need be careful about prevention, comply with medication regimes, and tell others about their condition. Children revealed that they felt more comfortable following the program to ask a friend about taking safe food to their home or to request a break from the hockey coach when they had breathing difficulty. Children and mentors believed that talking with an adolescent peer role model reinforced advice from professionals or parents.

Definitely, before I was singled out in school and now I'm not singled out and I think it's a lot easier to talk to them. I can hang out with my friends a lot easier without having that nagging feeling in the back of my head. It was helpful because I learned a lot of new ways to deal with my asthma and it helped me to talk to other people about my asthma and allergies. I feel a lot more comfortable talking to students, parents and teachers now. (10 year old girl with asthma and allergies).

Throughout the intervention, children's support-seeking skills improved. They became more comfortable to talk about their asthma and allergies and seek assistance from others. Improved support-seeking linked with increased perceived support and satisfaction with support. As children learned to discuss their condition and ask for support, they received support. Requesting required support was a new skill for many children. Prior to the online intervention, several children said they had previously been too shy and anxious about talking with others about their condition. To illustrate, one child, who said he had been very shy, asked teachers for support following the online peer support intervention. Participants credited increased confidence about requesting support to role playing and learning how other children and peer mentors handled similar challenges (See Table 4 for quotes from children, parents, and mentors).

Loneliness (Research Question 3)

There was a statistically significant decrease in loneliness for the girls and for children with severe allergies on the Loneliness and Social Dissatisfaction Scale. Although loneliness and social dissatisfaction decreased for the entire

group from pre-test mean (19.48) to post-test mean (17.96) ($p=.081$); this finding was not statistically significant (See Table 3). Following the intervention loneliness was reduced for the children with anaphylaxis (mean scores 17.30 to 16.00 ($p=.013$)). Interviews with children confirmed that they felt less alone and more like other children following the online support program. Children were impressed that many of their role models, including hockey players, singers, actors and Olympic athletes, had asthma and allergies. Most children (74%) reported that valuable impacts of the online support intervention included learning they were not alone as other people had similar challenges, and they belonged to the group.

Hearing that I'm not the only one in the whole world who has an allergy that I'm not the only one left out, so I feel much better in the group. (9 year old girl with allergies).

Although children were aware that their parents were supportive, they missed having a peer group. Following the peer support intervention, they talked about fitting in, sharing feelings with others, and feeling special. Some mentioned that they could be themselves in the support group and they didn't need to conceal their condition or be concerned about a social facade.

It is really good to know that I am not alone, not the only person with asthma and allergies. I was really surprised to find a lot of people had much worse allergies than me. I do have one friend with allergies to latex but that it. Mainly, I feel good to know that I am not alone, that there are some other kids that also have allergies. (10 year old boy with allergies).

Parents noted that their children needed the support of other children with asthma and allergies to diminish their feelings of loneliness. One mother said after seeing the effects of this support group, she planned to help her eight-year old daughter meet with other children who have asthma and allergies. The peer and professional mentors reported that meeting other children with asthma and allergies helped participants recognize that they were not alone (See Table 4 for verbatim quotes).

Table 3 Loneliness and Social Dissatisfaction Scale (LSDS) Results.

		Number	Mean	Min	Max	Std. Deviation	2 –tailed t-test	P. Sig. (2 tailed)
All children	Pre-test	(n=27)	19.48	16	48	6.60	1.81	.081
	Post-test	(n=27)	17.96	16	48	5.03		
Asthma and allergies	Pre-test	(n=17)	20.76	16	48	8.07	1.25	.230
	Post-test	(n=17)	19.12	16	48	6.11		
Anaphylaxis	Pre-test	(n=10)	17.30	16	48	1.33	3.07	.013
	Post-test	(n=10)	16.00	16	48	.00		
Boys	Pre-test	(n=12)	21.58	16	48	9.41	1.20	.25
	Post-test	(n=12)	19.33	16	48	7.06		
Girls	Pre-test	(n=15)	18.31	16	48	2.89	2.45	.027
	Post-test	(n=15)	17.50	16	48	3.33		

Table 4 Impacts of an Online Support Intervention: Qualitative Quotes.

	Children's Viewpoint	Parents' Viewpoint	Mentors' Viewpoint
t4.1 t4.2 t4.3			
t4.4	Satisfaction with social support		
t4.5	We talked about stuff in the meeting and then I'd talk with my parents and they would help me. Sometimes my friends at school, you know not tease me, but ask all these questions about my asthma and what we talked about in the group is what to say and it's been helping me. (Nine year old boy with asthma) In a way that I feel about allergies— I feel a whole new way— I feel better all over because I learned a lot of things. (Nine year old girl with asthma and allergies)	Well, I think it opened up conversations between myself and [name]. It presented some opportunities, you know subjects that we don't normally talk about that often. I think it was good to bring those to light and he got to spend time with other children who have some of the same allergies like him. I think it's good to in a group, being, less isolated. So he, he seemed to sort of open up a bit more about those issues. Yeah, I could say better communication and opportunities for the communication. (Mother of a 10 year old son with allergies)	You bring up different things and you talk about things you wouldn't talk about with your parents so it provides another opportunity to learn from other people. So yah, the kids are (now) doing things their parents want them to do. (Female mentor, Group 2)
t4.6	Coping and Support Seeking		
t4.7	I gave them some ideas about things to do. Like [another participant] was forgetting about taking her puffers and I said to keep it where she could see it, like her bedside table or the bathroom where she could actually see it and she know that she has to take it. (Girl aged 10 with anaphylaxis) I got to talk to other kids in Canada, other kids like me. I only see a couple of my friends at school, so I know now there are more people I can be friends with. Usually when I go to a friend's house, they usually have a cake or cupcakes with nuts or stuff in them and I feel really left out. But if I go to a friend's house with allergies, they have stuff I can have. (9 year old boy with allergies and asthma)	It helped her because she could talk to others when we were going through the move (from one city to another). She was right there when we went into the new school and we were talking all about the allergy things and I think she felt comfortable because of this. I think it was the backup of online friends that really helped her to know she could deal with it. She got to ask how others dealt with it and with educating the new kids and she learned to talk about it like, "I have an allergy and I can't eat that." (Mother of 8 year old daughter with allergies) I didn't know that it was important for her to talk to other children with asthma and allergies. I see how she benefitted and there is a little boy her age that has allergies. I am going to make sure they can play. (Mother of an 8 year old daughter with asthma and allergies)	There are different connections. Your parents are there to guide you and teach you. Your friends are there to have fun or for comfort. So they gained confidence from a friend to do what is right. (Female mentor, Group 4) I think it kind of reaffirmed that this type of support can do much more than we think. Things are much better than they were. The children got pretty confident in terms of knowing other people and communicating with others. More are able to talk about it. (Female mentor Group 2)
t4.8	Loneliness and Social Isolation		
t4.9	I learned that there were more people that had asthma than I thought there was. I thought there were not very many but there's more. I feel special, like I fit in somewhere. Asthma makes you really, really slow. You get out of breath quick. It is comforting to know that someone knows what it is like to have asthma. (Eight year old boy with asthma and allergies) It gave me a lot more friends and they can't make fun of me because we have the same problem. Other kids make fun of me because I can't run as fast or I can run but I can't run for as long. If I didn't have asthma, I could beat them around the track 10 times,	In this school year, she had been coming up against the same type of issues, but the children were not so inclusive—so not being invited to birthday parties and being told she wasn't invited because she had a peanut allergy. She had never had a boy yell at her because she asked him to put away a peanut product when he was eating it in front of her. But now we are in Grade 6 and we are more independent and they (other students) will voice their displeasure. So she wasn't feeling very good about life and this trial came along and it really showed her that she wasn't alone. (Mother of an 11 year old daughter with allergies)	I know some of them felt alone. They learned that they weren't alone, that there were other kids that faced the same problems. So it helped them with their self-esteem and stuff, just knowing that they have somebody else to talk to and they could talk about the same problems and empathize with them. It is not the same if somebody is giving you advice and they don't have the same problems. (Female mentor, Group 1)

but because I have asthma, I am not so fast and stuff. It kind of made a difference. Now they understand that. (Girl, aged 10, with asthma and allergies)
Hearing that I'm not the only one in the whole world who has an allergy, that I'm not the only one left out, so I feel much better in the group." (8 year old girl with allergies)

t4.10 Self- confidence, self-efficacy

t4.11 I keep my puffers with me so it's in my bag and I take it before gym class if I have a sore throat so I make it through the whole thing and if it gets tight again I take it in the middle and I learned to keep it beside my bed when I'm feeling sick and that really helped (Girl aged 10 with asthma and allergies)

It was mainly different ways of avoiding contact with allergens— what to do when I came in contact with them is not a problem but avoiding them is the tricky part. Like what to say to a waiter or waitress at a restaurant. It gave me confidence. Now I know what to say. The role playing – we did that quite a bit. (10 year old boy with allergies)

Every time I learned something new like one time I learned that Olympic athletes have allergies too and what they have to do before they go into their event. I was really surprised. All I need to do now is be better in the sport (9 year old boy with allergies)

I am able to do things better. (Seven year old girl with allergies)

I feel really, really special because we are important. I feel a lot more important to the world than I did before. It was kind of before, it's like "she has asthma and allergies so let's not play with her, but now it's like I don't care, it's whatever. And it's a lot easier to play with my friends because I've talked to them about it so I think that it really made a difference in my playground life (Girl aged 10, with asthma and allergies)

He's exercising more and he's actually taking responsibility about taking his own medication without us having to remind him all the time about it. Huge difference. Huge cause we are not huffing at him all the time right. And it's not just mom and dad saying it now he knows from other kids that they take their medication and that they have to carry it around with them as well. It means a lot more. (Mother of boy aged 8 with asthma and environmental allergies)

And I think confidence. Just talking to other kids and connecting with them and you know hearing their stories I think was important. I know some of the kids were older and I think that's good. It's always nice to be with other people that have the same issues. That's pretty much I think the most important thing. (Mother of an 8 year old boy with allergies and asthma)

Her kind of looking at things on her own—she has learned to take it to the next level, being in charge of asthma and allergies on her own, so it's kind of nice (mother of 8 year old daughter with asthma and allergies)
I think it just helped him realize that (pause) he doesn't need to hold himself back because before he would be like, "Oh! I have asthma I don't have a chance." And then hearing these other kids and hearing [mentor's] story saying you know like, "His allergies are pretty severe. And he's still able to do things and go places." So I think [name of son] isn't so withdrawn anymore about it—that you know it's not really a big deal. (Mother of 8 year old son with asthma and allergies)

I really think he gained confidence. Just talking to other kids and connecting with them and you know hearing their stories I think was important. I know some of the kids were older and I think that's good. I think it's just giving him (pause) like just giving him the tools and the vocabulary and you know just, it's modeling really. It's modeling the behavior. (Mother of 9 year old boy with allergies)

There was one pivotal session for me with a girl who was really outgoing and one who was really shy. So it was just the two of them that week, she started to talk about her anaphylactic reaction. Sometimes it takes one moment when you feel like you are confident. (Female mentor, Group 2)

It changed the way they would go about things, they would tell the waiter, or try themselves to talk to the waiter and emotionally they were more open with the group and they would talk to the group if something was bothering them. And their confidence, they were able to do things for themselves. (Male mentor, Group 5)

(continued on next page)

t4.12	Table 4 (continued)		
t4.13	Children's Viewpoint	Parents' Viewpoint	Mentors' Viewpoint
t4.14	Satisfaction with the intervention		
t4.15	Well, I like pretty much. I like the way how it's set up. I liked how we had a big conversation about everything and then we answered questions and looked at stuff that was actually fun and then we... after went to club Penguin. It's like that, that was the way that I really liked it. (8 year old boy with asthma and allergies) It was cool meeting a whole bunch of new people and many people had the same problem as me. And it was really cool because I don't meet many of those people. (9 year old girl with asthma and allergies)	Overall, it was an excellent program. I think you should get an A+. (Mother of a 10 year old son with allergies) She really, really enjoyed it. She like connecting with the other kids that have allergies. She does know other kids here in [name of city] that do, but not necessarily getting to know them as they have in this program. She enjoyed the different things that [mentor] went through, you know the different exercises where they pretended they were in a restaurant and had to order food and that sort of role playing. That they could do that with their peers that were in the same situation and then learn from each other's experiences. (Mother of a 9 year old daughter with allergies)	At the beginning, it was almost like trying to pry something out of them, but then near the middle, they were sharing stuff with the group and just being able to take more responsibility. The biggest thing that came up was the sense of community and having other people in the same boat that understood and that was obvious at every sessions. There was one girl that really learned assertiveness. (Female mentor, Group 2)
t4.16	Continued Contact with Peers		
t4.17	It was really nice to have [participant] over and we are getting together next week. (Girl aged 10 with asthma and allergies)	There is so much benefit to this. I wished it could have gone on longer they did so well. You never know how well it will go. (Rural mother of an 8 year old daughter)	To have it sustainable, you could have an open chat room in a website. You'd have to make sure there was always something fun like a game or Club Penguin, but online on the Internet. We could do a normal meeting place. (Female mentor, Group 4)

Confidence (Research Question 4)

Key additional impacts of the support intervention reported during the post-test qualitative interviews were increased self-confidence and self-efficacy. Most children (88.8%) reported they were more confident following the intervention. Several children noted that they were more confident about their self-care skills and about handling difficult social interactions. A ten year old boy with allergies said, *"I learned quite a few ways to deal with my allergies. I just feel more relaxed and it's not something that needs to be kept a secret."*

Approximately 50% of the children believed that confidence gained in the support group transferred to many areas of their lives, revealed in comments such as "feel better all over" and "helps all the stuff I do."

I got to learn about others experiences. I got to see how other people deal with their experiences. I was thinking how important it was to belong to a group. I can understand myself better. Just before the group happened, I was feeling left out of things, but when we did the trial, I got to know there was other people and when we had a meeting we told each other about our experiences. I remember one week we got to share about other people's experience and how they got to handle it and I really liked to hear how they handled it and the next time it happened to me, I tried using their methods. There were so many people that were like us. (Girl 11 with allergies).

Parents noted that their children had new self-assurance to "take charge" of their health condition. Some parents mentioned that children were more confident about decision making and had learned to take balanced risks. Mentors also provided examples of children whose confidence had improved.

Children's self-efficacy increased. They felt more prepared to take medication and avoid allergens. To illustrate, an eight year old boy reported, *"It just helps you every time you can't breathe well; they gave me ideas on how to control my asthma."* Moreover, many children thought they were better prepared to handle social situations. Parents believed that their children could now make their own decisions and handle peer pressure. Parents also observed that children were more aware of what they were capable of doing following the intervention, rather than focusing on how asthma and allergies restricted their lives. They noticed that their children were more independent and willing to try new activities.

Satisfaction with Intervention (Research Question 5)

The majority of the children (96.2%) provided very positive feedback about the online peer support group. Most children said they would recommend the online support

group to other children with asthma and allergies because it was helpful and fun.

Well, I like pretty much everything I like. I like the way how it's set up. I like a lot of it! I also like, well the only way I can put to you is, I like pretty much everything! I liked how...we had a big conversation about everything and then we answered questions and everything and looked at stuff that was actually fun and then we... after went to club Penguin. It's like that, that was the way that I really liked it. (8 year old boy with asthma and allergies).

Most children reported that they learned social skills and coping strategies during interactions with their peers and mentors in the support group sessions and in Club Penguin. Parents thought the online program was excellent because their children liked talking to peers. They appreciated their children's new skills for managing their life and health condition. Mentors believed that role modeling enabled children to accept their condition and be themselves.

During the online support group program, three children met in person. Several mentioned that they continued to communicate following the intervention by email with other participants and two children had play dates and sleepovers. One child said that he and his new friends continued to phone each other and talk while they play Club Penguin.

I just saw [another participant] yesterday. We [our group] wanted to get together but all the other kids are pretty far away and [Name] was the closest. So we played on the trampoline and I had to go home. It was supposed to be a sleepover but because it was the first time meeting her so my mom and dad changed it to a play date with her and I tried to convince my mom to have a sleepover but it didn't work. We are going to have a sleepover another time. (Girl aged 10 with anaphylaxis).

Parents wanted the children to continue to meet. Mentors also noted that some children had met following the intervention, and believed that a sustainable online support group would be ideal.

Discussion

High participation rates indicate that children were interested and engaged in this innovative online intervention. Children involved in this peer support intervention reported that their relationships with families and friends became more supportive; their support seeking increased; and, their loneliness and social isolation decreased. Children and parents also attributed increased self-confidence to the support intervention. Participants and parents were impressed by children's enhanced confidence to manage their health condition and life.

According to these children, parents, and mentors, learning to manage medications and avoid allergens is only

the initial step in living with these chronic health conditions. In these children's daily lives, managing social activities and social relationships with their peers are priorities. Children want to be accepted by their peers (Kyngas, 2004; Protudjer et al., 2009). Social interactions with peers in the online intervention assured children that they are accepted by others and helped enhance their self-esteem. Positive exchanges with social networks can improve people's sense of self-esteem; reduce isolation; and, influence self-care (Buston & Wood, 2000; Kyngas, 2004; Stewart, 2000; Uchino, 2004). Some authors have suggested that traditional asthma and allergy education programs emphasize medication management and allergen avoidance, whereas children are focused on "being normal" (Mandell et al., 2005; Mangan, Wittich, & Gerald, 2007; Protudjer, Kozyrskyj, & Becker, 2011; Protudjer et al., 2009).

Peer relationships are important to children, and peer support is particularly significant for children with chronic illness (Cohen, Frnaco, Motlow, Resnick, & Ozuah, 2003; Kyngas, 2004; Murray et al., 2006; Protudjer et al., 2009, 2011; Yang et al., 2009). Our online support intervention was accessible to children with a computer and an Internet connection; both were provided to the few who lacked these resources. Research focused on other chronic illness conditions suggests that online interventions may be a viable means of supporting adults and families (Bravata et al., 2009; Meric et al., 2002; Plante, Labato, & Engel, 2001; Stinson et al., 2009; Yorke, Flemming, & Shuldham, 2007). Our study reveals that online peer programs are also a feasible, relevant, and accessible mechanism for supporting children.

Unlike traditional web-based health education programs (Ewing et al., 2009; Eyesenbach, Powell, Englesakis, Rizo, & Stern, 2004; Gustafson et al., 2008; Han & Belcher, 2001; Han et al., 2010; Meric et al., 2002); this support program had high participation rates. In one other study (Han & Belcher, 2001), families of children with cancer who received training were more likely to use online systems, compared to those who received verbal instruction. Children, parents, and peer mentors in our study agreed that the training, support, mentoring, and flexible schedule helped to make this online intervention accessible.

There are several complex online interventions for adults with chronic conditions (Gustafson et al., 2008; Han et al., 2010). Our successful intervention was designed to foster comprehensive peer-to-peer support and education for children affected by asthma and allergies. Unlike the disease-specific email groups for adults that offer lay support (Bennett & Glasgow, 2009; Ewing et al., 2009), this intervention included trained peer mentors and professional monitoring. Prior to this online intervention, few studies focused on the psychosocial aspects of children's asthma and allergies; even fewer assessed the support resources, support intervention preferences and support needs of children with asthma and severe allergies; and, no reported intervention studies targeted support for children.

We need to comment on the limitations of the study; as this was a pretest- posttest design and because the children reported the intervention was fun, an acquiescent response set bias is possible. The study combined children with asthma with children with anaphylaxis. Although over 90% of children with asthma have allergies (Boulet et al., 2008), the support needs of children with anaphylactic allergies may be different. A follow-up intervention study that separates children with asthma and anaphylaxis by condition has been launched. The children who benefited most were those who indicated they did not know many other children with asthma and allergies, felt different because of their condition, or were singled out in school by other children. These are important factors in tailoring interventions in future research and practice.

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