Objective The purpose of this study was to evaluate the feasibility and preliminary outcomes of a social skills group intervention program for child brain tumor survivors. Methods Participants were 32 survivors (14 females) aged 8–18 years. Medulloblastoma (28%) was the main diagnosis. The intervention consisted of eight 2-hr weekly sessions focused on social skills including friendship making and assertion. Survivors and parents completed measures of social skills, quality of life, behavior and depression, at baseline, pre- and post-intervention, and 6 months later. Results Feasibility analyses revealed promising acceptability, retention, recruitment, and treatment fidelity. Significant improvement was found after intervention based on parents’ reports of self-control \( F(1,27) = 5.97, p < .05 \), social skills \( F(1,28) = 5.70, p < .05 \), and quality of life \( F(1,15) = 17.98, p < .01 \). Conclusions The intervention is feasible and outcomes based on parental reports provide preliminary support for the efficacy of the program.

Key words pediatric brain tumors; social skills; intervention.
Regardless of the etiology, there have been some efforts to address social deficits by providing social skills training to childhood brain tumor survivors. Of the two previously published studies on social skill interventions for this population, the first one targeted a small group of boys with social skill deficits including assertiveness, and handling teasing by peers (DieTrill et al., 1996). Using satisfaction questionnaires devised by the authors, boys and parents reported improvements in social skills after completion of the program, but with no systematic assessment, little can be derived from these results. In the second social skills intervention, assessments were conducted for 13 children using standardized scales of social skills and behavior administered 1 month prior and 10 months following the intervention (Barakat et al., 2003). Although social skills changed in the direction of improved functioning, the small sample employed in this study limits the generalizability of these results.

Individual social skills training has also been evaluated in newly diagnosed children with cancer, excluding those with brain tumors (Varni, Katz, Colegrove, & Dolgin, 1993). Compared to controls, participants reported greater perceived social support from peers and teachers and parents reported decreased internalizing and externalizing behavior problems and increased social competence. In this study, however, children themselves were not evaluated on their perceived social competency and since the social skills training was conducted individually rather than in a group, it is questionable whether these findings can be generalized to a social environment with peers. Finally, given that children with brain tumors were excluded in this study, it is also questionable whether these findings can be generalized to this population.

Preliminary research initiated by Barrera and colleagues (Barrera, Spiegler, & Baruchel, 2000) began to examine the social competence of childhood brain tumor survivors. A focus group with a convenience sample of these survivors was conducted first to obtain views about their needs (Barrera et al., 2000). The major themes that emerged during the group discussion included being made fun of by peers and a lack of friendships with classmates, replicating other findings in this area (Upton & Eiser, 2006). The decision to focus on social skills, as a critical source of social competence outcomes, was guided by findings in which social skills training has been found to not only positively affect social acceptance among healthy children, (Asher, Oden, & Gottman, 1977; Cole & Kupersmidt, 1983; Dodge, 1983; Newcomb, Bukowski, & Pattee, 1993; Putallaz & Gottman, 1981), and peer status as determined by sociometric methodologies (Bierman & Furlong, 1984) but is also argued to be central to social reintegration among childhood cancer patients (Katz & Varni, 1993).

Recent conceptualizations of the social competence construct have also guided the current research. Specifically, social competence has been conceptualized as the umbrella under which social skills exist at the bottom of a hierarchy followed by social performance and subsequently social adjustment (Cavell, 1990). Social adjustment is defined by the quality of social interactions and the extent to which individuals are achieving developmentally appropriate, societally determined goals (Cavell, 1990). The key to influencing change in social adjustment, therefore, lies in the ability to affect social skills.

Integrating the findings from the focus group, previous literature findings, and the aforementioned conceptual framework, a social skills intervention was developed and a manual written as a guide. (The manual is available by request from the Principal Investigator, Dr Maru Barrera, Department of Psychology, SickKids, 555 University Ave., Toronto, ON, M5G1X8, Email: maru.barrera@sickkids.ca) The format of the Social Skills Group intervention was based on previous work (e.g. Elliott & Gresham, 1991; Varni et al., 1993) and work by the same research team with the Siblings Coping Together Program (Barrera, Chung, & Fleming, 2004; Barrera, Chung, Greenberg, & Fleming, 2002). The selection of specific social skills was based on previous intervention work (Barakat et al., 2003; DieTrill et al., 1996; Varni et al., 1993) and included assertiveness, handling teasing by peers, making new friends, cooperation, empathy and conflict resolution.

The primary objective of this study was to test the feasibility of this manualized social skills intervention with children and adolescents who had been treated for a brain tumor. Program acceptability, recruitment and retention, treatment fidelity, and preliminary evidence of intervention outcomes were assessed utilizing feasibility criteria established by Kazak and colleagues (2005). For intervention outcomes, social skills were the primary outcome measure. Quality of life and behavior problems were also assessed as social competence has been found to affect psychological function and childhood adaptation to chronic illness (La Greca, 1990). Finally, survivors’ depressive symptomatology was assessed given previous findings with this population (Barrera et al., 2008). It was hypothesized that: (1) the program would be found to be feasible and (2) there would be improvements after the intervention in social skills, quality of life, behavior, and depression outcomes.
Methods

Participants

In total, 32 children (≤ 12 years; n = 17) and adolescents (> 12 years, n = 15) (19 males, 14 females) participated. Inclusion criteria required survivors: (1) had a diagnosis of a brain tumor; (2) were between 8 and 18 years of age; (3) were on follow-up after the end of treatment; (4) did not present with severe cognitive or communication impairments as determined by full-time enrollment in a special education program; and (5) were English-speaking. Table I presents the sample characteristics. Briefly, survivors’ mean age at enrollment was 12.7 years. The mean age at diagnosis was 7.31 years. Mean time since diagnosis ranged from 1.5 years to 16 years; mean time off treatment ranged from 0.42 years to 15 years. Sixty-five percent of families were White, 13% were Asian, 7% were Hispanic and 16% classified themselves as “Other,” representing a diverse group. Based on the Hollingshead Scale of Occupations (Hollingshead, 1975), the majority of survivors came from low middle class families with occupations including skilled manual workers, clerical workers, and semiprofessionals.

Recruitment

Most participants were referred by the Neuro-oncology team at a large pediatric center based on concerns reported by parents including being socially withdrawn, having no friends, and being teased or bullied by peers.

Design and Procedure

The study was approved by the institutional ethics review board. Referred families were contacted by telephone. After obtaining verbal consent, one parent of each available participant was interviewed by telephone to verify inclusion criteria and to obtain personal information.

Written consent and child assent were obtained prior to the completion of the baseline assessment.

The design consisted of a repeated measures methodology using each participant as his/her own control. Included were two pre-intervention assessments (controlling for the passage of time before intervention): baseline; and pre-intervention; and one post-intervention assessment, immediately after the intervention had ended. The mean time between baseline and pre-intervention was 70.56 days (SD = 106.31) ranging from 20 to 150 days. This wide range reflects constraints imposed by the formation of age appropriate groups based on available referrals. Four of six groups (19 families) were invited to complete follow-up assessments 6 months after the intervention was completed. This study design was similar to that used in a group intervention for siblings of children with cancer (Barrera, Chung et al., 2004). Each of six groups consisted of four to seven children close in age (8–12 years of age, 13–16 years of age) (Group 1, n = 6; Group 2, n = 7; Group 3, n = 5; Group 4, n = 6, Group 5, n = 4, Group 6, n = 4).

Clinically trained graduate or post-doctoral students and/or a clinical assistant with Master’s level training in clinical psychology served as group facilitators under the supervision of a registered psychologist. Facilitators’ training involved reading the manual, observing group sessions through a one-way mirror and assisting facilitators prior to running groups.

Intervention fidelity was insured by using the intervention manual, and meeting with facilitators and the supervisor before and after every intervention session for Table I. Sample Characteristics

<table>
<thead>
<tr>
<th>N = 32</th>
<th>n</th>
<th>Percentage</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 12 years</td>
<td>17</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>&gt; 12 years</td>
<td>15</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Diagnoses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medulloblastoma</td>
<td>9</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Astrocytoma</td>
<td>6</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>53</td>
<td></td>
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<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Infratentorial</td>
<td>18</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Supratentorial</td>
<td>14</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>11</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Radiation</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
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<td>3</td>
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</tr>
<tr>
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<tr>
<td>Surgery and chemotherapy</td>
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</tr>
<tr>
<td>Radiation and chemotherapy</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Surgery, radiation and chemotherapy</td>
<td>12</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>No treatment</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Time since diagnosis (years)</td>
<td>6.28 (3.94)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time off treatment (years)</td>
<td>5.30 (4.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IQ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full IQ</td>
<td>91.95 (15.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal IQ</td>
<td>96.86 (10.62)</td>
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<td></td>
</tr>
<tr>
<td>Performance IQ</td>
<td>87.00 (18.25)</td>
<td></td>
<td></td>
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<tr>
<td>SES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levels 1–3</td>
<td>3</td>
<td>9.4</td>
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<tr>
<td>Levels 4–6</td>
<td>16</td>
<td>50.0</td>
<td></td>
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<tr>
<td>Levels 7–9</td>
<td>13</td>
<td>40.6</td>
<td></td>
</tr>
</tbody>
</table>


*b* Hollingshead Scale of Occupations (Hollingshead, 1975).
planning the incoming session and debriefing about the previous session. In addition, facilitators completed “session logs” describing group participation, cooperation and engagement as well as the group process. A research assistant blind to the details of the group intervention and study purpose coded the logs for adherence to session plan and group objectives according to three criteria: (1) facilitators adhered to session outline; (2) facilitators adhered to session theme; and (3) survivors successfully engaged in session activities. A five-point Likert scale ranging from “goal completed not at all” to “goal completed completely” was used to rate each of the criteria. Criteria were scored by adding the totals from each session of each group and averaging the totals across groups. Percentages were then calculated. Finally, to prevent contamination, none of the other trained facilitators were involved in data management and statistical analysis for this study, except for one.

**Group Intervention Program**

The intervention program consisted of a 2-hr group session once a week for 8 weeks. The program was supervised by a psychologist with a total of eight clinically trained graduate students or clinical assistants with graduate level training, out of which two facilitated each of the six groups. Each session followed a specific structure including: (a) Pre-Activities, which served to keep participants occupied upon arrival and provided the opportunity for informal verbal interaction among facilitators and participants; (b) Review, which served to help refresh the learning acquired in the previous session through discussion of the homework, and re-involving any participant who might have missed the previous session; (c) Mental Set Activity, the first specific activity of each session that addressed the theme/social skills of that session and aimed to focus participants’ attention, interest, motivation and curiosity into thinking about the session’s theme and social skill; (d) Social Skills, where each skill was taught by implementing the “Tell” phase, in which the facilitator introduced the skills by describing it and asking questions, involved the group participants, provided rationale for the importance of the skills, and outlined the specific skills steps, followed by the “Show” phase, which involved the facilitators’ modeling the behavior positively and negatively by role-playing with active involvement of group participants, followed by role-playing of positive or negative behavior by participants and finally a discussion of the role-play; (e) Snack, a 10-min break allowing for spontaneous social interactions among group participants; (f) Main Activity, designed to consolidate the social skill learned in the session; and finally; (g) Homework, to practice at home and school the social skill learned in the session to facilitate generalization to participants’ everyday lives. More details can be found in the manual created for this purpose (Barrera, Fleming et al., 2004).

The intervention focused on six specific skills based on previous intervention work (Barakat et al., 2003; DieTrill et al., 1996; Varni et al., 1993): social initiation and friendship making; cooperation; managing teasing and bullying; conflict resolution; empathy; and assertion with self-confidence building (Barrera, Fleming et al., 2004). Each of these skills were taught during the first six sessions using a variety of fun activities and games guided by cognitive behavior strategies and expressive therapies such as music, art, and drama. A collection of activities designed for different developmental levels and age ranges are included within the intervention manual. Activities for each session were carefully selected by facilitators and the supervisor based on the different age and skill levels of the group members during the planning and supervision meeting. The seventh session was a review of all previous skills both in the regular structured setting (the first hour) and in an unstructured (new) setting (second hour). The unstructured setting consists of a large children’s play area contained within the hospital where children are free to play a variety of games. This setting provides children with opportunities for practicing their social skills in a new setting to facilitate generalization. The final session provided additional opportunity to practice skills and put closure on the group experience by preparing for the graduation ceremony, which included describing to parents what was learned. As well, children completed the post intervention assessments. The group facilitators ensured that children participated in every activity and assisted those who needed extra help either understanding the activities or engaging with others.

**Measures**

Parents and survivors completed the Social Skills Rating System (SSRS; Gresham & Elliott, 1990), the Pediatric Quality of Life (PedsQL) Cancer Module (Varni, Burwinkle, Katz, Meesse, & Dickinson, 2002), and the Child Behavior Checklist (CBCL; Achenbach, 2001)/Youth Self Report (YSR; Achenbach, 2001) (for survivors aged 11 years and older). Survivors also completed the Child Depression Inventory (CDI) (Kovacs, 1992).

The SSRS assesses social skills with versions to be completed by children (Elementary, grades 3–6; Secondary, grades 7–12) and parent proxies. The various forms range in number of items from 34 to 57. Four social skills subscales are derived: cooperation; assertion; self-control; and responsibility (empathy for the child form);
and a total score. Raw scores are computed to a standard score with a mean of 100 and SD of 15. Higher scores represent better social skills. Internal consistency estimates for the SSRS ranged from .83 to .94 (Gresham & Elliott, 1990). Test-retest reliability was assessed over a 4-week interval and was .68 for the child self-report, and .87 for the parent reported total score. Subscale reliability estimates ranged from .77 to .84 for parents and .52 to .66 for children (Gresham & Elliott, 1990). Internal consistency for this measure in our sample was .71 for the parent report and .90 for the child self-report with Cronbach’s alpha ranging from .58 to .90 for subscale scores.

The PedsQL Cancer Module is a 27-item measure designed to assess cancer specific health related quality of life (HRQL). The module includes both parent proxy reports (aged 2–18 years) and self-report forms (aged 5–18 years). The measure derives eight subscales of HRQL: pain; nausea; procedural anxiety; treatment anxiety; physical attractiveness; worry; communication; and cognitive function. For the purposes of this study, we calculated a total HRQL score which has been conducted elsewhere (Meeske, Katz, Palmer, Burwinkle, & Varni, 2004). Only the total score is reported here. Scores range from 0 to 100 with higher scores reflecting better reported HRQL. In the current study 18 parents and children completed the PedsQL cancer module as this measure was introduced after three groups were completed. The internal consistency reliability for the PedsQL was .72 for the child form and .87 for the parent form (Varni et al., 2002). Test–retest reliability was conducted in the initial development paper of this scale as short-term fluctuations in functioning are likely given the variability of disease and treatment factors among this population (Varni et al., 2002). In our sample, internal consistency estimates for parent report were .77 and .91 for the child self-report.

The CBCL parent form is a standardized 118-item inventory summarized into total, internalizing and externalizing scores, as well as three different competence scales (social, academic, activities). Internal consistency reliability ranges for the CBCL from .57 to .71 for internalizing, .70 to .86 for externalizing, and .69 to .82 for total Problem Behaviors, across ages (Achenbach, 1991). Test-retest reliability was calculated at a mean interval of seven days, using Intraclass Correlation Coefficients, ranged from .82 to .95 (Achenbach, 1991). The YSR is the self-report version of the CBCL that is completed by youth 11 years and older. It provides similar scores as the CBCL. For the YSR reliability is reported to range from .47 to .79 (Achenbach, 1991). Twenty-two survivors were old enough (> 11 years) to complete the YSR. Raw scores of these measures are transformed to standardized T scores with higher scores reflecting more behavioral difficulties (Achenbach, 1991). In this study we examined the total, externalizing and internalizing T scores from the CBCL and YSR as well as the social problems subscale and the social competency scale.

The Children’s Depression Inventory is a 27-item inventory for children aged 6–17 years of age, yielding a total depression score. Test–retest reliability has been evaluated over a 2-week period and found to be .82 (Finch, Saylor, Edwards, & McIntosh, 1987). The internal consistency coefficients range from .71 to .89 and the test-retest coefficients range from .74 to .83 (Kovacs, 1992). The total depression T scores are reported in this study.

Upon completion of the intervention program, survivors and parents completed group evaluation forms, which were constructed by our research team to assess acceptability and has been described in more detail elsewhere (Barrera, Fleming, & Al-Khalili, 2004). The version completed by the survivors consists of seven questions, and the parent version is five items including: “How useful was the group in helping you/your child improve your/his/her relationships with your/his/her friends and peers?” Each question was rated on a scale ranging from 1 (not helpful/useful) to 5 (very helpful/useful).

To describe the sample, data pertaining to cognitive functioning was retrieved from psychological records. Medical and demographic data were obtained from parents or from medical files. Patients were assessed using various Wechsler tests, including the WISC III (Wechsler, 1991) (45%), WISC IV (Wechsler, 2003) (30%), WASI (Wechsler, 1999) (15%), WAIS III (Wechsler, 1997) (5%), WAIS IV (5%). The average time lapse between cognitive assessment and pre-intervention was 14.04 months (SD = 10.11 months).

**Statistical Analyses**

Descriptive statistics to assess feasibility of the group intervention were conducted first. Subsequently, baseline data for parents and survivors were compared. To test intervention effect, baseline, pre- and post-intervention data for each outcome measure were subjected to a repeated measure analysis of variance (ANOVA). Where significant or borderline time effects were found, post-hoc pairwise comparisons were conducted between baseline and pre-intervention and pre- and post-intervention to determine the location of effect. A Bonferroni correction was employed to control for the number of comparisons. Finally, given the reduced sample at follow-up (n = 17; ≤ 12 years, n = 11; > 12 years, n = 6), separate
analyses were conducted to assess change from post-intervention to follow-up 6 months later, using one sample t-tests.

**Results**

**Feasibility**

Based on satisfaction questionnaires, all survivors and parents found the group to be very helpful or somewhat helpful for: Improving relationships with friends and peers (survivors: 55%, 35%; parents: 30%, 60%; respectively); improving relationships with family/parents (survivors: 55%, 30%; parents: 25%, 45%; respectively); helping to express feelings about experiences with peers (survivors: 55%, 30%; parents: 45%, 30%; respectively); helping to express feelings about experiences with parents/family (survivors: 60%, 30%; parents: 25%, 45%; respectively). Survivors and parents provided the same ratings for “Informal group discussions” and “Discussions about social skills and problem solving”; 67% very useful and 33% as somewhat useful. Finally, all survivors reported meeting other kids with similar experiences as very beneficial (67%) or somewhat beneficial (33%) while parents found the group to be very beneficial (67%) or somewhat beneficial (33%).

**Recruitment**

Fifty-eight brain tumor survivors were referred due to social difficulties. Forty were referred by members of the neuro-oncology team based on reports made by parents and 16 by research staff from a previous study with this population, as determined by parent reported social skills falling at or below the 25th percentile on the SSRS.

Figure 1 shows the flow chart of the potential participants (CONSORT; www.consortstatement.org). Seven families did not meet the inclusion criteria. Of the seven participants who were found to be ineligible, one was non-English speaking and the remainder were excluded based on their cognitive impairments (being in a special education classroom full-time). Eighteen families refused participation because of lack of interest, transportation problems, or scheduling difficulties. Thirty-three families were allocated to the intervention, representing a participation rate of 65%. One participant dropped out half way through the program due to scheduling difficulties. In addition, 19 families were scheduled for follow-up. Of these, two could not be contacted.

The final sample was compared to the greater brain tumor population at the hospital diagnosed between 2000 and 2006 (n = 127) based on demographic and disease variables. There was no significant difference for age at diagnosis [F(1,151) = 2.46, p > .05] or gender (χ² = .83, p > .05). A significant difference, however, was found for diagnosis (χ² = 6.66, p < .05). The referred population included more survivors of Medulloblastoma or PNET tumors (28% vs. 13.5%) and Astrocytoma tumors (28.1% vs. 25.4%) and fewer tumors categorized as “other” (40.6% vs. 61.1%).

**Retention**

There were no dropouts except for one survivor who completed only four sessions. This survivor was excluded from analyses because of incomplete data. Attendance averaged 90% ranging from 89.63% to 91% across the six groups. In addition, of the 19 survivors who participated in the last four groups and were offered follow-up, 17 successfully completed follow-up assessments. There were no significant differences between those who completed follow-up and those who did not on personal and medical variables with age being the only exception [F(1,31) = 4.64, p < .05]. The group who completed follow-up were slightly
Table II. Means and Standard Deviations for Outcome Measures

<table>
<thead>
<tr>
<th>Scale</th>
<th>N</th>
<th>Baseline M (SD)</th>
<th>N</th>
<th>Pre-intervention M (SD)</th>
<th>N</th>
<th>Post-intervention M (SD)</th>
<th>N</th>
<th>Six-month follow-up M (SD)</th>
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</thead>
<tbody>
<tr>
<td>SSRS (total, parent)</td>
<td>31</td>
<td>84.26 (12.86)</td>
<td>32</td>
<td>83.38 (14.16)</td>
<td>29</td>
<td>88.45 (14.60)</td>
<td>16</td>
<td>92.44 (18.40)</td>
</tr>
<tr>
<td>SSRS (total, survivor)</td>
<td>31</td>
<td>100.73 (18.12)</td>
<td>32</td>
<td>99.10 (16.03)</td>
<td>30</td>
<td>98.33 (13.96)</td>
<td>17</td>
<td>97.74 (14.74)</td>
</tr>
<tr>
<td>CBCL Social Problems</td>
<td>65.60 (7.91)</td>
<td>63.87 (8.89)</td>
<td>62.61 (9.84)</td>
<td>60.89 (9.98)</td>
<td>59.39 (10.55)</td>
<td>58.74 (10.80)</td>
<td>57.10 (11.63)</td>
<td>55.46 (12.41)</td>
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<td>CBCL Social Competence</td>
<td>38.68 (8.87)</td>
<td>39.12 (7.94)</td>
<td>41.35 (8.46)</td>
<td>42.31 (8.23)</td>
<td>43.12 (8.23)</td>
<td>44.21 (8.54)</td>
<td>45.32 (8.83)</td>
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</tr>
<tr>
<td>CBCL Externalizing</td>
<td>56.77 (10.39)</td>
<td>54.61 (8.61)</td>
<td>52.68 (10.17)</td>
<td>53.38 (7.50)</td>
<td>54.03 (7.50)</td>
<td>55.74 (7.83)</td>
<td>57.45 (8.13)</td>
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</tr>
<tr>
<td>CBCL Internalizing</td>
<td>64.25 (9.12)</td>
<td>62.93 (8.67)</td>
<td>62.75 (9.07)</td>
<td>62.75 (9.07)</td>
<td>63.45 (7.30)</td>
<td>64.15 (7.65)</td>
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</tr>
<tr>
<td>YSR (total, survivor)</td>
<td>15</td>
<td>55.50 (8.40)</td>
<td>20</td>
<td>51.76 (8.41)</td>
<td>21</td>
<td>53.64 (9.71)</td>
<td>10</td>
<td>53.30 (10.04)</td>
</tr>
<tr>
<td>YSR Social Problems</td>
<td>48.13 (8.45)</td>
<td>47.38 (7.90)</td>
<td>49.82 (7.04)</td>
<td>48.40 (10.36)</td>
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<td>YSR Social Competence</td>
<td>56.94 (6.47)</td>
<td>53.10 (9.15)</td>
<td>54.48 (12.05)</td>
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<td>YSR Externalizing</td>
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<td>YSR Social Problems</td>
<td>60.56 (5.41)</td>
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<td>53.30 (19.59)</td>
<td>54.55 (12.85)</td>
<td>55.85 (13.15)</td>
<td>57.15 (13.45)</td>
</tr>
<tr>
<td>CRI (total)</td>
<td>27</td>
<td>51.41 (10.48)</td>
<td>29</td>
<td>50.17 (9.85)</td>
<td>28</td>
<td>49.93 (13.30)</td>
<td>17</td>
<td>47.12 (7.64)</td>
</tr>
</tbody>
</table>

3SSRS (Social Skills Rating System; Gresham & Elliott, 1990).
3CBCL (Child Behavior Checklist; Achenbach, 1991).
3CDI ( Childhood Depression Inventory; Kovacs, 1992).
3YSR (Youth Self Report; Achenbach, 1991).
3PedsQL (Pediatric Quality of Life Index; Varni, 2002).

younger than those who did not (mean age of 11.71 years vs. 13.80 years).

Treatment Fidelity
The scores for adherence to session and group objectives yielded the following results: 88% adherence to session outline, 87% adherence to session themes and 83% successful engagement in the activities by participants.

Intervention Outcomes
Table II shows the means and standard deviations of the outcome measures. At baseline, parents reported significantly more social skills problems than survivors ($t = -3.94, p < .01$), whose scores were equivalent to normative values (i.e., mean = 100.73, SD = 18.12). Also for behavior scores, parents reported significantly more total ($t = 3.36, p < .01$), internalizing ($t = 4.01, p < .01$), externalizing ($t = 2.63, p < .05$), and social problems ($t = 2.15, p = .05$).

This was not surprising given that participants were considered eligible for the social skills intervention based on parental reported concerns of social skills difficulties. Finally, parents reported lower quality of life than survivors but this result was of borderline significance ($t = -1.97, p = .07$).

Social Skills
A repeated measure ANOVA using total parent social skills scores yielded a borderline main effect of time $[F(2, 54) = 3.06, p = .06]$. Post hoc pairwise analyses revealed a significant change from pre- to post-intervention with a Bonferroni correction and a moderate to large effect size $[F(1,28) = 5.70, p = .024, d = -.68]$, suggesting improvement in social skills over the course of intervention and indicative of a clinically significant change (Cohen, 1988). Observed power based on an alpha of .05 was 0.64. No significant differences were found between baseline and pre-intervention scores. Of the subscale scores, self-control yielded a borderline time effect $[F(2,52) = 2.50, p = .09]$ using a Bonferroni correction to account for four comparisons ($p = .0125$). Post-hoc analyses again revealed a significant improvement in self-control scores from pre- to post-intervention, after Bonferroni correction $[F(1,27) = 5.97, p = .021, d = -.70]$, with a medium to large effect size (mean 11.26 vs. 12.75). Again, this was suggestive of a clinically significant change (Cohen, 1988). Observed power with an alpha of .05 was 0.65. Again, no significant differences were found between baseline and pre-intervention. Survivors’ total social skills scores did not show significant time changes.

Quality of Life
Analysis of parent reported PedsQL total scores yielded a significant time effect $[F(2,28) = 16.58, p < .001]$. Post-hoc comparisons with a Bonferroni correction revealed a significant increase between pre- and post-intervention scores with a strong effect size $[F(1,15) = 17.98, p = .001, d = -.203]$ indicating a clinically significant change in HRQL after intervention (Cohen, 1988). Observed
power, calculated with an alpha of .05, was 0.98. No significant differences between baseline and pre-intervention were found. Survivors’ self-reports of HRQL showed no significant time differences.

**Behavior**

Analysis of CBCL total change scores using a Bonferroni correction \( (n = 4; \ p = .0125) \) revealed a borderline main effect for time \( [F(2,52) = 3.29, \ p < .05] \). Examination of these effects indicated that survivors, in general, improved their behavior, however post-hoc pairwise comparisons found no significance between baseline and pre-intervention or pre- and post-intervention with a Bonferroni correction. Similar analyses using the CBCL social problems scores also yielded a borderline effect of time \( [F(2,24) = 3.89, \ p < .05] \). This change was significant from baseline to pre-intervention \( [F(1,13) = 11.25, \ p < .01] \) with survivors scores decreasing from baseline to pre-intervention. There was no significant effect from pre- to post-intervention.

**Depression**

Survivor’s scores on the CDI revealed no significant time differences. Survivors’ scores at baseline were not significantly different from normative values and remained consistent across assessments.

**Follow-Up**

One sample t-test comparisons between change scores calculated for post-intervention and 6-month follow-up were conducted for those outcomes that yielded significant main effects at the end of intervention (parent reported SSRS total scores and assertion, parent reported PedsQL). A Bonferroni correction was added to account for the number of comparisons \( (n = 3; \ p = .017) \). No significant differences were found for any of the outcomes.

**Discussion**

The current study tested the feasibility of a social skills group intervention for children and adolescents who were treated for brain tumors, yielding promising results. With respect to the acceptability of the program, survivors and parents consistently reported substantial benefits on the satisfaction questionnaire suggesting strong acceptability. In terms of recruitment, there was a relatively large participation rate, which compares favorably with participation rates in other interventions with families of children with cancer (Kazak et al., 2005). The main obstacles to participation included transportation and scheduling difficulties. Future research may improve recruitment, therefore, by offering parking or transportation costs to families. As well, intervention programs could be run from locally based community centers depending on the geographic population distribution. Although the groups were run either on weeknights or weekends based on families’ preferences, this may not always work for all families. Once enrolled in the program, however, only one participant dropped out while the sessions were ongoing. Only two of the 19 participants who were contacted for follow-up dropped out, indicative of a high retention rate. Finally, analysis of the session logs indicate that treatment fidelity was maintained.

Based on parental reports, participants’ social skills, self-control and HRQL improved after the group intervention. Considering that participants were enrolled in the social skills group based on parental concerns about their children’s social difficulties, it is encouraging to see that parents reported improvements on standardized measures of social skills, including self-control. That these improvements were maintained after 6-month follow-up is also encouraging, given the importance of social skills for long-term social reintegration. Parents also reported beneficial effects on the satisfaction questionnaire.

That social skills training also resulted in improvement in HRQL as reported by parents, supports the argument that social skills training is central for overall improvement of the well-being of childhood brain tumor survivors (Varni et al., 1993). Again, these results were maintained at 6-month follow-up. These promising findings warrant further examination.

In contrast, although participants reported beneficial effects of the social skills program on the satisfaction questionnaire, they did not report significant improvement on any of the standardized outcome measures. This is not surprising given that the means of survivors’ self-reports at baseline on all outcome measures were within the normal range. Considering the consistence of the beneficial effects reported by youth and parents on the satisfaction questionnaires and the participants’ self-reports of social isolation (limited or no friends, being teased and bullied at school) during the actual group sessions, we suspect that the survivors’ responses to standardized questionnaires may not adequately reflect their social experiences or the effects of the social skills intervention. Certainly, the CBCL has been criticized for its use among children with chronic illness particularly as a measure of social
competence (Drotar, Stein, & Perrin, 1995). It is plausible that the SSRS has similar deficiencies among this population.

Based on parental reports, therefore, the results of this study expand earlier reports of the effect of social skills training in children and adolescents treated for brain tumors (Barakat et al., 2003, DieTrill et al., 1996). There is no literature, however, linking social skills deficits based on parent report with problematic peer relationships, and therefore further examination of intervention outcomes is warranted using other informants such as teachers and classmates, as well as alternate methods of measurement such as sociometry. Additional information using sociometric methodologies would enhance the validity of the intervention evaluation. Establishing the effect of social skills training in childhood brain tumor survivors will also help to better understand the conceptual relationship between social skills and social competence as postulated by Cavell (1990).

There are some limitations with this study. The use of each child as his/her own control in this time series design prior to, and after intervention, controlled for the passage of time and maturation, but cannot rule out other threats to validity. Lack of a control group prevented our ability to rule out threats to validity or potential sample biases such as parental reports reflecting commitment to the group as opposed to actual change. Nevertheless, we have reason to suspect the results obtained in the current study may indeed be valid, given that all outcome measures showed change after the intervention. Parental reports of behavior, for example, showed no change, whereas parental reports of social skills, self-control and HRQL showed improvement, suggesting that parents were not discriminatory in their reports of improvement after intervention.

A relatively small sample size limited the power of our statistical analyses to assess the efficacy of the intervention, particularly with regards to youth self-reports and the HRQL data. In addition, the lack of reports from additional informants (teachers, peers) to assess change in social behavior in other settings limits the generalizability of the findings.

Despite its limitations, the current study presents compelling evidence of feasibility and preliminary empirical evidence of program efficacy, which represents major improvements over previous work. In addition to testing feasibility, the study included a manualized intervention, an examination of several outcomes with standardized questionnaires completed by parents and survivors, a larger sample size than in previous studies, and tested sustainability of intervention effects 6 months later.

The empirical evidence of feasibility and efficacy of the intervention offers clinicians and parents new hope for improving the lives of pediatric brain tumor survivors, using a manualized group social skills intervention. In terms of clinical implications, these preliminary results highlight the need to identify social skills difficulties, such as having no friends and being teased at school, in children and adolescents who are treated for a brain tumor. At the very least, clinicians should address these issues with parents and youth to ensure that these problems do not go unnoticed. Ideally, the beneficial effects of the social skills training program could be offered to these families.

Although the evidence for intervention effect in this study is modest, it should be considered in light of the constraints of working with children who have rare and challenging medical conditions. Certainly, these findings are promising and warrant further investigation using a larger sample size, a control group, additional informants, including teachers and peers, and alternative data gathering tools, such as sociometric techniques and behavioral observations. Yet, developing and testing innovative interventions to improve the chances of living a better life for these survivors is costly and may take an unreasonably long time to achieve in only one site. Nevertheless, future research validating the effect of the social skills program, across other sites and via a randomized control trial, will contribute to the development of evidence-based interventions for this high-risk population. This will contribute to greater improvements in their quality of life and will prepare young survivors to better succeed in the future.

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