A Meta-Analysis of the Effects of Psychological Interventions in Pediatric Oncology on Outcomes of Psychological Distress and Adjustment

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Objective To estimate the effectiveness of psychological interventions in pediatric oncology on decreasing psychological distress and increasing psychological adjustment using meta-analytic methods. **Methods** A meta-analysis was conducted on 12 psychological intervention studies in pediatric oncology using a weighted least squares (WLS) approach and random effect models. **Results** Effect sizes significantly different from zero were found for parent distress (mean = 0.35, 95% CI = 0.20–0.49, n = 7) and parent adjustment (mean = 0.23, 95% CI = 0.07–0.40, n = 5). Effect sizes for child distress, child adjustment, parent-reported child distress, and parent-reported child adjustment were not significantly different from zero. **Conclusions** Psychological interventions in pediatric oncology show promise in decreasing distress and improving the adjustment of parents of children with cancer but may have minimal effects for child outcomes. Methodological issues of intervention research are discussed.

Key words cancer; intervention; pediatric oncology; psychological adjustment; psychological distress.

Children with cancer and their families are confronted with multiple and pervasive stressors including significant medical side effects (Bryant, 2003), considerable changes in daily activities (Woodgate, Degner, & Yanofsky, 2003), disruption of social and family roles (Kazak, Simms, & Rourke, 2002), and the threat of death. These significant stressors put this population at risk for short- and long-term psychological difficulties. A notable subset of children with cancer experience significant psychological distress (Koocher & O'Malley, 1981), posttraumatic stress symptoms (21% of young adult survivors; Hobbie et al., 2000), as well as diminished social skills compared to their peers (Katz & Varni, 1993; Mulhern, Carpentieri, Shema, Stone, & Fairclough, 1993; Vannatta, Gartstein, Short, & Noll, 1998). For caregivers, rates of global psychological distress have been estimated to be as high as 51% (Sloper, 2000). Moreover, posttraumatic stress symptoms (Kazak et al., 1997) and internalizing symptoms (Manne et al., 2001) commonly afflict caregivers of children with cancer.

To address the formidable psychological risks facing children with cancer and their families, psychological services are now considered a critical component of comprehensive cancer treatment (American Academy of Pediatrics, 1997). An emerging body of published work has responded to the need to develop empirically supported psychological interventions for children with cancer and their families. Although some of these interventions have shown promise (Barakat et al., 2003; Kazak et al., 2004; Sahler et al., 2005), findings regarding intervention effects on specific psychological outcomes across intervention studies are mixed (Hinds et al., 2000; Hoekstra-Weebers, Heuvel, Jaspers, Kamps, & Klip, 1998). The diversity of populations, treatment targets,

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modalities used, and methods to evaluate psychological interventions in pediatric oncology make it difficult to compare intervention efficacy across different intervention approaches and to describe intervention efficacy.

In addition to the difficulties interpreting available intervention findings, there is increasing discussion regarding the future direction of behavioral intervention research in pediatric oncology. In a recent special issue of the *Journal of Pediatric Psychology*, Phipps (2005) questioned the need for interventions among some pediatric oncology groups. Acknowledging the limitations of the existing intervention research in pediatric oncology, other reviews have called for additional intervention research to further increase the specificity of interventions for subsamples of patients, to increase the inclusion of fathers and siblings, and to address ongoing survivorship issues (Kazak, 2005; Patenaude & Kupst, 2005).

To our knowledge, a comprehensive critical review of psychological interventions that focus on enhancing the adjustment of children with cancer and their parents has not been published in the peer-reviewed literature. Thus, a meta-analytic review is a logical next step in intervention research efforts. Therefore, the purpose of this study was to conduct a meta-analysis of psychological interventions in pediatric oncology, which target psychological distress and adjustment outcomes. The meta-analytic technique provides a systematic approach for synthesizing the diverse literature of pediatric oncology interventions (Lipsey & Wilson, 2001). The goals of this review were: (a) to describe and evaluate the current state of psychological intervention research in pediatric oncology, (b) to estimate the effectiveness of psychological interventions on improving psychological outcomes for children with cancer and their parents using meta-analytic methods, and (c) to identify future directions for intervention research in pediatric oncology. In contrast, several reviews of psychological interventions to reduce procedural distress and chemotherapy side effects have been published (Kuppenheimer & Brown, 2002; McQuaid & Nassau, 1999; Powers, 1999) and therefore will not be addressed here.

Methods

For purposes of this review, a psychological intervention was defined as an intervention that (a) was designed to alleviate psychological distress and/or improve adaptive functioning and (b) involved a structured interaction between a facilitator and a participant which incorporated psychological methods (e.g., behavioral, cognitive behavioral, family systems, or psychoeducation). Interventions facilitated by psychologists, therapists in training, and other trained professionals were included. Treatments identified exclusively as medication, music therapy, art therapy, or bibliotherapy were excluded.

Psychological distress and adjustment of children with cancer and their parents were the outcomes reviewed. Psychological distress was defined as upsetting or aversive feelings or affect experienced by an individual, which may include symptoms of anxiety or depression but may or may not meet the criteria for a mental disorder as defined by the Diagnostic and Statistical Manual of the American Psychiatric Association IV-TR (2000). Psychological adjustment was defined as skills and abilities that are related to social, occupational, and educational functioning. Such skills include problem-solving skills, perceived competence, and social skills.

Literature Search

Literature searches were conducted on Medline, Comprehensive Index to Nursing and Allied Health Literature (CINAHL), PsychInfo, Digital Dissertations, and the Cochrane Database of Intervention Studies for psychological intervention studies conducted with pediatric oncology populations from 1967 to 2005 (see list of search terms in appendix). Then, hand searches were conducted in the *Journal of Pediatric Psychology*, *Children's Health Care*, *Psycho-oncology*, and the *Journal of Developmental and Behavioral Pediatrics* as these publications commonly report intervention literature. Dissertations were included if they met the study criteria, because previous studies have shown that dissertations typically meet and exceed the methodological rigor of published studies and, therefore, should be included in meta-analyses (McLeod & Weisz, 2004). Finally, citations included in identified studies and review articles were inspected for additional intervention studies.

Design and Reporting Criteria

The following inclusion criteria were utilized: (a) a sample of children aged 18 years or younger diagnosed with any type of cancer and/or their families, (b) published in English, and (c) an empirical report that included data sufficient to calculate a raw effect size statistic. When statistics needed to calculate raw effect sizes were not reported, we contacted the authors of the article to obtain the necessary information (n = 7 attempted contacts, n = 4 responded). Effect sizes from randomized clinical trials of both within-subject or between-group designs were included in this study. Only one study with a group within-group design met the inclusion criteria.

Effect sizes for this study were reported separately as they include intraparticipant variance not captured in the effect size calculation for the between-subject designs. A total of 28 studies published between 1983 and 2005 were identified by the search process. Nine were excluded because of insufficient data to calculate effect size statistic (six of nine reported qualitative data only), five were excluded because of not fitting the definition of a psychological intervention, and two were excluded because the outcomes were not coded as either psychological distress or adjustment. A total of 12 studies that met all the criteria were included in the analysis.

Study Coding

Studies were coded for intervention recipient, therapy method, study design, and study outcomes. Intervention recipient categories included child only, child and parent, parent only, and others (e.g., school-based interventions). Therapy method categories were educational, behavioral/cognitive behavioral, social skills training, and others (e.g., relaxation, written disclosure, and social support). Randomized controlled trial, quasi-experimental design, and within-group design constituted study design categories. Finally, outcomes were coded as self-reported child distress, self-reported child adjustment, self-reported parent distress, self-reported parent adjustment, parent-reported child distress, and parent-reported child adjustment. To prevent bias, two advanced pediatric psychology graduate students independently coded treatment method and study outcomes of each of the intervention studies. Mean interrater reliability across coders was kappa α = .87 and kappa α = .93 for treatment method and study outcomes, respectively.

All outcome measures for studies included in the meta-analysis were reliable and valid, widely used standardized measures of child distress (e.g., Children's Depression Inventory; Kovacs, 1992), child adjustment (e.g., Perceived Competence Scale for Children; Harter, 1985), parent distress (e.g., Impact of Events Scale; Weiss & Marmar, 1997), parent adjustment (e.g., Social Problem Solving Index; D'Zurilla & Nezu, 1990), parent-reported child distress, and parent-reported child adjustment (e.g., Child Behavior Checklist; Achenbach, 1991). Most of the studies included more than one outcome that fit the outcome selection criteria for distress or adjustment. In these cases, mean effect sizes were calculated across multiple measures of the same construct (Lipsey & Wilson, 2001). In cases where total scores and scale scores for the same measure were reported, only the total score was used to calculate effect sizes. Effect size scores from studies with a single score were then compared to effect sizes derived from aggregated scores to determine whether they were statistically different. No statistical differences (all $p > .05$) were found, and therefore single scores and aggregated scores were analyzed together for each outcome category (e.g., child distress, child adjustment, parent distress, parent adjustment, parent-reported child distress, and parent-reported child adjustment).

Finally, each study was rated for study quality. An adaptation of a checklist developed by Jadad was used to assess the quality of studies included in the study (Moher et al., 1999). Each study was rated on the following factors: (a) Were participants randomized? (b) Were randomization procedures described? (c) Did the authors report numbers and reasons for dropouts? (d) Did the study include a control group, and (e) Did the authors report monitoring treatment fidelity? Of the 12 studies included in the meta-analysis, one study scored 5/5, five studies scored 4/5, three studies scored 3/5, two studies scored 2/5, and one study scored 1/5. Ratings of study quality did not significantly correlate with the average study effect size ($r = -.07$, $p = .84$).

Results

Effect Size Calculations

Effect size calculations were conducted for between- and within-group analyses. For studies with a between-group design, a comparison of the intervention group with the control or comparison group was calculated (Lipsey & Wilson, 2001). For studies that only had within-group data, the effect size was calculated by comparing pre- to posttreatment data (Lipsey & Wilson, 2001). The mean of the control group (or baseline data) was subtracted from the mean of the treatment group (or follow-up assessments). This figure is then divided by the pooled group standard deviation. These calculations yielded a Cohen's *d* for each study (Cohen, 1988).

A weighted least squares (WLS) approach was employed for the primary analysis. This approach weights each effect size by the inverse of its variance, thus emphasizing findings from studies with larger samples and more precise estimates (Hedges & Olkin, 1985). A positive effect size indicates a treatment effect in the desired direction on the outcome measures, whereas a negative effect size indicates a treatment effect in the opposite direction. Effect sizes were calculated by the first author (A.L.H.P.), and all data were independently verified by coauthors (K.Z. and M.M.). Random effects models were used to calculate all mean effect sizes because this method provides a more conservative

estimate of the mean effect size by including study-level sampling error as well as subject-level sampling error. Use of the random effects model is recommended when analyzing a small number of studies that have small sample sizes (Lipsey & Wilson, 2001). Cohen's (1988) classification of effect sizes was employed here where an effect size of $d = 0.20$ is small, $d = 0.50$ is medium, and $d = 0.80$ is large.

Tests of Homogeneity

The overall test for homogeneity (Q_T) assesses the distribution of the effect sizes for a designated group of studies to determine whether variance in a group of studies is primarily because of sampling error or whether there are systematic differences among the studies in addition to sampling error. A nonsignificant Q_T indicates homogeneity of the effects, meaning that the variability across effect sizes is not greater than expected from sampling error alone (Lipsey & Wilson, 2001). A significant Q_T indicates that variability in the sample is greater than expected from sampling error alone and that the data should be examined for outliers and/or moderating factors. The inclusion of the *Q*-statistic provides a methodological advantage as it provides an objective indicator of the internal consistency of the study outcome groupings.

Description of Studies

Summary of Sample Characteristics

A total of 28 studies were reviewed for the current analysis. Of those, 12 met the criteria for inclusion in the final analysis. The mean number of participants at baseline was 46.57 (range = 9–215) for the treatment groups and 42.21 (range = 10–210) for the control groups. Ten studies had less than 50 participants in each group. Participants with various cancer diagnoses, site of malignancy, and treatment regimens were included in the samples of 10 of the 12 studies. One study exclusively targeted children with brain tumors (site of malignancy) and one targeted families of children undergoing bone marrow/stem cell transplant (similar treatment regimens).

Across the 11 studies that reported ethnic distribution of the study sample, participants were predominantly Caucasian (45–95% of the sample). Notably, lower socioeconomic status (SES) groups were well represented in the intervention study samples (22–62% falling in the lowest SES category reported in each study). Five of the interventions were delivered to the parents, five were delivered to the child, and two delivered the intervention to both the caregivers and the children (see Table I for a summary of the included studies). Timing of the intervention within the cancer course also varied, with seven studies targeting those in the newly diagnosed period, three targeting survivors/off-treatment phase, and two targeting the treatment phase.

Summary of Methods

Most of the studies were preventive interventions that were designed to reduce the level of potential negative psychological sequelae of pediatric cancer. As such, they included all individuals within a specific diagnostic group (e.g., brain tumors) or period of the illness course (e.g., newly diagnosed) but did not require a certain level of symptomatology on a particular outcome to be included in the sample or to have a preidentified deficit or problem.

The average number of sessions per intervention was 4.18 (range = 1–8, $SD = 2.86$, $n = 11$), and the average duration of an intervention session was 66 min (range = 20–120 min, $SD = 28.85$, $n = 10$) for an average of 260.50 min (range = 40–720 min, $SD = 228.26$) of total direct treatment contact minutes per completed intervention. Interventions delivered to parents or caregivers included teaching problem-solving skills ($n = 2$), engaging in written disclosure tasks, stress inoculation, and teaching cognitive behavioral techniques. The interventions delivered to the children included social skills training, school re-integration, and promoting self-esteem. Finally, interventions that targeted the entire family taught cognitive behavioral techniques in a family systems context.

Nine intervention studies were randomized clinical trials. Of the 11 studies that included a comparison/control group, a waitlist/standard care control group was used in eight studies, attention control (e.g., discussing topics of participant's choosing with a facilitator and writing about ordinary events) was used in two studies, and a comparison group (healthy controls) was used in one study. One study used a within-group design (Barakat et al., 2003). Nine of the studies specifically indicated that they used a standardized treatment manual or written material so that the intervention could be replicated. We also examined whether the interventions were delivered in a group or individual format. Six of the 12 interventions were delivered in a group format. Notably, 5 of the 12 interventions reported the use of some method of treatment fidelity check. Of those that reported fidelity checks, one videotaped the sessions, two used audiotape the sessions, one used observer-completed checklists, and one cited supervision as their method of ensuring treatment fidelity.

Of the nine studies that included some form of parent report, only three studies reported paternal outcomes or

Table I. Summary of Studies Included in the Analyses

Citation	Intervention group (*n*)	Control (*n*)	Intervention group child age (years)	Control child age (years)	Target group	Control group type	Outcomes	Follow-up
Barakat et al. (2003)	13	Not applicable	10.77	Not applicable	3	Not applicable	CD, CA, PRCD, PRCA	T2: 9 months PI
Hinds et al. (2000)	40	38	16.4	15.6	1	AC	CD, CA	T2: 5–7 weeks post-DX
								T3: 3 months post-DX
								T4: 6 months post-DX
Hoekstra et al. (1998)	39	42	6.4[a]	–	1	W/SC	PD, PA	T2: PI
								T3: 6 months PI
Katz et al. (1988)	49	36	9.76	10.48	1	W/SC	CD, CA, PRCD, PRCA	T2: mean = 8.87 months post-BL
Kazak et al. (2005)	9	10	5 (Mdn)	4.5 (Mdn)	1	W/SC	CD, PD	T2: 2 months PI
Kazak et al. (2004)	76	74	14.62	14.60	3	W/SC	CD, PD	T2: 3–5 months PI
Sahler et al. (2002)	50	42	8.11	8.53	1	W/SC	PD, PA	T2: PI
								T3: 3 months PI
Sahler et al. (2005)	215	210	7.6	7.6	1	W/SC	PD, PA	T2: PI
								T3: 6 months post-BL
Schwartz, Feinberg, Jilinskaia, and Applegate (1999)	54	22	21.8	22.0	3	CG	CA	T2: 10–12 weeks post-BL
								T3: 6 months post-BL
Schwartz and Drotar (2004)	29	25	NR	NR	4	AC	PD, PA	T2: PI
								T3: 4 months PI
Streisand, Rodrigue, Houck, Graham-Pole, and Berlant (2000)	11	10	9.4	8.0	2	W/SC	PD	T5: +21 posttransplant
								T3: +7 posttransplant
								T4: +14 posttransplant
								T2: Day 0
Varni et al. (1993)	33	31	8.3	8.01	1	W/SC	CD, CA, PRCD, PRCA	T2: 6 months post-DX
								T3: 9 months post-DX

Target group: 1, newly diagnosed; 2, on treatment; 3, survivors; 4, mixed sample. Outcomes: CA, child adjustment; CD, child distress; PA, parent adjustment; PD, parent distress; PRCD, parent-reported child distress, PRCA, parent-reported child adjustment. Control group: AC, attention control; CG, comparison group; W/SC, waitlist/standard care. Follow-up: BL, baseline; DX, diagnosis; NR, not reported; PI, postintervention.

[a]Demographics collapsed across groups.

paternal report of child outcomes independently (Hoekstra-Weebers et al., 1998; Kazak et al., 2004, 2005). Parent and child distress outcomes included measures of depression, anxiety, and posttraumatic stress symptomatology. Parent adjustment measures included parenting competence, problem-solving skills, and positive affect, whereas child adjustment outcomes included measures of self-esteem, self-efficacy, and perceived control. Measures that were directly tied to a theory or a model were used in four studies including problem-solving skills (Sahler et al., 2002, 2005) and posttraumatic stress symptoms (Kazak et al., 2004, 2005).

Seven of the studies mentioned the issue of the clinical significance of their findings. Six of these studies provided empirical estimates of the clinical significance of the study results, including comparison of the sample to a normative sample and the percentage of the sample moving into the normative range on the respective study outcome measure. Finally, seven of the interventions included at least one behavioral or cognitive behavioral component. Other intervention components included education regarding the illness, education regarding coping skills, social support, social skills training, relaxation, written disclosure, and communication skills. Follow-up periods ranged from immediately postintervention to 9 months (mean = 4.35, *SD* = 2.88) following the completion of the intervention.

Primary Analyses of Effect Size

Parent Outcomes

Homogeneity was demonstrated for the effect sizes for both parent distress (Q_T = 3.96, p = .68) and adjustment (Q_T = 2.03, p = .73). As summarized in Table II, overall small mean effect sizes were significantly different from zero for both parent-reported distress [mean = 0.35, 95% confidence interval (95% CI) = 0.20–0.49, n = 7] and adjustment (mean = 0.23, 95% CI = 0.07–0.40, n = 5) when calculated with the first follow-up data available for each study. Because of the small sample sizes, we calculated the fail-safe *N* for each significant outcome as an estimate of the number of unpublished studies reporting null results needed to reduce the cumulated effect across studies to the point of nonsignificance. The fail safe *N* were 17 and 35 for parent distress and parent adjustment outcomes, respectively.

Table II. Summary of Mean Effect Sizes

	n	Weighted mean effect size	95% CI	Q_T
Distress				
Child	4	0.18	–0.04 to 0.40	0.17
Parent	7	0.35	0.20 to 0.49	3.96*
Parent-reported child outcome	2	0.31	–0.10 to 0.72	0.69
Adjustment				
Child	4	0.31	–0.05 to 0.67	5.23
Parent	5	0.23	0.07 to 0.40	2.03*
Parent-reported child outcome	2	0.72	–0.35 to 1.78	5.66

n, number of studies included in the calculation of effect size; Q_T, test of homogeneity statistic.
*$p < .05$.

Child Self-Reported Outcomes

Effect sizes for both child-reported distress and adjustment were homogeneous (Q_T = 0.17, p = .98 and Q_T = 5.23, p = .16, respectively). Effect sizes observed for child-reported distress (mean = 0.18, 95% CI = –0.04 to 0.40, n = 4) and adjustment (mean = 0.31, 95% CI = –0.05 to 0.67, n = 4) were not significantly different from zero. [Baseline values of child distress were examined to determine whether the scores used to evaluate distress were high compared with the available norms or other samples. The mean total score for both groups (intervention and comparison groups) in Varni, Katz, Colegrove, and Dolgin (1993) fell below published norms on State-Trait Anxiety Inventory for Children (Spielberger, 1983) and the general population mean (10) on the CDI (Kovacs, 1992). CDI scores in the Katz et al. (1988) study also fell below the general population mean. In Kazak et al. (2004), PTSD-RI score fell in the "mild" range for both the intervention and the control groups. Finally, in Hinds et al. (2000), the mean hopelessness score fell in the "moderate" hopelessness range for both groups.] The only within-group study reported here had a medium effects as defined by the effect size of 0.64 (*SD* = 0.16) for child distress and 0.56 (*SD* = 0.14) for child adjustment (Barakat et al., 2003).

Parent-Reported Child Outcomes

Effect sizes for parent-reported child distress were homogeneous (Q_T = 0.68, p = .41) but not for parent-reported child adjustment (Q_T = 5.66, p = .02). Effect sizes for parent-reported child distress (mean = 0.31, 95% CI = –0.10 to 0.72, n = 2) and parent-reported child adjustment (mean = 0.72, 95% CI = –0.35 to 1.78, n = 2) were not significantly different from zero. For the within-group study, mean effect sizes for parent-reported child distress and parent-reported child adjustment were 0.22 (*SD* = 0.03) and 0.32 (*SD* = 0.16), respectively (Barakat et al., 2003).

Discussion

To our knowledge, this review is the first meta-analytic synthesis of findings of the pediatric oncology intervention

literature conducted in a standardized, quantitative manner. With psychological services increasingly being integrated into pediatric oncology care, this empirical review provides a value-added contribution to the literature by distilling findings of a diverse sample of interventions with regard to intervention modalities and cancer populations. In addition, this study contributes to the current psychological intervention literature in pediatric oncology by providing a benchmark for scientific progress in the field and suggesting critical next steps to enhance the power and clinical significance of future findings.

Taken together, the findings of this review provide modest support for the effectiveness of the available interventions. The most notable findings were for parents, where effect sizes significantly different from zero were found for parent distress and parent adjustment. However, effect sizes for child distress, child adjustment, parent-reported child distress, and parent-reported child adjustment were not significantly different from zero.

There are a number of potential explanations for the relatively small effects observed in this meta-analysis. For instance, the majority of the studies included in the meta-analysis were executed with little or no previous data on the effects of the intervention that was tested. In addition, most of the interventions were relatively unfocused in that they were eclectic in nature, employing a variety of modalities within the same intervention (cognitive behavioral techniques, education, support, etc.). Finally, no significant effect sizes were found for child distress. This may be related to the fact that, as a group, children with cancer have not been found to have significantly higher levels of psychological distress than healthy children. Indeed, scores of child distress included in the effect size calculations in this study often fell in the "mild" range or below the population means for each particular measure. It is not known whether these subthreshold levels of distress are related to increased risk of functional impairments. This is a critical issue for future behavioral invention research in pediatric oncology.

Key methodological issues of psychological interventions in pediatric oncology were also identified by the current investigation, which need to be considered. Although nine of studies were randomized trials, only two of the studies included a group equivalent to an attention control group, with the majority of investigators using a waitlist/standard care control group. Unfortunately, waitlist control groups do not control for the potential nonspecific treatment effects (e.g., social support from other group members or facilitators) and the influence of therapist and patient expectations of receiving a treatment. Previous intervention studies have demonstrated that such nonspecific factors can account for the observed treatment effects (Blanchard et al., 1992).

The second key methodological issue is the length of follow-up periods. The average length of follow-up was just slightly over 4 months (longest follow-up period was 9 months postintervention), limiting conclusions that can be drawn with regard to the durability of the intervention effects. Only six of the studies included in the current investigation reported empirical estimates of clinical significance of the findings, such as effect sizes, which provide a measure of the magnitude of treatment effect independent of sample size. Finally, only four studies measured outcomes directly tied to the theory on which the intervention was based. The remainder of the studies utilized generalized measures of adjustment and distress such as depression, anxiety, and parenting stress. As stated previously, model-mechanism-outcome specificity and correspondence could potentially increase the ability of researchers, and eventually clinicians, to choose specific interventions for specific problems at specific times during the illness course.

Several limitations of this review should be considered in interpreting the findings. Owing to the small number of psychosocial intervention studies published in pediatric oncology, relatively few studies were included in the current investigation. The small sample size limited the ability to conduct more elaborate analyses that compared the timing of implementation and mediators of intervention effects. However, this has been an active area of recent research, and our review reflects the state of the art with respect to the current research and is a benchmark against which future intervention research can be compared. Another limitation is the small number of studies coupled with the diversity of the intervention approaches (e.g., family systems, written disclosure, etc.), timing (newly diagnosed, on treatment, survivors, etc.), recipients (e.g., mothers, family, child, etc.) and contexts (e.g., bone marrow transplant, brain tumor, leukemia, etc.). As a result, generalizations of the findings must be made cautiously. Finally, as with many meta-analyses, it is possible that this study is susceptible to the "file-drawer" problem and therefore may overrepresent studies that had statistically significant effects.

As the field progresses, increased use of attention control groups, although costly and logistically challenging, needs to be utilized in the testing of well-developed

interventions to increase experimental control for the effects of history and demonstrate that the interventions are effective above and beyond the effects of nonspecific therapeutic treatment effects. The study by Hinds et al. (2000), examining the effects of a coping intervention on psychological distress and adjustment of adolescents newly diagnosed with cancer, is a noteworthy example of the use of an attention control group. Instead of receiving the intervention, participants in the attention control group spent an equivalent amount of time with a facilitator as participants in the intervention group discussing topics of their choosing. By having the attention control in place, the effects for this study cannot be attributed solely to the process of interacting with the interventionists, thereby increasing the interpretability of the study findings (i.e., how the intervention may be related to the observed effects).

It is also recommended that longer follow-up periods be incorporated into future studies to better determine the long-term effects of the interventions. The longest follow-up period (from the completion of the intervention) in this study was 9 months. This seems an especially important issue in pediatric oncology in which the challenges that the families face change dramatically depending on the course and stage of the illness. Informed by longer follow-up periods, investigators could better understand the natural course of distress and adjustment and refine intervention content accordingly. For example, in the clinical child intervention literature, interventions to improve parenting skills (Bradley et al., 2003) and decrease child behavioral disorders (Querido & Eyberg, 2005) have incorporated booster sessions (i.e., additional sessions added after the completion of the core intervention) and found them to assist in the maintenance of intervention outcomes.

To facilitate comparisons between intervention outcomes, we also recommend that effect sizes be reported for all psychological intervention studies in pediatric oncology (Moher, Schulz, & Altman, 2001). As stated, only half of the interventions included in the current investigation included such an estimate. Finally, to advance the state of the art of psychological interventions in pediatric oncology, future interventions should consider more closely tying intervention elements, outcomes and measures to theoretical models that can be tested and refined. Two intervention studies have set the precedent for theoretically based intervention work—Kazak et al. (2004) and Sahler et al. (2005). Specifically, Kazak and colleagues based an intervention on years of empirical work examining cancer as a traumatic event leading to increased risk of individuals experiencing posttraumatic stress. Consequently, their intervention taught cognitive behavioral skills designed to target posttraumatic symptoms in a family systems context.

Overall, this study yielded modest findings for psychological interventions in pediatric oncology. More importantly, however, the current investigation also highlighted that this is a nascent area of research with multiple opportunities for future investigation and refinement.

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Appendix

Search terms for the meta-analysis of the effects of psychological interventions in pediatric oncology on outcomes of psychological distress and adjustment

Oncology
Cancer
Leukemia
Brain tumor
Pediatric
Child
Childhood
Parent
Mother
Father
Family
System(s)
Intervention
Behavioral
Cognitive behavioral
Behavioral modification
Psychosocial treatment
Psychological treatment
Support group
Biofeedback
Relaxation