

Pediatric Cancer and the Quality of Children's Dyadic Peer Interactions

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Objective To use observational methods to assess the quality of peer relationships in 51 7- to 12-year-old acute lymphoblastic leukemia survivors as compared to healthy children. **Methods** Children were audiotaped as they engaged in free play with their best friend and interactions were coded to assess their ability to maintain engagement with one another during play as well as the affective dimension of their play. **Results** Results indicated that dyads with survivors of childhood cancer were less likely to be highly engaged with their best friend and more likely to experience disengagement than dyads with healthy participants. There were no group differences in positive or negative affect. **Conclusions** Overall, these data suggest that survivors of childhood cancer's relationships with their best friend may be compromised in some specific areas when compared to the relations of healthy children. Implications for intervention are discussed.

Key words pediatric cancer; peers; survivors.

Introduction

Due to remarkable medical advancements, there is a growing group of children and young adults who are now considered to be cancer survivors. Survivors of childhood cancer have experienced a myriad of stressful life events that are generally not shared by their age mates. Not only have they coped with the uncertainty and fear that surrounds a cancer diagnosis, but they have also experienced numerous invasive and painful medical interventions, and have intermittently been kept out of school or away from their friends due to hospitalization or decreased immune functioning (Fearnow-Kennet & Kliever, 2000).

Across studies of children with varying forms of cancer and treatments, recent evidence suggests that experiences with childhood cancer treatment may have implications for children's social functioning and peer relationships. Survivors of childhood cancer have been found to engage in less than half the number of social activities as their peers (Pendley, Dahlquist, & Dreyer, 1997). They are also rated by parents as having poorer social competence

and are seen by peers as sick, fatigued, and absent from school (Kullgren, Morris, Morris, & Krawiecki, 2003; Olson, Boyle, Evans, & Zug, 1993; Reiter-Purtill, Vannatta, Gerhardt, Correll, & Noll, 2003; Schultz et al., 2007; Vannatta, Zeller, Noll, & Koontz, 1998). Survivors of childhood cancer have also been identified by peers, teachers, and parents as more socially isolated and withdrawn than their classmates or siblings (Noll, Bukowski, Davies, Koontz, & Kulkarni, 1993; Schultz et al., 2007; Vannatta, Gartstein, Short, & Noll, 1998), and they describe themselves as feeling isolated from their peers (Spirito et al., 1990; Vannatta, Garstein et al., 1998).

There is also evidence that the friendship quality of survivors of childhood cancer may be different than their peers. Survivors rate themselves as having fewer close and confiding relationships when compared to children who have never had cancer (Sloper, Larcombe, & Charlton, 1994). They are also less likely to be seen by peers as having best friends (Reiter-Purtill et al., 2003), are chosen by peers less often as a best friend (Vannatta,

Zeller et al., 1998), and receive fewer friendship nominations from classmates (Vannatta, Garstein et al., 1998). They are also less likely to use friends as confidants (Barrera, Shaw, Speechley, Maunsell, & Pogany, 2005). When followed into adulthood, their friendships are shorter in duration and characterized by less intimacy than those of their peers (Mackie, Hill, Konydryn, & McNally, 2000).

Results of research in this area are far from uniform, however, and several studies have found no significant differences between survivors of childhood cancer and their peers on measures of social functioning. In a series of papers, Noll and colleagues have found survivors of childhood cancer exhibited significant psychosocial hardness and to be no different from their peers on standardized questionnaire measures of loneliness, social acceptance, and reciprocated friendships (Gerhardt, Vannatta, Valerius, Noll, & Correll, 2007; Noll et al., 1993, 1997). Contradictory findings regarding children's social functioning within studies have also been noted, such as when some informants note difficulties in social functioning whereas others do not (Vannatta, Zeller et al., 1998) or when differences between survivors of childhood cancer and healthy participants are seen on some measures of social adjustment (e.g., social isolation) but not on other measures (e.g., peer acceptance; Noll, Bukowski, Davies et al., 1993).

Such heterogeneity of findings may be due to a number of factors. Social problems may be relatively uncommon and are perhaps most prevalent in a subgroup of survivors. Studies also vary widely in research methodology and populations under study. For example, many studies have included participants with a range of types of cancers, which may be problematic as recent findings suggest that children receiving different types and intensities of treatment may be differentially at risk for negative psychosocial outcomes (Vannatta, Gerhardt, Wells, & Noll, 2007). Additionally, several studies have included children of widely varying ages into one group. In addition, much research in this area has relied upon teacher and parent reports of survivors' peer interactions and peer sociometric ratings. These methodologies tend to focus on general dimensions of peer functioning (e.g., acceptance, sociability, and number of friends) and may fail to capture the subtle component processes of dyadic interaction that reflect the quality of intimate friendships. Parents and teachers also have limited opportunity to observe and evaluate children's peer interactions. Observational methods have the advantage of identifying subtle aspects of dyadic friendship quality (both positive and negative) that may not be directly observable by parents or teachers, and that can be targeted for intervention. Indeed, it has been suggested that

enhancing high-quality dyadic friendships may be a realistic goal for some social skills interventions (Wiener & Schneider, 2002) and can serve as a stepping stone towards overall acceptance by a peer group.

A number of factors related to the cancer experience may result in reductions in the social problem-solving or social affective processes critical to successful engagement with peers (Yeates et al., 2007). The biological insult associated with chemotherapy may directly affect social and cognitive processes necessary for negotiating interpersonal interaction, particularly in children receiving central nervous system directed treatment (Brown et al., 1998; Vannatta et al., 2007). Changes in physical appearance and functional impairments (e.g., fatigue) due to treatment factors may be associated with reduced time with peers and less opportunity to practice key social-affective skills, such as the ability to regulate emotion or take another's perspective. Family factors such as parental overprotection may also lead to reductions in time with peers at school and a smaller circle of companions with fewer opportunities to practice social-affective skills.

The Current Study

The current study focused on the peer interactions of childhood survivors of acute lymphoblastic leukemia (ALL) as compared to typically developing peers. ALL was selected because it is the most common type of childhood cancer and has a well-standardized course of treatment. The current study attempts to address limitations of previous research by assessing quality of friendship in a group of cancer survivors that are similar in terms of diagnosis, treatment history, and age. Additionally, the current study was limited to children between the ages of 7 and 12 years, a developmental period often referred to as middle childhood. Middle childhood is a time when interactions with peers become increasingly complex and peers begin to take center stage in children's growing social worlds (Gottman, 1983). While there is no consensus about the age at which children are most vulnerable to socioemotional difficulties related to treatment, there are clearly differences in the challenges and requirements for successful social interaction at different developmental levels.

In this study, we were specifically interested in assessing the quality of children's friendships. To do so, we assessed dyadic interactions between survivors of childhood cancer and their best friends and compared these interactions to the interactions of healthy best friend dyads. Children tend to exhibit a wider range of affect and behavior with their best friends than they do with other peers,

and best friend interactions have been used as an index of maximal social competence (Gottman, 1983). To our knowledge, there are no observational studies of dyadic peer relationship quality in survivors of childhood cancer. Instead, studies focus largely on social isolation and/or peer acceptance. Yet, it is important to consider the quality of survivors' friendships whether or not as a group they are more socially isolated. Using observational methodology extends prior research by specifically assessing social skills and social performance, rather than social adjustment (Cavell, 1990). Observational methods also allow us to measure specific behavioral aspects of friendship quality that can be clearly identified and targeted for intervention, either to increase relationship strengths or decrease relationship difficulties.

In middle childhood, being accepted by a group of friends becomes increasingly important, and friendship processes are in the service of group belonging (Gottman & Mettetal, 1986; Kuttler, Parker, & La Greca, 2002). In part due to the importance of group belonging, best friendships during this age period are typically same-sexed. The ability to establish and maintain positive affect as well as the ability to engage in cooperative play has each been identified as important indices of friendship quality during middle childhood (Gottman & Parker, 1986; Newcomb & Bagwell, 1995). Additionally, survivors of childhood cancer have been noted to be sensitive and isolated, raising the possibility that they may have difficulties with social engagement. As such, children's ability to intimately engage with their best friend and, conversely, their tendency to disengage from their friend and experience a breakdown of play were assessed. The ability to remain engaged in play has been identified as an important quality of successful peer interaction, and consists of several component skills, including maintaining conversation, establishing a common activity, disclosing personal information, and engaging in fantasy play (Gottman, 1983). These skills have also been found to distinguish normally functioning and behaviorally disordered children (Katz & Windecker-Nelson, 2004). We hypothesized that dyads that included survivors of childhood cancer would be less engaged and more disengaged during peer play than dyads that did not include survivors of cancer. Specific a priori predictions regarding which component skills may be observed less frequently in dyads that included survivors were not made, given the absence of data on peer interaction in this population. We were also interested in the affective dimensions of play since the amount of negative and positive affect in play has been associated with peer acceptance and rejection (Asher & Coie, 1990). Since social disengagement sometimes observed in survivors

of childhood cancer can be due to conflict during play, we hypothesized that dyads that included a survivor of childhood cancer would show more negative affect and less positive affect than dyads that did not include a survivor of cancer. Finally, to determine whether differences in peer play may be indicative of adjustment problems that would need intervention, we examined whether high levels of engagement/disengagement or positive or negative affect in dyadic peer play were related to parent and child report of psychosocial adjustment of survivors of childhood cancer and healthy controls.

Age and gender effects were also investigated as prior research has noted differences in the friendships of boys and girls, and of children at different ages (Howes, Rubin, Ross, & French, 1988; Maccoby, 1998). For example, boys tend to engage in more rough and tumble play with friends, while girls engage in more conversation. Similarly, parallel play is more commonly observed in younger children than in older children, and conversation and the establishment of common ground activities develop with age (Gottman, 1983). It was therefore hypothesized that age and gender may be related to engagement variables, with older children and girls being more likely to show higher levels of engagement.

Methods

Participants

Participant children and their mothers were part of a larger study of family communication and adjustment in survivors of childhood cancer.

Cancer Survivor Participants

Survivors of childhood cancer between the ages of 7 and 12 who were treated for ALL at two children's hospitals were recruited for the study. Eligible participants included survivors of standard or high risk ALL who were in continuous first complete remission for at least 1 year following the end of therapy and had received treatment on a Children's Oncology Group (COG) treatment protocol, or an institutional regimen based on the COG protocol. Treatment largely included multi-agent chemotherapy and one child in our sample received cranial radiation therapy. Children were excluded if they had been diagnosed with a pervasive developmental disorder, mental retardation, or a physical disability. Potential participants were identified from existing survivor registries or by treating clinicians and were contacted by letter. Once ineligible families were excluded from those who were interested in participating, the final sample comprised 58% of those originally contacted by letter. Forty-two percent refused to

participate. Because of IRB stipulations, investigators were not provided information about families that did not reply to our letters. We are therefore unable to ascertain whether there were any differences between families that did and did not agree to participate.

In all, 26 childhood ALL survivors and their mothers took part in the study (10 boys and 16 girls). Children were on average 10 years 1 month (range 7 years, 1 month to 12 years, 9 months; $SD = 20$ months). Average age at time of diagnosis was 36.4 months (range: 18–72 months). On average, children were 52.8 months (range 12–96) months from the end of treatment when they participated in the study. Average socioeconomic status level as measured by the Hollingshead Index was 51.77 (Hollingshead & Redlich, 1958). The predominant ethnic identity was European American (88.5%), followed by Hispanic (3.8%) and biracial/multiracial (7.7%).

Healthy Participants

Healthy children were recruited from public and private schools in a medium-sized metropolitan city. They were from the same neighborhoods as those cancer survivors who lived in this city. A school-based selection process was adopted to obtain as representative a sample of healthy children as possible. In coordination with the local school district's Department of Research, Assessment and Evaluation, letters of introduction to the study and recruitment flyers were sent to the parents of approximately 1,700 children between the ages of 7 and 12. Parents were encouraged to call the study phone number if they were interested in participating. In all, 77 parents responded to recruitment flyers. Potential participants were excluded if they had a history of severe or chronic illness, pervasive developmental disorder, mental retardation, or a physical disability. Families were also excluded if the child did not match cancer survivor group on measures of age, gender or ethnicity ($n = 29$), they decided not to participate ($n = 2$), the child's mother was no longer living with the child ($n = 2$), or they failed to return follow-up phone calls ($n = 9$). With the exception of one child, groups were case-matched on age (i.e., within 6 months of age) and gender given data suggesting these variables may be related to peer play and other characteristics related to the larger study in which these data are embedded. Ethnicity was a secondary matching criterion used to ensure that groups did not vary on qualities related to the goals of the larger study (i.e., family communication).

Twenty-five typically developing children and their mothers participated in the study (12 boys and 13 girls). Children were on average 10 years, 3 months (range: 7 years, 5 months to 12 years, 9 months;

$SD = 17$ months). Average socioeconomic status level as measured by the Hollingshead Index was 58.42. Eighty-eight percent of participants identified themselves as European American, and the remainder self-identified as Asian (4%) or bi/multi-racial (8%). Groups differed in socioeconomic status $F(1,50) = 4.65$, $p = .04$. There were no significant differences between groups on measures of age $F(1,50) = .16$, $p = .68$, gender (Mann-Whitney $U = 294.0$, $p = .50$), or ethnicity ($\chi^2 = .65$, $p = .42$).

Procedures

Peer play was assessed by audio-taping children for a 45-minute free play session with their best or closest friend. Friends were chosen by agreement of the mother and child. Same-sex peers were used since social processes during cross-sexed peer interaction differ markedly from those that occur during same-sexed peer interaction (Gottman & Parker, 1986). In dyads with a survivors of ALL, play sessions occurred at the home of the survivor. Play was audiotaped rather than videotaped to reduce the intrusiveness of recording equipment. It has been established that use of observational equipment and/or inviting children into a laboratory setting for an observational session is disruptive to some of the very processes being observed in this study (e.g., fantasy play; Gottman, 1983). While children played alone in one room (typically their bedrooms), a research assistant was present in the home throughout the interaction. Children were instructed to play as they normally do but were asked not to watch television, play videogames or leave the room except to use the bathroom. No information was obtained regarding whether the friendship was mutual, although previous studies using this procedure have found relations between observations obtained using this best or close friendship selection method and friendship closeness (Gottman, Katz, & Hooven, 1997). Information about length of friendship was not obtained nor was any descriptive data on the friends themselves (e.g., demographics). Mothers of survivors of childhood cancer and healthy control and the children themselves also completed questionnaires on the child's psychosocial adjustment.

This study was approved by institutional review boards at each of two participating hospitals. Informed consent was obtained from parents of survivors of cancer and healthy participants, and parents of the child's friend. Assent was obtained from all child participants. Children were informed that the current research was being conducted to learn about emotions and friendship in children.

Measures

Peer Play

Peer interactions were coded using the Rapid-MACRO coding system (R-Macro; Gottman, 1983). The R-Macro identifies 45 positive and negative behaviors that are indicative of children's peer play. This observational paradigm and coding system have been used with hundreds of children ranging in age from 4 to 16 years, and has been found to relate to teacher and parent ratings of children's social competence and behavior problems, as well as other observational measures of peer relations (Gottman et al., 1997; Katz & Gottman, 1997; Leary & Katz, 2005). The entire 45-min interaction was coded in 3-min segments by independent observers. Discrete events were coded. Using a checklist format, coders noted which of the R-Macro codes had occurred within each 3-min period. All codes that occurred within the 3-minute segment were recorded. A total for each code was then computed by summing the number of 3-min segments that contained the code in question and possible totals ranged from 0 to 15. We used 3-min segments because of previous data indicating that this time segment produces reliable and valid data on the quality of peer interaction (Gottman, 1983). A primary rater was identified prior to the initiation of data coding and that individual's ratings were used in final analyses when disagreements between coders arose. There was no attempt to obtain consensus ratings when disagreement existed. Codes were derived by listening to audio recordings rather than transcripts of the interaction. Coders used a gestalt approach in coding peer interaction; that is, codes emphasized both the verbal content of the interaction as well as the tone of voice and other contextual indicators that the children were experiencing strong affect or were no longer engaged (e.g., footsteps followed by the door closing followed by silence). Coders were blind to each child's group assignment.

For the purposes of this study, four summary variables were created to assess children's ability to maintain engagement with one another during play as well as the affective dimension of their play: (a) high-level engagement, (b) disengagement, (c) positive affect, and (d) negative affect. All codes reflected the behavior of the dyad rather than an individual child. Virtually identical summary variables have been used in other studies (Leary & Katz 2004, 2005), and have been found to relate to family processes and behavioral adjustment. Behavioral codes indexing each of these variables are listed in Table I. Interrater reliability for macrocodes, computed using intraclass correlations, was strong for high engagement (.81), disengagement (.85), positive affect (.94), and negative affect (.86).

Table I. Behavioral Codes Comprising Each Peer Play Variable

High engagement	<ul style="list-style-type: none"> • Connected play • Established a common activity • Engaged in extended conversations, disclosed sensitive information, or were receptive to such disclosures • Engaged in nonstereotyped fantasy play where children make up their fantasy roles and activities in the moment and rely upon one another to collaboratively keep the fantasy play going
Disengagement	<ul style="list-style-type: none"> • Ignored or changed the subject when their friend disclosed highly personal information • Left the common play area • Attempted and failed to establish fantasy play • Unable to sustain or agree on a common activity • Play required parental intervention
Positive affect	<ul style="list-style-type: none"> • Laughter • Humor • Joy • Positive teasing
Negative affect	<ul style="list-style-type: none"> • Conflict • Whining • Anger • Bossiness • Fighting • Negative teasing • Negative statements about friend or relationship

Psychosocial Adjustment, Mother Report

Child social problems, externalizing, and internalizing behaviors were assessed via mother report on the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001). The CBCL has been used extensively in the developmental literature and has been found to show good reliability and validity (Achenbach & Rescorla, 2001). *T*-scores on the social problems subscale and the internalizing and externalizing broad-band factors of the CBCL were used in this study.

Psychosocial Adjustment, Child Report

The Children's Depression Inventory (CDI) is a self-report measure of the presence and severity of symptoms of depression that was used to assess depressive symptomatology. *T*-scores on the CDI were used. The CDI shows strong psychometric properties (Kovacs, 1981). The Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) is a widely used standardized 37-item self-report questionnaire that has been used with children ages 6–18 years to assess symptoms of general anxiety. It shows high internal consistency and high validity (Reynolds & Richmond, 1978).

Table II. Means and Standard Deviations of Primary Study Variables by Treatment Status

Variable	Survivors			Healthy Children			Effect size
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	
High-level engagement ^a	33.71	5.04	23–50	37.39	6.65	23–44	.62
Disengagement ^a	1.55	1.73	0–3	0.64	0.95	0–5	.65
Positive affect	28.01	13.37	0–50	25.39	14.27	1–48	.19
Negative affect	11.14	8.24	3–45	12.69	10.27	0–28	.17

^aSignificant difference between survivors and healthy children; $n = 51$.

Results

Table II displays the means and standard deviations of all study variables by treatment status. Analyses were conducted to test hypotheses related to relations between age, gender and time off treatment and peer play variables, and hypotheses related to group differences in peer play. Correlations between dyadic peer play and psychosocial adjustment of the study's target child were also computed.

Effects of Age, Gender, and Time-off Treatment

Using the whole sample of children, correlations were conducted between the four peer play summary scores and two treatment variables, age at diagnosis and time-off treatment. Only one significant correlation emerged. Children who were diagnosed at a younger age showed higher levels of positive affect ($r = -.48$, $p = .02$) than children diagnosed at an older age. There were no significant relations between any of the peer play variables and either socioeconomic status or child's current age.

Using the whole sample of children, a MANOVA was performed to determine whether there were gender differences in the four summary measures of peer play and was found to be nonsignificant $F(4,44) = .36$, $p = .36$. Bivariate correlations were conducted to examine relations between age and outcome variables. Results indicated that when children were older, they showed less expression of negative affect with best friend ($r = -.36$, $p = .01$). No other significant correlations were found.

Intercorrelations among the peer play variables were computed across the whole sample and within each dyad type. Correlations across the whole sample indicated that disengagement was positively correlated with negative affect ($r = .30$, $p = .04$). No other statistically significant correlations were observed. Within dyads with survivors, disengagement was positively correlated with negative affect ($r = .42$, $p < .05$) and high engagement was positively correlated with positive affect ($r = .44$; $p < .05$). Within

Table III. Correlations between Peer Play and Behavioral Adjustment Variables

	High engagement	Disengagement	Positive affect	Negative affect
CBCL internalizing	-.19	.12	.01	.02
CBCL externalizing	-.06	-.06	.08	.28*
CBCL social problems	-.10	.08	-.12	.35*
CDI T-score	.09	.09	.16	.05
RCMAS total score	.01	.25 ^a	.21	.17

* $p < .05$; ^a $p < .10$.

dyads with two healthy participants, there were no significant correlations between any of the peer play variables.

Group Differences in Peer Play Variables

We also conducted a MANOVA to investigate whether there were differences between dyads that did and did not include a survivor of ALL on four measures of best friend play: high engagement, disengagement, positive affect, and negative affect. Results of the MANOVA were significant $F(4,44) = 2.91$, $p = .03$. Examination of univariate statistics indicated that dyads that included a survivor of ALL were less likely to be highly engaged in their interactions with their best friend [$F(1,44) = 4.73$, $p = .04$, partial- $\eta^2 = .09$] and were more likely to be disengaged [$F(1,44) = 4.49$, $p = .04$, partial- $\eta^2 = .09$] when compared to dyads that did not include a survivor of ALL. There were no differences between groups in level of positive or negative affect. These findings support our hypothesis that dyads that included survivors of ALL would be less engaged and more disengaged during peer play than dyads that did not include survivors of ALL, but did not support hypothesized group differences in positive and negative affect. Post hoc analyses were conducted to determine which component skills were responsible for the observed group differences in high engagement and disengagement. Univariate analyses were conducted for each dependent variable comprising the summary scores of high engagement and disengagement. Significant group differences were found in the amount of nonstereotyped fantasy play $F(1,48) = 5.88$, $p = .02$, with dyads that included a survivor showing less nonstereotyped fantasy play ($M = 0.54$) than dyads that did not include a survivor ($M = 3.09$).

Peer Play and Psychosocial Adjustment

To determine whether differences in peer play may be indicative of adjustment problems in target study participants, correlations were computed between the peer play variables, parent ratings on the CBCL, and child ratings of depression and anxiety (Table III). Dyads that were high in negative affect during peer play contained a study

participant that was rated by their mothers as showing higher levels of externalizing behaviors and more social problems. Dyads that were high in disengagement contained a study participant that was more likely to rate him/herself as high in anxiety, although this correlation only approached significance.

Discussion

Past research studies have yielded inconsistent results regarding the long-term psychosocial effects of cancer treatment on peer relations (Hobbie et al., 2000; Langeveld, Grootenhuis, Voute, Haan & Van Den Bos, 2004; Zebrack et al., 2002). While some studies have found survivors of childhood cancer to exhibit deficits in peer relations, other studies have found no such effects (Noll et al., 1997; Schultz et al., 2007). The current study used an observational approach to investigate peer relations in 7- to 12-year old cancer survivors and healthy comparison children. One advantage of this methodology is that it can detect subtle interactive processes that are not detected by sociometric ratings or parent report, or that may not be expressed as clinically significant symptomatology. Interactive processes form the fabric of peer relationship quality, and can be behaviors that are targeted for intervention.

Results indicated that dyads that included a survivor of ALL were less likely than dyads that did not include a survivor of ALL to be highly engaged with each other during an audiotaped peer interaction. This effect appeared largely due to differences in nonstereotyped fantasy play between groups. In nonstereotyped fantasy play, children make up their fantasy roles and activities in the moment and rely upon one another to do the same to collaboratively keep the play going. These types of interactions require that the children feel comfortable enough with their friends to take risks, trusting that their friend will not rebuff their ideas or disclosures. An important prerequisite of successful nonstereotyped fantasy play is the ability to negotiate and to resolve conflict, since children are creating new characters and negotiating the scenario being acted out. When dyads cannot resolve their differences, fantasy characters cannot be created and play stays at a lower level of engagement (i.e., parallel play; Gottman, 1983). One possible interpretation of these findings is that dyads which contain a child who has survived ALL may be less likely to develop this high level of intimacy due to reduced time with peers and less opportunity to practice social-affective skills necessary to maintain closeness in peer relationships. Lower levels of intimacy in friendship may contribute

to survivors of childhood cancer reported experiences of feeling isolated from peers (Spirito et al., 1990).

In our data, dyads that included a survivor of childhood cancer were also more likely to exhibit disengagement during observations of dyadic peer interaction with a close friend. Although group differences were not observed in individual component skills, this pattern of results suggested that it is likely that some dyads that included a survivor showed difficulty with certain component skills, while other dyads that included a survivor showed difficulty with other component skills. Dyads that included a child survivor of ALL may have more difficulty than dyads that did not include a child survivor of ALL in finding a common activity, maintaining interaction or were more frequently leaving the common play room. When children have difficulties sustaining engagement, they typically show breakdowns in play that they cannot repair and that are accompanied by negative affect (Gottman, 1983). As is typically the case, disengagement in our data was related to the presence of negative affect, and this was uniquely true for the dyads with survivors of ALL. Although there were no differences in overall levels of negative affect between dyads with and without survivors of ALL, the standard deviations for the affective variables were large and observed relations between disengagement and negative affect for dyads with survivors suggest that children likely struggled with the appropriate expression of negative affect. It may be that dyads with survivors of ALL have difficulty managing and repairing interactions when there is a breakdown in play, which may contribute to difficulties in sustaining common ground activity and leaving the play room. They may also be more likely to involve an adult in regulating their play. Such reliance on intervention from adults is likely to compromise the experience of intimacy in the relationship and may lead teachers and others to view survivors of childhood cancer as having fewer social skills or poorer social competence than their peers (Schultz et al., 2007).

In general, children's dyadic peer play showed few relations with the overall psychosocial adjustment of survivors of cancer or healthy controls. This suggests that peer play—particularly the dimensions related to engagement and disengagement—may be tapping an aspect of social functioning that is difficult for parents and teachers to detect. As would be expected, observable aspects of peer play, such as negative affectivity, were related to parent report of externalizing behaviors however engagement and disengagement were not related to parent report of child internalizing or externalizing problems or child social problems. The tendency to disengage was marginally related to children's report of their own anxiety. Relations

between disengagement and anxiety suggest that children may disengage when they are experiencing higher levels of anxiety during play. They may have some difficulty regulating their own anxiety and withdraw as a way to calm down. Sequential analyses that examine whether indices of anxiety precede withdrawal would be helpful to address this possibility. Alternately, it may be that children who are characteristically high in anxiety may be less likely to want to engage with others during play. To the extent that this is true, these children may not show a breakdown in play, rather they will simply not engage through the entire play period. Examining the ebbs and flows of disengagement throughout play using sequential analysis may be helpful in teasing apart these two forms of disengagement and could help direct intervention efforts.

When comparing the peer interactions of dyads that include a survivor of ALL with dyads that did not include a survivor, no significant group differences were found in the amount of positive or negative affect displayed during the peer play session. Dyads containing a survivor of childhood cancer were just as likely as other dyads to laugh and have fun with their peers as well as become frustrated or upset with them. Although the lack of observed effects may in part be due to low effect sizes, the absence of differences in affective displays may be important, since children's affect with their friends is readily observable by parents and teachers. The apparent lack of differences between groups in this domain may explain why some raters do not see survivors of childhood cancer as having particular difficulties with peers.

While several studies have found no differences between survivors of childhood cancer and their peers on measures of social functioning, the current results suggest that, at least within the close friend context, dyadic interactions of survivors of childhood cancer and their friends do evidence subtle differences. It may be that these differences are subtle enough that they do not come to the attention of parents, teachers, or even peers when asked to describe these children on measures of global peer functioning. One question that can be asked is whether these differences indicate significant social problems that need intervention. Difficulties with engagement are likely to lead children to feel more isolated from their peers. This is consistent with some prior findings that survivors of childhood cancer may be more socially isolated than their peers (Noll, Bukowski, Rogosch, LeRoy & Kulkarni, 1990; Schultz et al., 2007). Increasing survivors' ability to engage positively with peers may be an important area for intervention as social isolation has been associated with both depression and loneliness (Rubin, Burgess, & Copelan, 2002).

One advantage of observational studies of peer play is that these data can highlight several specific aspects of

peer play that can be targeted for intervention by parents or teachers. Attention to the component skills involved in disengagement from dyadic play can provide direction as to which aspects of dyadic play may best be addressed. Adults may pay particular attention to signs of withdrawal (i.e., leaving the room during play) or requests for adult intervention. Adults may be encouraged to refrain from intervening in children's play in order to allow children to learn skills to maintain play on their own. If it is clear that adult intervention is required, its goal should be to facilitate re-establishment of common ground activities. Survivors may also need practice in establishing common activities with peers, and adults can facilitate such play either by coaching their child during peer play, or during one-on-one time with the child. Children may also be directly trained in conflict management techniques such as compromise to prevent breakdown of play, and coached in ways to maintain engagement in face-to-face interaction when they are feeling a desire to withdraw. Some practice in basic conversational skills, such as asking questions, following up on ideas introduced by the peer, and disclosing personal information may also be warranted. Studies on social skills training in children with chronic illnesses suggest that such an approach may be fruitful (Drotar, 2006; Varni, Katz, Colegrove, & Dolgin, 1993).

Helping children learn how to manage strong negative affect and anxiety may also be useful to promote sustained engagement in play. Although group differences in negative affect were not directly observed in our data, disengagement was related to the presence of negative affect particularly for dyads with survivors or ALL, suggesting that some children who disengaged were experiencing negative affect. Emotional flooding has also been linked to disengagement in other studies of interpersonal interaction (Gottman, 1994; Katz & Gottman, 1996). Emotion regulation strategies such as stopping, taking a deep breath, and waiting before responding may be useful for some survivors to help them manage strong negative feelings and anxiety that can contribute to breakdown of play and disengagement.

An advantage of this study was its restriction of study participants to survivors of ALL. At the same time, this raises questions about generalizability of findings to survivors of other forms of cancer. To the extent that other forms of cancer result in the reductions of opportunities to practice social-affective skills critical to successful engagement with peers, results would be expected to generalize. Future research should be directed at understanding which forms of childhood cancer are associated with peer difficulties, and clearly identify the nature of

these difficulties. Attention to potential strengths in peer relations or areas of growth in friendships that result from the cancer experience would provide a richer picture of interpersonal impact of childhood cancer.

Limitations of the current work warrant attention. Most notably, the modest sample size included in the study may limit the generalizability of the current findings as well as the fact that the sample was relatively homogenous with regard to race and ethnicity. Additionally, while we hypothesize that absences from school and separations from friends are important factors in why the dyads containing a survivor of cancer differed from the dyads that did not contain a survivor of cancer on the measures of friendship quality we included, we did not directly measure these factors. We also did not obtain information regarding the length of friendships and this may have contributed to group differences. The current study is also cross-sectional, and it would be important for future research to determine whether peer deficits in children with ALL persist longitudinally and warrant more intensive intervention. Because peer interactions were audiotaped rather than videotaped, nonverbal behaviors relating to affect and engagement may have been missed. Finally, because accrual rates in both survivors and healthy participants were low, and because healthy participants were recruited from public and private schools, the representativeness of the final sample to the general population is unclear and may have affected the results.

Overall, these data suggest that the cancer survivor's relationship with their best friend may show less engagement and more disengagement when compared to the relations of healthy children. This is important as the quality of children's friendships is related to their overall adjustment and social competence. Interventions to help children maintain close relations with friends throughout the treatment process may help children to develop age appropriate intimacy with their best friend. Our data suggest that interventions that target skills specifically aimed at increasing peer engagement and reducing disengagement have the greatest likelihood of mitigating against the social isolation commonly reported in survivors of childhood cancer. An important next step will be to better understand mediating or moderating processes that explain why some survivors of childhood cancer are able to maintain engagement while others show more difficulty.

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