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Adaptive Functioning in Pediatric Brain Tumor Survivors: An Examination of Ethnicity and Socioeconomic Status

Kimberly P. Raghubar[1], **Jessica Orobio**[1], **M. Douglas Ris**[1], **Andrew M. Heitzer**[1], **Alexandra Roth**[1], **Austin L. Brown**[2], **M. Fatih Okcu**[2], **Murali Chintagumpala**[2], **David R. Grosshans**[3], **Arnold C. Paulino**[3], **Anita Mahajan**[3], **Lisa S. Kahalley**[1]

[1]Department of Pediatrics, Section of Psychology, Baylor College of Medicine, Houston, United States

[2]Department of Pediatrics, Section of Hematology Oncology, Baylor College of Medicine, Houston, United States

[3]Division of Radiation Oncology, The University of Texas MD Anderson Cancer Center, Houston, United States

Abstract

Background: Survivors of pediatric brain tumor are at risk for adaptive difficulties. The present study examined adaptive functioning in a multi-ethnic sample of survivors accounting for socioeconomic status, and whether demographic, diagnostic, and/or treatment-related variables predict adaptive outcomes.

Method: Participants included a multi-ethnic sample of survivors (58 Caucasian, 34 Hispanic, and 23 other non-Caucasian) (*M* age = 14.05 years, *SD* = 4.33) who were approximately 7 years post-treatment. Parents rated adaptive functioning and provided demographic information. Diagnostic and treatment-related information was abstracted from the electronic medical record.

Results: Parent ratings of adaptive functioning were similar across Caucasian, Hispanic, and other non-Caucasian survivors covarying for family income and primary caregiver education, both of which served as proxies for socioeconomic status. All ethnic groups were rated lower than the normative mean in overall adaptive functioning as well as the specific domains of conceptual, social, and practical skills. Demographic, diagnostic, and treatment-related variables were differentially associated with adaptive functioning in survivors of pediatric brain tumor, though socioeconomic status emerged as a strong significant predictor of adaptive functioning domains.

Conclusions: Adaptive outcomes do not differ as a function of ethnicity after accounting for family income. Racial and ethnic minorities may be at increased risk for poorer outcomes given their over-representation at lower income levels. Assessing demographic and treatment-related variables early on may be helpful in identifying children likely to develop adaptive difficulties.

Corresponding Author: Kimberly P. Raghubar, PhD, 1102 Bates Ave. Ste. 940, Houston, TX 77030, Ph: 832-822-3713, kpraghub@texaschildrens.org.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

Keywords

brain tumor; ethnicity; adaptive functioning; socioeconomic status; radiation

An estimated 2,700 Hispanic children aged 0 to 14 years were projected to have been diagnosed with cancer in 2018. Among Hispanics, brain tumor represents the second most common cancer diagnosed in children and the most common cancer diagnosed in young adolescents (1). Improvements in treatment have resulted in significantly increased survival rates over the past 20 years. Increased survival rates have led to an appreciation for the long term adverse effects associated with brain tumor and the necessary life-saving treatments (2). Medical/physical (e.g., cardiac, and neurological dysfunction) (2; 3), neurocognitive (e.g., attention, working memory, and processing speed) (4–6), academic (7; 8), and adaptive (9; 10) consequences of pediatric brain tumor treatments have been identified and studied. To our knowledge, there are currently no studies of adaptive functioning in pediatric brain tumor samples that include 1) a multi-ethnic cohort; and 2) Non-English speaking caregivers.

Hispanic Americans represent the largest minority group in the United States. Racial/ethnic minority and low SES families face similar ecological challenges, including but not limited to, poverty, segregation, neighborhoods with poor economic resources, and sub-par schools (11). These challenges have important implications for socialization and developmental outcomes of minority children (11; 12). Cultural values, beliefs, and behaviors influence how parenting practices and parent-child interactions evolve to meet these challenges. For example, parents of Mexican descent in the United States reported greater use of authoritarian practices (e.g., emphasize respect for authority, provide clear rules to be followed, punitive) than non-Hispanic Caucasian parents, who tended to demonstrate more authoritative practices (nurturing, monitor and provide clear standards for behavior, emphasize autonomy) (11). Although authoritarian parenting is negatively associated with cognitive and academic outcomes compared to more responsive forms of parenting among non-Hispanic Caucasians (13), the impact among Hispanic children is less clear. Authoritative parenting practices result in a clear benefit for Hispanic/Latino children (14–16), but authoritarian practices have yet to be firmly linked to deleterious consequences (15). Taken together, ethnic and economic differences may have differential impact on neurocognitive, social-emotional, and/or adaptive late effects of cancer treatment and thereby warrant further consideration.

To date, limited research examines functional outcomes, or long term outcomes more generally, in racial or ethnic minority survivors of pediatric brain tumor despite widespread recognition of the need for such studies [(17); see (18; 19) for studies of neurocognitive and psychosocial outcomes among cohorts of Latino/Hispanic survivors of acute lymphoblastic leukemia]. In fact, the most recent studies of adaptive functioning in survivors of pediatric brain tumor do not report on the ethnic or racial make-up of the sample and exclude non-English speaking families from participation (e.g., (9; 10; 20; 21).

Although no study has yet to examine ethnic differences in adaptive functioning in pediatric brain tumor survivors, Meeske and colleagues (22) conducted a study of particular relevance

looking at ethnicity as a predictor of health-related quality of life in a heterogeneous sample of survivors of pediatric cancer (including leukemia, lymphoma, wilms tumor, and brain tumor). In a sample that was almost 50% Hispanic with over one-quarter of participants reporting Spanish as their primary language, school functioning was lower for the Hispanic and other non-Caucasian survivors compared to Caucasian survivors, and emotional functioning scores were significantly lower for Hispanic survivors compared to non-Hispanic survivors. Interpretation of findings was tempered because SES was not included in the analyses: SES, not ethnicity, may have accounted for health-related quality of life differences. The present study is a first of its kind, integrating ethnicity and SES in the prediction of outcomes following treatment for pediatric brain tumor.

Generally, radiation is associated with impairment in adaptive functioning (9; 20; 23). Children treated for infratentorial and supratentorial tumors have been shown to demonstrate worse adaptive functioning compared to sibling and solid tumor control groups (9) and to the normative mean (10), as well as increased rates of impairment (20). Broadly weaker adaptive functioning (24; 25) as well as weaknesses in specific adaptive skill areas including communication (10), socialization [(10) but see (20)], and practical (e.g., self-care, health/safety skills, home living skills) (20) have been documented.

Few studies have examined the trajectory of adaptive skills. In a sample of children receiving radiation for high grade glioma (>85% located supratentorially), patients exhibited an initial increase in adaptive functioning at 6 month follow-up, and then significant decline by 12 month follow-up (24), with mean scores falling more than 1 SD below the mean. Comparatively, in a more heterogeneous sample treated with radiation or surgery, children were rated as having adaptive functioning skills that were in the average range within 6-months of diagnosis, with rates of impairment exceeding expectation for practical skills only (21). Two years later, adaptive functioning remained within expectation, but the percentage of children exceeding the clinical cutoff for impairment was elevated, in large part due to difficulties with practical skills (20). Predictors of adaptive functioning are less well studied than those of cognitive outcomes; however, socioeconomic, developmental, behavioral, and treatment-related factors have been identified in primarily non-Hispanic Caucasian samples (10; 20; 21).

The goals of the current study are to: (1) evaluate adaptive functioning in a multi-ethnic group of survivors of pediatric brain tumor; (2) determine differences in parent-reported adaptive functioning among Caucasian, Hispanic, and other non-Caucasian survivors; and (3) evaluate potential demographic, diagnostic, and/or treatment-related predictors of adaptive functioning in a multi-ethnic sample. Consistent with existing research, we hypothesized that parent ratings of adaptive skills among survivors of pediatric brain tumor would fall below the normative mean. Although adaptive outcomes have not been examined as a function of ethnicity in survivors of pediatric brain tumor, we may expect Hispanic and other non-Caucasian survivors to be rated as having worse outcomes than Caucasian survivors given documented associations between ethnicity and aspects of health-related quality of life (22). Finally, we expected that sociodemographic variables that serve as a proxy for SES, as well as treatment-related variables, would significantly correlate with adaptive functioning.

Methods

Participants

Data presented here are part of an ongoing study examining long-term neurocognitive, social-emotional, and functional outcomes in survivors of pediatric brain tumor treated with radiation therapy. Eligible participants were 18 years old or younger at radiation therapy, treated between 2000 and 2016, with no evidence of active disease at enrollment, and were more than one-year post-diagnosis at the time of evaluation given the focus on adaptive functioning among survivors of pediatric brain tumor. Patients diagnosed with brain stem gliomas, high-grade gliomas, and atypical teratoid/rhabdoid tumors were excluded from participation due to interest in long-term outcomes. One hundred and eighteen participants were enrolled in the larger study, with 23 patients and families refusing participation. The present study reports on 114 survivors of pediatric brain tumor, as 4 patients were excluded due to the absence of parent report measures. Fifty-six survivors were non-Caucasian, thirty-four of whom self-identified as Hispanic. Survivors ranged in age from 5 to 21 years at evaluation, and were primarily male, Caucasian, and 7 years post-treatment on average. Table 1 provides a comparison of demographic variables by ethnicity (i.e., Caucasian, Hispanic, and other non-Caucasian) (22) and Table 2 provides a comparison of diagnostic and treatment-related variables.

Measures

Child and Family Information.—Caregivers completed a survey consisting of sociodemographic information including child's race and ethnicity, primary language of caregivers and spoken in the home, primary caregiver education, and family income.

Adaptive Functioning.—Adaptive functioning in the home and community was assessed using the Adaptive Behavior Assessment System, Second Edition (ABAS-II) (26), or Third Edition (ABAS-3) (27) Parent Form (Ages 5–21). Items are rated on a scale from 0 (Is not able) to 3 (Always/Almost Always). It assesses nine skill areas among all children/adolescents which are combined to form three composites including Conceptual (Communication, Functional Academics, Self-Direction), Social (Leisure, Social), and Practical (Self-Care, Home Living, Community Use, and Health and Safety), as well as an overall General Adaptive Composite (GAC). The GAC, Conceptual, Social, and Practical scores were employed in this study. The ABAS-II and ABAS-3 are highly correlated: corrected r for GAC = .88 and corrected r's for adaptive domains ranged for .83 to .87 (27). Consistent with previous studies, we analyzed the domain scores separately rather than only the GAC (20).

Procedure

With approval from the Institutional Review Board, eligible study participants were identified by medical chart review and consecutively enrolled. Informed written consent was obtained prior to participation. Spanish-speaking families were consented in Spanish using a Spanish language consent form. Families completed questionnaires in their preferred language and had access to English- or Spanish-speaking research assistants when questions arose during completion.

Statistical Analyses

To evaluate adaptive functioning among multi-ethnic survivors of pediatric brain tumor, one-sample t-tests compared adaptive scores to the normative mean of 100 for ABAS-II/ABAS-3 composite scores. Frequency data on the number of participants rated as having impaired adaptive functioning skills were examined, with impairment defined as scores falling 1.5 SD below the mean (standard score of 77 or less). Further, chi-square analyses determined whether the percentage of participants with impairment exceeded expectation assuming normal distribution of scores (6.68%) [as described in (21)]. Because ethnic groups (Caucasian, Hispanic, other non-Caucasian) differed on key demographic variables (i.e., primary caregiver education and family income), correlations between these variables and adaptive functioning composites were examined to determine potential covariates for group-level analyses. Both primary caregiver education and family income serve as proxies for SES and were moderately correlated with adaptive functioning scores (See Table 4; significant p-values range from $p < .025$ to $p < .001$). As such, analysis of covariance (ANCOVA) examined ethnic differences in parent ratings of GAC, and Conceptual, Social, and Practical scores, covarying for primary caregiver education and family income. Predictor variables within demographic, diagnostic, and treatment-related domains were examined in relation to adaptive functioning composite scores. Predictors were included in regression analyses based on significant correlations with adaptive functioning domains. In this sample, parent education and family income were highly correlated (spearman's rho = .7): Parent education alone was included in the regression models based on strength of correlations to adaptive skills and the broader literature linking primary caregiver education to child development, including language, cognitive, and academic development (28; 29).

Results

Descriptive data for adaptive functioning for the group as a whole are presented in Table 2. Parents rated survivors of pediatric brain tumor as having worse adaptive functioning relative to the normative mean of 100 (see Table 3) in all domains (all *p*-values <.001). The percentage of participants meeting criteria for impairment in Global adaptive functioning (31.0%) exceeded expectation (i.e., 6.68%) ($p < .001$). Domain specific analyses revealed elevated impairment in all domains (all *p*-values < .001).

After covarying for primary caregiver education and family income, there was no effect of ethnicity (Caucasian, Hispanic, Other) on adaptive functioning, including GAC ($p = .25$); Conceptual ($p = .19$); Social ($p = .48$); or Practical ($p = .15$) skills. Descriptive data for adaptive functioning by ethnicity are presented in Table 4; significant group differences without accounting for primary caregiver education and family income are also denoted. Among Hispanic families, there was no effect of home language, covarying for primary caregiver education and family income, on GAC ($p = .14$) and Conceptual ($p = .25$), Social ($p = .79$), and Practical skills ($p = .11$). Correlations among predictors and outcomes yielded a number of significant relationships (see Table 5). Lower GAC was associated with ethnicity, younger age at diagnosis, lower primary caregiver education, reduced family income, craniospinal irradiation (CSI), and shunt placement. Lower Conceptual skills were related to ethnicity, younger age at diagnosis, lower caregiver education, reduced family

income, chemotherapy, and CSI; decreased Social skills were related to ethnicity, lower caregiver education, reduced family income, and CSI; and finally, reduced Practical skills were associated with ethnicity, younger age at diagnosis, lower caregiver education, shunt placement, and CSI.

Multiple linear regression models examined the independent and shared contributions of predictors that were significant in univariate correlations with outcomes (see Table 5). For GAC, the overall model was significant, with significant contributions from primary caregiver education, age at diagnosis, shunt placement, and CSI (see Table 6 for regression models). The overall model was significant for Conceptual skills, with primary caregiver education, age at diagnosis, CSI, and chemotherapy emerging as significant predictors. Although the overall model for Social skills was significant, none of the individual predictors was statistically significant, though there was a marginal contribution from CSI. The overall model was significant for Practical skills, with significant contributions from shunt placement and CSI, and a marginal contribution from age at diagnosis.

Discussion

Despite widespread recognition of the need for increased understanding of functional outcomes in survivors of pediatric brain tumor, adaptive functioning remains relatively understudied. The present study is a first of its kind examining adaptive difficulties in a multi-ethnic sample of pediatric brain tumor survivors. We replicate findings of impairment in adaptive functioning among survivors of pediatric brain tumor. Moreover, this study improves upon previous research examining the relationship between ethnicity and long term outcomes of survivors of pediatric cancer by accounting for the influence of SES. The primary findings of this study are as follows: 1) parent ratings of adaptive functioning were similar for Caucasian, Hispanic and other non-Caucasian survivors of pediatric brain tumor after accounting for primary caregiver education and family income; 2) a sociodemographic factor that serves as a proxy for SES (i.e., primary caregiver education) emerged as a significant predictor of adaptive functioning domains; and 3) although sociodemographic, diagnostic, and treatment-related variables predicted adaptive functioning, they accounted for only a small portion of the variance. Each of these findings are discussed in greater detail below.

As a group, survivors of pediatric brain tumor were rated as having significantly poorer adaptive functioning than expected normatively, replicating findings of previous studies [e.g., (10; 20)]. Rates of impairment in adaptive functioning exceeded expectation for all domains. In comparison, although previous studies report similar rates of impairment in global adaptive functioning (23–27%), rates of impairment exceeded expectation for practical skills alone during the acute stages of recovery (21) and almost two years post-diagnosis (14). Rates of impairment in the present study may be due to all survivors having received radiation and the majority also receiving chemotherapy. Taken together, survivors of pediatric brain tumor continue to lag behind same-age peers several years post-treatment in most aspects of adaptive functioning, regardless of ethnicity.

Parent ratings of adaptive skills were similar for Caucasian, Hispanic, and other non-Caucasian survivors of pediatric brain tumor after accounting for family income and primary education. A previous study reported ethnic differences in overall health-related quality of life and psychosocial functioning, but did not account for differences in SES between groups (22). Although there was variability in family income and primary caregiver education within study groups, Hispanics and other non-Caucasians were over-represented among the socioeconomically disadvantaged as is observed in the general population. It is difficult to truly disentangle the effects of SES on ethnicity, particularly given the known adverse effects of low SES on parenting practices (30), and child cognitive development and academic achievement (31; 32). Because low SES is over-represented in our ethnic minority groups and in the general population, survivors from ethnic/racial minorities may be at increased risk for deficits in adaptive functioning.

Just under half of our Hispanic families were Spanish-speaking and completed Spanish-rating forms. Language use and proficiency is a key variable for assessing level of acculturation (33), with primarily Spanish-speaking individuals having lower levels of acculturation. Although acculturation was not explicitly examined in this sample, adaptive functioning did not significantly differ as a function of primary or home language among Hispanic families. Future studies would benefit from incorporating measures of acculturation to get at more subtle differences in adaptation to and adoption of the dominant culture.

Adaptive outcomes among survivors of pediatric brain tumor were predicted by demographic and treatment-related variables, though these variables accounted for only a small proportion of variance in outcome. Consistent with between-groups analyses, ethnicity did not significantly predict adaptive functioning. Instead, primary caregiver education emerged as a significant predictor of overall adaptive functioning and conceptual skills comprised of communication, functional academics, and self-direction. Indeed, caregiver education has been linked to quality of teaching strategies and learning-related activities/environments (29; 34), cognitive development, and academic achievement (28; 29). In our sample, primary caregiver education and family income were highly correlated. While both frequently serve as proxies for SES (35), the two are not necessarily interchangeable and may not serve as proxies for the other, particularly among minority groups. Overall, our findings are generally in keeping with the literature connecting socioeconomic factors to child functioning [e.g., (30)]. Moreover, socioeconomically disadvantaged families may struggle to manage challenges in adaptive functioning and to obtain the resources to bolster or improve adaptive skills.

Our findings converge with the broad literature demonstrating the importance of age at diagnosis and treatment, as it significantly predicted overall adaptive functioning, and conceptual and practical skills. Indeed, younger age at diagnosis is a known risk factor for adverse neurocognitive and behavioral outcomes (19; 22). Consistent with studies of neurocognitive functioning [e.g., (4)], CSI emerged as an important predictor of all aspects of adaptive functioning, with the exception of social skills, but radiation dose was not. Prescribed dose may be a crude measure of treatment intensity (36). Moreover, survivors in this study, treated on contemporary protocols, received similar total doses of radiation, with

79% of our sample, receiving doses of 5040 – 5580 cGy, with no dose exceeding 6000 cGy. Interestingly, shunt placement emerged as a predictor of overall adaptive functioning and practical skills specifically. Hydrocephalus and shunt placement resulting from tumor obstruction has been reported as a risk factor for developing cognitive deficits (37), and likely decreased adaptive functioning. Hydrocephalus is broadly associated with specific cognitive (e.g., visual-spatial skills and attention) and motor weakness (38; 39), which are also areas of weakness in children treated with RT. These cognitive and motor weaknesses may be exacerbated in survivors treated with RT, and adversely impact level of independence in carrying out household or home living tasks and self-care tasks, as this subgroup may require reminders to complete tasks or assistance. Although this is a novel finding, previous studies incorporating tumor size as a predictor found it to be predictive of adaptive functioning acutely and two years post-treatment in survivors of pediatric brain tumor (20; 21). Of particular relevance, none of the sociodemographic or treatment-related variables emerged as significant predictors of social skills, which were rated on average as being generally at age expectation for survivors. Previous research suggests that premorbid behavioral functioning may be an important predictor of social skill development following treatment for a brain tumor (20).

Our findings must be interpreted in light of the study's methodological limitations. In an effort to avoid excluding survivors based on ethnicity/race, the other non-Caucasian group was comprised of Blacks, Pacific Islanders, and Asians. Future studies with larger sample sizes and increased diversity will be better able to parse racial and ethnic differences. Variables of primary caregiver education and family income served as proxies for SES as is commonly the case in health research [see (35) for detailed discussion]. Future studies incorporating both individual and neighborhood levels of SES will help us to better understand risk and protective factors as they relate to long term outcomes in pediatric brain tumor.

This sample was heterogeneous with respect to tumor location, histology, and treatment, all of which were interrelated and difficult to parse for the purpose of examining predictors of adaptive functioning. Available predictors were limited to those commonly examined demographic, diagnostic, and treatment-related variables. Acute variables, such as presence/length of posterior fossa syndrome and early sensory/motor impairment, and alternative dose metrics were not recorded. Additionally, variables related to development and premorbid cognitive and behavioral functioning were not obtained. Indeed, inclusion of premorbid levels of functioning would speak to reserve capacity. Although our findings are discussed in relation to ethnicity and SES, factors such as family income and caregiver education may also serve as proxies for cognitive reserve (40). Considered from this perspective, SES might reflect the quality of early childhood experiences as well as intrinsic buffering effects of reserve capacity (41).

In summary, the current study highlights the importance of examining outcomes in multi-ethnic and socio-economically diverse samples and reporting the ethnic, racial, and socioeconomic make-up of study samples. Although ratings of adaptive functioning did not differ as a function of ethnicity, indicators of SES predicted outcomes among survivors of pediatric brain tumor. Because non-Caucasians, including Hispanics, are over-represented at

lower levels of SES, they are at increased risk for poor adaptive outcomes. Further work is needed to evaluate neurocognitive, behavioral, socio-emotional, and adaptive outcomes in multi-ethnic samples, and potentially differing contributors to outcomes. Additionally, continued efforts to examine the impact of cultural variables on measurement of cognitive, behavioral, social-emotional, and adaptive functioning among Hispanic and Latino Americans are needed.

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Abbreviation

SES	Socioeconomic status
CSI	Craniospinal irradiation
GAC	Global Adaptive Composite
ABAS-II/3	Adaptive Behavior Assessment System – 2nd or 3rd edition

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TABLE 1

Demographic variables by ethnicity.

	Caucasian (*n* = 58) *M* (*SD*) or *N* (%)	**Hispanic (*n* = 34) *M* (*SD*) or *N* (%)**	**Other non-Caucasian (*n* = 22) *M* (*SD*) or *N* (%)**
Age at Evaluation	14.47 (4.35)	14.22 (3.93)	12.70 (4.74)
Gender (males)	39 (67.2)	20 (58.8)	14 (63.6)
Primary Language			
English	58 (100)	19 (55.9)	22 (100)
Spanish	0	15 (44.1)	0
Primary Caregiver Education *	a	b	ab
< High School Graduation	3 (5.2)	7 (20.5)	1 (4.5)
High School Grad/GED	7 (12.1)	12 (35.3)	7 (31.8)
Some College	15 (25.8)	11 (32.4)	3 (13.5)
2-Year College Degree	5 (8.6)	0	4 (18.2)
4-Year College Degree	19 (32.8)	4 (11.8)	4 (18.2)
Graduate Level Education	9 (15.4)	0	3 (13.5)
Family Income *	a	b	ab
<$40,000	13 (22.4)	21 (61.8)	11 (50)
40,000 – 79,999	11(19.0)	8 (23.5)	4 (18.1)
80,000 – 119,999	15 (25.9)	3 (8.8)	4 (18.1)
120,000 – 159,999	2 (3.4)	1 (2.9)	3 (13.6)
160,000 – 199,999	15 (25.9)	1 (2.9)	0
Don't know	2 (3.4)	0	0

Note. RT = radiation;

* Denotes a significant difference at $p < .01$, with significant differences occurring between Non-Hispanic Caucasians and Hispanics.

TABLE 2

Diagnostic and treatment-related variables by ethnicity.

	Caucasian (*n* = 58) M (SD) or N (%)	**Hispanic (*n* = 34) M (SD) or N (%)**	**Other non-Caucasian (*n* = 22) M (SD) or N (%)**
Age at Diagnosis	6.68 (4.12)	5.65 (3.53)	6.77 (4.02)
Time since RT	7.16 (3.95)	7.49 (3.97)	5.73 (3.67)
Tumor Histology			
Gliomas	16 (27.6)	6 (17.6)	1 (4.5)
PNETs	21 (36.2)	14 (41.2)	13 (59.1)
Ependymomas	8 (13.8)	5 (14.7)	3 (13.6)
Germ Cell Tumors	7 (12.1)	1 (2.9)	5 (22.7)
Craniopharyngiomas	3 (5.2)	5 (14.7)	0
Other	3 (5.2)	3 (8.8)	0
Tumor Location (Infratentorial)	30 (51.7)	17 (50)	11 (50)
Volume of Tumor (Largest diameter in cm)	4.42 (1.58)	5.25 (1.86)	4.79 (1.30)
Chemotherapy (Yes)	33 (56.9)	20 (58.8)	17 (77.3)
Craniospinal (Yes)	23 (43.1)	18 (52.9)	17 (77.3)
Total RT Dose (Gy)	52.51 (3.52)	53.35 (3.94)	52.88 (6.11)
Shunt Placement (Yes)	22 (37.9)	11 (32.4)	7 (31.8)

Note: RT = radiation; PNET = primitive neurectodermal tumor

TABLE 3

Adaptive functioning for pediatric brain tumor survivors (N = 114).

Adaptive Skills	*M* (*SD*)	Normative Mean	t	d	% Impaired Observed	% Impaired Expected	χ^2
GAC	85.31 (19.80)	100	−7.89*	−.72	31.00	6.68	106.95*
Conceptual	87.45 (18.59)	100	−7.21*	−.68	25.44	6.68	64.28*
Social	90.25 (17.03)	100	−6.12*	−.57	22.81	6.68	47.51*
Practical	84.08 (20.62)	100	−8.20*	−.77	33.60	6.68	131.60*

Note. GAC = Global Adaptive Composite;

* = $p < .001$

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TABLE 4

Adaptive functioning by ethnicity

	Caucasian ***M*** **(*SD*)**	**Hispanic** ***M*** **(*SD*)**	**Other non-Caucasian** ***M*** **(*SD*)**	***F***	η^2
GAC	89.91 (20.00)[a]	79.42 (17.75)[b]	80.82 (20.02)[b]	4.13	.07
Conceptual	92.41 (17.85)[a]	81.65 (16.61)[b]	82.68 (20.81)[b]	4.98	.08
Social	93.70 (17.63)[a]	85.09 (14.97)[b]	88.32 (17.33)[ab]	3.23	.06
Practical	88.45 (20.46)[a]	79.79 (19.95)[b]	77.68 (20.13)[b]	3.54	.06

Note. GAC = Global Adaptive Composite; Superscripts denote significant group differences without accounting for socioeconomic status (SES); after covarying for SES, the effect of group is no longer significant.

TABLE 5

Correlations between adaptive skills and demographic and treatment-related variables.

	GAC	Conceptual	Social	Practical
Ethnicity	−.27*	−.30**	−.25**	−.21*
Gender	.08	.06	.06	.04
Tumor Level	−.04	−.03	−.04	−.03
Volume of Tumor	.08	−.04	−.02	−.04
Shunt Placement	−.24*	−.17	−.11	−.29**
RT Total Dose	−.00	−.01	−.05	.00
RT CSI	−.29**	−.34**	−.20*	−.25**
Chemotherapy	−.10	−.19*	−.10	−.13
Age at Diagnosis	.20*	.21*	.16	.20*
Time since Diagnosis	−.12	−.16	−.13	−.14
Caregiver Education	.27**	.33**	.24**	.20*
Family Income	.22*	.27**	.24*	.12

Note. GAC = Global Adaptive Composite; RT = Radiation; CSI = Craniospinal Irradiation

* = $p < .05$

** = $p < .01$.

TABLE 6

Predictors of adaptive outcome.

	t	*p*
GAC	$F(5, 107) = 6.38$, $p < .001$ $R^2 = .23$	
Ethnicity	−1.4	0.164
Caregiver Education	2.03	0.045
Age at Diagnosis	1.98	0.05
Shunt Placement	−2.15	0.034
CSI	−2.69	<.008
Conceptual	$F(5, 108) = 8.63$, $p < .001$ $R^2 = .29$	
Ethnicity	−0.91	0.363
Caregiver Education	2.88	0.005
Age at Diagnosis	3.25	0.002
CSI	−4.12	<.001
Chemo	2.05	0.043
Social	$F(3, 110) = 4.47$, $p < .01$ $R^2 = .11$	
Ethnicity	−1.43	0.154
Caregiver Education	1.68	0.097
CSI	−1.89	0.061
Practical	$F(5, 107) = 5.20$, $p < .001$ $R^2 = .20$	
Ethnicity	−1.34	0.183
Caregiver Education	1.28	0.204
Age at Diagnosis	1.88	0.063
Shunt Placement	−2.73	0.007
CSI	−2.03	0.045

Note. GAC = Global Adaptive Composite; CSI = Craniospinal Irradiation; Chemo = Chemotherapy