Systematic review of educational supports of pediatric cancer survivors: Current approaches and future directions

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Keywords: Childhood cancer, Cancer survivors, Education, Academic, Schools, Intervention, Services

Funding sources: PCORI: EADI-14100 to LAJ; Career Development Fellowship from the NHMRC of Australia (APP1143767) to CEW; support from American Lebanese Syrian Associated Charities to MMH.

Conflicts of Interest: None

Abstract

PURPOSE: Survivors of childhood cancer are at-risk for educational problems and lower educational attainment. This systematic review examined the literature on the frequency of educational support use and the impact of educational interventions on school outcomes and quality of life (QoL) among children with cancer, from diagnosis into long-term survivorship.

METHODS: The search strategy was executed in the following databases: PubMed, PsycINFO, CINAHL, and ERIC.

RESULTS: Of 4,356 articles retrieved, 80 original articles were included with a combined sample of 24,875 survivors of childhood cancer. Sixty-six studies reported on the frequency of educational support use; estimates varied by cancer diagnosis, with increased use observed among survivors of brain tumors. Rates of special education service utilization varied extensively from 2-90%. Over half of survivors (53-62%) received lessons through their hospital school while on treatment, and 13-66% reported utilizing homebound educational instruction. Overall, 12-70% of survivors received an Individualized Education Plan (IEP) outlining special education programming tailored to identified learning needs. Many survivors reported receipt of non-specific "special help" in school (17-60%) and/or tutoring (12-36%). Twelve studies evaluated the impact of intervention on educational outcomes including academic skills, parental perception of survivors' academic performance, and graduation rates, demonstrating positive effects across several outcomes. Of note, only three studies assessed the relationship between educational intervention and QoL outcomes.

CONCLUSION: While it appears that a substantial proportion of survivors of childhood cancer receive educational supports during or after their cancer treatment, there remains a paucity of intervention research to evaluate the effectiveness of these supports. Future research must focus upon the development and evaluation of interventions to help survivors overcome educational problems associated with childhood cancer and its treatment.

INTRODUCTION

Adverse effects of childhood cancer on survivors' educational attainment have been well-documented.[1-6] The literature reveals that children with cancer miss more school than their peers both during and after treatment.[7-11] Neurocognitive late-effects related to cancer type and treatment exposures have also been widely reported[12,13] and are further discussed in other manuscripts in this Special Issue of the *Journal of Clinical Oncology*. Clinical practice guidelines have therefore been established to assist providers with facilitating school re-entry, providing screening for educational progress, and identifying patients who are at increased risk for educational problems related to neurocognitive late-effects.[14-18] Despite these advances, much less is known about school, hospital, or home interventions to help survivors overcome educational problems associated with cancer and its treatment.

The aim of this systematic review was to examine the literature on educational interventions for children diagnosed with cancer. The review sought to answer the following clinical questions: (1) What is the frequency of school-, hospital-, and home-based educational support use among survivors of pediatric cancer?, (2) Do educational interventions improve educational and/or vocational outcomes among survivors of pediatric cancer?, and (3) Do educational interventions improve quality of life (QoL) outcomes among survivors of pediatric cancer? By characterizing the frequency with which pediatric cancer survivors participate in educational supports and understanding the impact of these interventions, we can better advocate for survivors' educational needs both during and after cancer treatment.

METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was used as the guideline for conducting this review (Please see Supplemental Table A

for the PRISMA checklist).[19] We utilized the PICO framework to guide the systematic review process.[20,21] The population of interest included survivors of pediatric cancer, with children and adolescents being considered survivors from the time of diagnosis, during cancer treatment, and into long-term survivorship (Population). The concept of educational support interventions was operationalized to include special education services, academic accommodations, hospital school programming, school re-entry services, vocational rehabilitation services, college disability services, early intervention services for preschoolers, and physical/occupational/speech therapy offered within a school setting (Intervention). Relevant outcomes were categorized as educational (i.e., graduation rates, educational delay, absenteeism/missed instruction, academic skills or performance, and/or vocational outcomes) or quality of life (i.e., health-related quality of life, mental health, and/or independent living) (Outcomes).

Search Methods

An information specialist (S.P.) developed and executed a comprehensive search in the bibliographic databases PubMed, PsycINFO *(EBSCOhost),* CINAHL *(EBSCOhost),* and ERIC using a combination of key words representing age, survivorship of pediatric cancer, and educational interventions. Please see Supplemental Table B for the complete PubMed search strategy. Results spanned from January 1, 1990 to mid-June 2020 and were limited to journal articles and systematic reviews written in English. The search was completed in June 2020 and result records were imported into EndNote X9 for data management and deduplication. Four thousand three hundred and fifty-six (4,356) records were imported into the web-based application Covidence for screening.

Screening and Selection Criteria

Two authors first independently screened titles and abstracts and excluded irrelevant articles. In a second step, two authors independently assessed eligibility of the full text of the remaining articles. An article was included if (1) at least 75% of the study population were survivors of childhood, adolescent, and young adult cancers diagnosed at or before age 21, and (2) the paper included information about educational interventions as defined by the team. Case studies and papers that did not report quantitative outcomes were excluded. Disagreements were arbitrated by a third independent author during title/abstract and full-text screening. During full-text screening, articles reporting on frequency of educational support use that had a sample size of less than 20 and articles that featured medication as an educational intervention were also excluded (Figure 1). Systematic review articles were identified for reference searching.

Data Extraction and Quality Assessment

Relevant information regarding frequency of educational support use and intervention outcomes were extracted into evidence tables. Quality of the included articles was assessed using evidence-based methods provided by the Cochrane Childhood Cancer group (Supplemental Table C). Articles reporting frequency of educational support use were assessed for biases related to selection and attrition. Articles reporting outcomes were assessed for biases related to selection, attrition, detection, or confounding factors. Outcome articles were also assessed for biases in measurement (i.e., standardized measures used) and results reporting (i.e., significant and non-significant results reported).

RESULTS

Of 4,356 studies identified by the search, 333 full texts were screened for eligibility and 80 articles were abstracted for data (Figure 1). The eligible studies included: 66 papers reporting

on the frequency of educational support use among survivors, 14 papers investigating outcomes of educational interventions, and 14 systematic reviews which were screened for references. The 80 original studies with a total sample of n=24,875 survivors of childhood cancer were conducted in 18 countries across North America (n=45 studies), Europe (n=30 studies), Asia (n=2 studies), Oceania (n=2 studies), and South America (n=1 study). Examination of reference lists from the systematic reviews did not yield any additional papers meeting inclusion criteria.

Frequency of Educational Support Use

The results of studies reporting frequency of educational support use among survivors (n=66) are presented in Supplemental Table D. Studies varied in terms of sample size (range: N=20-961) and survivor age at study (range: 0.0-49 years). The majority of studies presented rates of special education service utilization (n=55 studies). Rates of survivors' use of homebound educational services (n=4 studies), hospital school teaching (n=3 studies), remedial teaching (n=10), repletion of school year/grade retention (n=11 studies), school-based rehabilitation services (n=2), tutoring (n=4 studies), and vocational services (n=2 studies) were also reported. Over half of survivors (53-62%) had received lessons through their hospital school while on treatment, while 13-66% reported utilizing homebound educational instruction. Many survivors received non-specific "special help" in school (17-60%) and formal tutoring (12-36%). Studies whose samples included survivors of mixed diagnoses or non-central nervous system (CNS) tumors indicated that 2-55% of survivors received special education services, with 12–30% of survivors having an Individualized Education Plan (IEP) outlining special education programming tailored to identified learning needs, and 2–40% of survivors attending specialized schools for cognitive or physical disabilities. Correspondingly, studies whose samples only included survivors of brain tumors indicated that 15-90% of survivors received special education

services, with 16–70% of survivors having an IEP, 13-28% having a Section 504 Plan documenting necessary accommodations to the learning environment (US-based studies only), and 19–30% receiving remedial teaching. Additionally, 8–43% of survivors of brain tumors attended specialized schools or classrooms for cognitive or physical disabilities.

Educational Support Interventions

The results of 14 studies investigating educational interventions for survivors are outlined in Table 1. Studies were diverse in terms of sample size (range: N=8-12,430) and survivor age at study (range: 5-59 years). Most of the intervention studies focused on providing supports to patients during early and/or long-term survivorship (n=10), with fewer studies evaluating supports provided to patients who were newly diagnosed (n=2) or on active treatment (n=2) for childhood cancer. Twelve studies evaluated the impact of intervention on educational outcomes including academic skills (i.e., literacy, numeracy, written expression),[22-28] parental perception of survivors' academic performance,[29-31] and graduation rates.[6,32] Three studies assessed the relationship between educational intervention and quality of life outcomes.[32-34] Among survivors of acute lymphoblastic leukemia and neuroblastoma, behavioral and mental health impairments were associated with increased special education service utilization.[32,33] School composite ratings on the Pediatric Quality of Life Inventory- Generic Core Scales (PedsQL) decreased following a school re-entry intervention for early survivors of leukemia, suggesting an initial worsening of school related quality of life over time even with re-entry supports.[34]

Hospital-based interventions. In terms of intervention setting, eight studies presented results of hospital-based interventions.[22,23,26-28,30,31,34] In two studies, parents of survivors receiving hospital-based school liaison programming reported greater belief that their child was meeting their academic potential and felt that accessing school services for their child was

easier.[30,31] All participants in an advocate led school re-entry program were able to access homebound services as needed, and half of survivors received a Section 504 Plan to support their learning.[34] Teens with cancer who participated in hospital schooling were able to keep pace or exceed national norms for mathematics in Brazil.[27] Hospitals also offered clinic-based mathematics intervention, cognitive remediation, and problem-solving training.[22,23,28] These interventions supported improvements in survivors' performance on tests of academic achievement.

School-based interventions. Three studies from the Childhood Cancer Survivor Study (CCSS) cohort assessed outcomes associated with school-based special education services for survivors.[6,32,33] Overall, survivors were more likely than siblings to receive special education supports. Mental health and behavioral impairments were associated with increased rates of engagement in special education services among survivors of acute lymphoblastic leukemia and neuroblastoma.[32,33] Although some subgroups of survivors were less likely to graduate high school than siblings, survivors who engaged in special education services had high school graduation rates similar to siblings.[6] In contrast, survivors of acute lymphoblastic leukemia who were in special education placements during adolescence had significantly increased risks of not graduating from college.[32]

Home-based interventions. Three studies presented results of home-based interventions.[24,25,29] Two of these studies investigated the use of a computerized working memory intervention, Cogmed (http://www.cogmed.com), to support survivors of acute lymphoblastic leukemia and brain tumors.[25,29] Improvement was observed in survivors' applied mathematics scores and parents reported an improvement in their survivors' grades following completion of the Cogmed interventions. Lastly, an intervention directed at parents of survivors

with neurobehavioral late effects found improvements in survivors' numerical operations and reading comprehension test scores following intervention.[24]

DISCUSSION

The aim of this systematic review was to examine the literature on the frequency of educational support use and the impact of educational interventions upon school outcomes and quality of life among children with cancer, from the time of diagnosis into long-term survivorship. Frequency of educational support use varied between diagnosis groups, with increased use observed among survivors of brain tumors. Despite the clearly recognized need to mitigate the adverse impact of cancer on survivors' school outcomes,[1-3,5] the number of intervention studies identified by our search was limited. The majority of studies identified focused on characterizing special education service utilization among survivors of pediatric cancer, yet only three studies investigated the impact of special education services on survivors' educational or quality of life outcomes.[6,32,33] Several studies assessed the effect of educational intervention on academic skills via psychoeducational testing;[22-28] however, no studies evaluated the effect of intervention on objective measures of academic performance in real-world settings (i.e., grades in school). Similar to the findings of the current review, limited studies were available to generate clinical practice guidelines for academic continuity, school reentry, and screening for survivors' educational and/or vocational progress.[14,15]

While it appears that a substantial proportion of childhood cancer survivors receive educational supports during and/or after their cancer treatment, it is difficult to ascertain whether the proportion receiving supports is appropriate and whether the 'right' survivors are accessing the 'optimal' supports. Some national health/education systems have a goal to provide educational supports for *all* children affected by cancer.[35] Using that lens, the proportion of

children using educational supports reported in this systematic review could be considered low. However, other health/education systems may interpret these figures as appropriate if limited resources are allocated to those with the highest need. There are also likely cultural differences in the choice of educational supports offered to students affected by cancer. For example, in some countries, grade retention may be standard practice for students who are falling behind or need more time (e.g., France), while in other countries, repeating a grade might be considered an uncommon and adverse outcome.[35,36]

The limited literature assessing the impact of education interventions is also difficult to interpret. The interventions offered, and the settings in which they were delivered, varied widely across studies. While there were some positive findings,[25,28-30] other studies reported that children who accessed educational supports experienced worse outcomes over time[34] or with increased use of supports.[32,33] These differing findings may be explained by the characteristics of participating survivors in each study. Many studies excluded children with the most severe educational challenges who were not attending mainstream school, while in other studies, it appeared that children with the most significant difficulties were most likely to be accessing the intervention.[34] Several studies had small samples,[23-25,34] did not include control groups,[18,25,34] or focused on specific cancer diagnoses,[26,28,32-34] making the findings of the reviewed studies less likely to be generalizable to the broader population of survivors of childhood cancer. Several studies also focused on short term outcomes[26,29,34] and studies rarely reported on longer term, more distal outcomes, such as quality of life and vocational attainment. The review also did not include literature published in languages other than English, and studies from the United States were heavily over-represented, further limiting generalizability.

Given the limitations of the studies reviewed, it is clear that more work is needed to help survivors and their families obtain needed supports. Communication between oncology providers, parents, and schools is key to ensuring survivors' access to needed educational supports, but critical gaps in such communication persist.[37] Several recent reviews reveal both limited patient/parent-provider communication about broader survivorship/late effects concerns,[38] as well as few evidence-based supports for patient/parent-provider communication about education-related concerns.[39] As access to formal school liaison programming remains inconsistent across settings, it will be critical to implement communication strategies and routines that ensure parents, schools, and medical providers have a shared knowledge of educationally-relevant needs of survivors as well as the procedures for proactively obtaining access to needed services. Communication must also be ongoing to ensure that services adequately address the needs of survivors, particularly as developmental and schooling needs inevitably change over time. Specific examples of communication tasks, supports, and resources are identified in Table 2. These examples and resources are based on the evidence from this systematic review, current clinical practice, and practical recommendations from the literature.[40]

Although there are several notable strengths of the current work, there are also some limitations to consider. To begin, qualitative studies were excluded in the current review. This decision was made in an attempt to focus the review on standardized academic outcomes. However, we acknowledge the strength of qualitative research to capture nuances of families' experiences that provide greater perspective to the quantitative findings. For example, decision-making among parents about accessing educational supports may differ depending upon personal priorities and family values after their child has survived cancer. As such, decisions made regarding when and how to access educational supports are not fully captured by quantitative

data. Furthermore, this review did not take into account the era of treatment for the studies reviewed, although treatment protocols have evolved significantly over the last few decades in favor of less toxic therapies for some diagnoses. Therefore, the need for educational supports for some survivors will most likely change over time. Importantly, we also acknowledge that many of the intervention studies we reviewed specifically excluded patients with severe cognitive difficulties. In so doing, we may not have an accurate perspective of the needs and supports available for the most educationally vulnerable patients. Finally, the majority of studies relied on parent-proxy or self-report of educational support, which might not always present the full picture. These data would be further strengthened by the inclusion of teacher-report forms, comparing the survivor with their classmates, along with school-based records of supports received or hospital records on interventions provided.

The results of the review also reveal many valuable opportunities for future research which have been summarized in Figure 2. To begin, only 14 studies investigated educational interventions for survivors. Given the widely documented deficits in educational attainment among survivors of childhood cancer, the paucity of intervention research was surprising. Future research therefore needs to focus upon the development and rigorous evaluation of educational interventions in an effort to improve academic outcomes among pediatric cancer survivors. Furthermore, while we noted a combination of hospital-based and school-based supports, it would be important to better understand the strengths and limitations of each of these types of intervention programs. For example, hospital-based programs may benefit from input from health care professionals with expertise in pediatric cancer but may be limited in their generalizability to the school setting as well as their ability to provide longer term advocacy and guidance. In addition to the intervention setting, identifying the optimal timing for educational

interventions, for example whether to initiate at the start, during, or shortly after completion of medical treatment, or perhaps well into survivorship, warrants future research attention. We also acknowledge that there currently exists little data documenting parental decision-making about educational needs, such as homeschooling secondary to lowered immunity and/or holding children back a year based upon having previously missed school. In addition, we believe that there is an important research opportunity to optimize educational supports by including serial assessments of cognitive and academic functioning, as well as quality of life, into clinical trials or longitudinal cohort studies. Finally, we believe this important work would be enhanced by more collaborative partnerships between researchers, clinicians, school personnel, and patients and families - each with extensive experience and valuable perspectives. Inclusion of these key stakeholders in the research process will help to identify priorities for investigation and provide further opportunities to highlight the gaps in knowledge regarding what educational supports may be needed, along with when and by whom, they should be offered.

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart

INSERT FIGURE 1 HERE

Table 1. Educational Support Interventions for Survivors of Childhood Cancer

Author / Publication Year	Study Design Study Center / Country	Participants	Educational supports / Results	Risk of bias
Fournier-Goodnight et al. 2019 [29]	Feasibility study-randomized waitlist control; St Jude Children's Research Hospital, USA	N=34 off-therapy survivors; ALL and mixed brain tumor diagnoses; M=12.21 yrs at study [SD=2.47 yrs]; M=5.15 yrs at diagnosis [SD=2.92 yrs]; M=4.97 yrs since treatment [SD=3.02 yrs]	Home-based- Cogmed: a computerized Working Memory intervention (http://www.cogmed.com) Participants asked to complete 25 training sessions (30-45 min each) at home over 5 to 9 weeks along with weekly coaching calls. Caregivers' perceptions that their child's grades improved and their child benefited from Cogmed training was equivalent across coaches.	Selection: No Attrition: No Detection: No Confounding: Yes Measurement: Yes Results reporting: No
Zheng et al. 2018 [32]	Cohort study; Childhood Cancer Survivor Study (CCSS), USA	N=859 long-term survivors of neuroblastoma; aged 8-17 yrs at study; Med=0.8 yrs at diagnosis [range 0.0–7.3 yrs] Controls: N=872 siblings aged 8-17 yrs at study	School-based- Special Education Services Compared to siblings, survivors were more likely to use SPED services (PR=2.25; 95%CI 1.84–2.74). Impairment on parent reported Behavior Problem Index (BPI) domains were associated with increased use of SPED services: Anxiety/Depression: PR=1.77 (95%CI 1.43–2.16, p<0.001); Headstrong: PR=1.72 (95%CI 1.38–2.10, p<0.001); Attention Deficit: PR=2.26 (95%CI 1.86–2.74, p<0.001); Peer Conflict/Social Withdrawal: PR=2.03 (95%CI 1.66–2.47, p<0.001); Antisocial: PR=1.66 (95%CI 1.32–2.06, p<0.001)	Selection: Unclear Attrition: No Detection: No Confounding: No Measurement: No Results reporting: No
Northman et al. 2018 [30]	Cross-sectional study; Dana-Farber Cancer Institute, USA	N=93 survivors; mixed diagnoses; M=9.57 yrs at study; M=7.80 yrs since diagnosis [SD= 4.15 yrs, range 0-18 yrs] Controls: N=66 patients with NF1; mean 9.20 yrs at study	Hospital-based- School Liaison Program School Liaison Program (SLP) provides ongoing psychoeducation to both parents and schools for as long as necessary, most frequently through high school graduation. Parents receiving SLP services reported greater belief that their child is meeting academic potential (p=0.02), better understanding of their child's learning needs (p=0.003), and increased ability to access school supports (0.0096).	Selection: Yes Attrition: No Detection: N/A Confounding: Yes Measurement: No Results reporting: No
Carlson-Green et al. 2017 [25]	Feasibility study; Cancer and Blood Disorders Clinic at Children's of Minnesota, USA	N=20 off-therapy survivors; mixed brain tumor diagnoses; 8-18 yrs at study; M=6 yrs at diagnosis [range 1-14 yrs]; M=5 yrs since treatment completion [range 1-12 yrs]	Home-based- Cogmed: a computerized Working Memory intervention (http://www.cogmed.com) Survivors' scores on Woodcock-Johnson Tests of Achievement, 3rd Ed (WJ-III) in applied math were significantly improved (over baseline) at 6 months following the termination of 35 sessions of CogMed (WJ-III Applied Problems: p=0.016). No effect was observed for an academic test of untimed reading comprehension (WJ-III Passage Comprehension: p=0.80).	Selection: Yes Attrition: No Detection: Unclear Confounding: N/A Measurement: No Results reporting: No
Jacola et al. 2016[32]	Cohort study; Childhood Cancer Survivor Study (CCSS), USA	N=1443 long-term survivors; ALL; M= 15.34 yrs at study baseline [SD= 1.65 yrs, range 12-17 yrs]; M= 3.76 yrs at diagnosis	School-based- Special Education Services Survivors of ALL (34.2%) more likely than siblings (13.7%) to use SPED services (p<0.0001). Impairment on parent reported Behavior Problem Index (BPI) domains were associated with increased use of SPED services:	Selection: Yes Attrition: No Detection: N/A Confounding: No Measurement: No

		[SD= 1.82 yrs]; M= 11.60 yrs since treatment [SD= 2.14 yrs] Controls: N=611 siblings; M= 15.36 yrs at baseline study [SD= 1.67 yrs]	Survivors treated with CRT- Antisocial RR=1.41 (95% CI 1.13-1.76, p<0.001); Anxiety-Depression RR=1.61 (95% CI 1.34-1.93, p<0.001); Headstrong RR=1.70 (95% CI 1.42-2.03, p=0.0011); Inattention-Hyperactivity RR=1.93 (95% CI 1.62- 2.31, p<0.001); Social Withdrawal RR=1.62 (95% CI 1.34- 1.95, p<0.001) Survivors treated without CRT- Antisocial RR=1.72 (95% CI 1.26-2.34, p=0.002); Anxiety-Depression RR=2.13 (95% CI 1.61-2.82, p<0.001); Headstrong RR=1.63 (95% CI 1.21-2.19, p<0.001); Inattention-Hyperactivity RR=3.54 (95% CI 2.77-4.52, p<0.001); Social Withdrawal RR=2.00 (95% CI 1.52-2.65, p<0.001) In a subset of survivors with longitudinal data and who were ≥25 years old at follow-up (n=925), SPED placement during adolescence significantly increased risk of not graduating from college.	Results reporting: No
Rubens et al. 2016 [31]	Cohort study; Dana Farber Cancer Center, USA	N=93 survivors; mixed diagnoses; M=9.6 yrs at study [SD=3.08 yrs, range 5-17 yrs]; M=5.87 yrs at diagnosis [SD=3.82 yrs]	<u>Hospital-based- School Liaison Program</u> Evaluation of hospital based school liaison program (SLP) spanning 121 schools in 6 US States. Parent questionnaire assessed: Parental Understanding, Confidence in Ability to Advocate, Informed of Services, Difficulty Obtaining Supports and Academic. Parental Understanding improved with >3 years of SLP service (OR=4.9, 95%CI: 1.3, 18.2); SLP participation in school meetings (OR=7.5, 95%CI: 1.2, 47.7), and SLP school visits (OR=2.9, 95%CI: 1.03, 8.3). Confidence in Ability to Advocate improved with >3 years of SLP service (OR=3.9, 95%CI: 1.1, 14.1); SLP participation in >1 school meetings ([2-5 meetings: OR=3.0, 95% CI: 1.01, 9.1] and [>5 meetings: OR=6.0, 95%CI: 1.8, 20.1]), and SLP school visits (OR=3.0, 95%CI: 1.1, 8.4). Informed of Services improved with SLP participation in >1 school meetings ([2-5 meetings: OR= 4.8, 95% CI:(1.5, 15.9] and [>5 meetings: OR=5.6, 95%CI: 1.6, 20.0]). Academic Potential improved with SLP school visits (OR=5.1, 95% CI:1.7, 15.4).	Selection: No Attrition: No Detection: Unclear Confounding: Yes Measurement: No Results reporting: No
Palmer et al. 2014 [26]	RCT; St. Jude Children's Research Hospital, USA	N=43 newly diagnosed patients with medulloblastoma; M=9.38 yrs at diagnosis [SD=3.12 yrs] Controls: N=38 newly diagnosed patients with medulloblastoma; M=9.27 yrs at diagnosis [SD=3.18 yrs]	<u>Hospital- and Home-based- Hospital School Program and Computerized Training Program</u> Both groups received standard of care supports through St. Jude's Hospital School Program. Intervention group also received access to a computer-based training system developed to improve reading skills (Fast ForWord) and was encouraged to complete 48 min of training per day, 5 days per week, for 6 weeks (target training criteria: 30 sessions and total training time of 1,440 min). 39.5% (n=17) of patients were able to complete the target goal of 30 intervention sessions. No significant difference between the reading intervention	Selection: No Attrition: No Detection: No Confounding: No Measurement: No Results reporting: No

			and standard of care group on Woodcock Johnson, Third Edition (WJIII) Tests of Achievement Letter-Word Identification and Word Attack.	
Patel et al. 2014 [24]	Randomized pilot; City of Hope Medical Center, USA	N=22 off-therapy survivors; mixed diagnoses Controls: N=22 off-therapy survivors; mixed diagnoses Intervention and controls: mean 11.92 yrs at study, [SD=3.28 yrs, range 6-17 yrs]; M=4.91 yrs at diagnosis [SD=3.64 yrs, range 0.08-14.83 yrs]	<u>Home-based- Parent Intervention Program (PIP)</u> Eight session (75–90 min each) manualized intervention directed at parents of survivors with neurobehavioral late effects to improve parenting skills and indirectly benefit survivors' educational functioning. Parents asked to implement PIP concepts at home with their child for a minimum of 30 min/4 days per week. 90% of parents completed the intervention with good adherence and high perceived benefit ratings. Medium effect sizes for group differences in pre–post change on Wechsler Individual Achievement Test-II (WIAT-II) composite scores were found with higher gains for the PIP arm in numerical operations (p=0.043) and reading comprehension (p=0.059). Survivors in the PIP arm increased use of study strategies at Time 2 (p=0.03), but this was not sustained at Time 3.	Selection: No Attrition: No Detection: No Confounding: No Measurement: No Results reporting: No
Covic et al. 2012 [27]	Cohort study; GRAACC Support Group for Children and Adolescents with Cancer, Brazil	N=54 patients on-therapy for HL, NHL, osteosarcoma, & other bone malignancy; patients were all 15 year-olds at baseline. Controls: Brazilian age matched national norms for math	<u>Hospital-based- Hospital School Program</u> 15-year-old patients participating in the hospital school program for ≥1 year were followed for 8 years (2001-2008) to determine impact of hospital school enrollment on math literacy as compared to national math norms established by the Programme for International Student Assessment. A smaller percentage of survivors had Level 0 results as compared to Brazilian average (17% vs. 53%). Larger percentages of survivors had Level 2 and 3 results as compared to Brazilian averages (Level 2: 24% vs. 14%; Level 3: 24% vs. 7%).	Selection: No Attrition: No Detection: Yes Confounding: Yes Measurement: No Results reporting: Yes
Moore et al. 2012 [28]	RCT; University of Arizona and Baylor University, USA	N=24 patients on-therapy for ALL; M=6.7 yrs at diagnosis [SD=1.75, >5 yrs old] Controls: N=33 patients on-therapy for ALL; M=6.5 yrs at diagnosis [SD=2.71, >5 yrs old]	<u>Hospital-based- Mathematics Intervention</u> A Mathematics Intervention based on Multiple Representation Theory was delivered in-clinic approximately 1-2 hours per week. Program completion was defined as receiving 40–50 hours of individualized math intervention during a one-year period. The intervention group demonstrated significant gains in Applied Mathematics scores on the Woodcock-Johnson III: Tests of Achievement (p<0.001) as compared to controls. The intervention was effective at increasing applied mathematics scores at post-intervention (p=0.002) and one-year follow-up (p=0.001).	Selection: Unclear Attrition: Yes Detection: Yes Confounding: Yes Measurement: No Results reporting: No
Annett et al. 2009 [33]	Feasibility study; University of New Mexico, USA	N=8 patients on-therapy for ALL; M=8.6 yrs at study [range 6-12 yrs]; 1 to 24-months post-diagnosis	<u>Hospital-based- School re-entry services</u> 4-month school reintegration intervention with eight modules delivered by an educational advocate providing informational and instrumental support to families. All children enrolled in the program received school services with both homebound instruction and	Selection: No Attrition: No Detection: Yes Confounding: Yes Measurement: No

			(partial or full) classroom instruction. Four patients obtained 504 Plans before or during study participation. School composite ratings on the Pediatric Quality of Life Inventory- Generic Core Scales (PedsQL) decreased during the study, suggesting a worsening of HRQoL: pre-intervention (mean= 57.9, SD= 17.3); post-intervention (mean= 48.3, SD= 20.2).	Results reporting: Unclear
Patel et al. 2009 [23]	Pilot trial; City of Hope Medical Center & Children's Hospital Los Angeles, USA	N=15 long-term survivors; ALL and mixed brain tumor diagnoses; M=11.75 yrs at study [SD=3.77 yrs, range 7-19 yrs]; M=5.96 yrs at diagnosis [SD = 4.86 yrs, range 1-17 yrs]; M=7.23 yrs since diagnosis [SD=2.75 yrs, range 2-12 yrs]	Hospital-based- Cognitive and problem-solving skills training 15-session, clinic-based training program to teach compensatory learning and problem-solving skills in survivors with cognitive deficits. Changes from pre-post intervention were for Woodcock-Johnson Tests of Achievement-Revised Writing Samples (p=0.03) and Child Behavior Checklist (CBCL) Externalizing T-score (p=0.08).	Selection: Yes Attrition: No Detection: Unclear Confounding: Yes Measurement: No Results reporting: No
Butler et al. 2008 [22]	RCT; Multicenter (n=7 institutions), USA	N=109 survivors; mixed diagnoses; M=10.8 yrs at study [SD=3.4 yrs]; M=4.9 yrs at diagnosis [SD=3.3 yrs]; M=5.8 yrs since diagnosis [SD=2.8 yrs] Controls: N=54 survivors; mixed diagnoses; M=11.1 yrs at study [SD= 3.1 yrs]; M=5.6 yrs at diagnosis [SD= 3.4 yrs]; M=5.6 yrs since diagnosis [SD= 3.2 yrs]	Hospital-based- Cognitive Remediation Program Survivors in the Cognitive Remediation Program (CRP) were seen for up to 20 two-hour weekly sessions over 4–5 months. Participants completed a modified version of the Attention Process Training cognitive rehabilitation program developed by Sohlberg et al. 1999. There was no change in academic achievement over time in the control group, but a statistically significant improvement within the CRP group was noted post-intervention. The differences between groups on academic achievement were statistically significant (p=0.003).	Selection: No Attrition: No Detection: Yes Confounding: No Measurement: No Results reporting: No
Mitby et al. 2003 [6]	Cohort study; Childhood Cancer Survivor Study (CCSS), USA	N=12430 long-term survivors; mixed diagnoses; 6-59 yrs old at study; 0-20 yrs old at diagnosis Controls: N= 3410 siblings; 6-59 yrs old at study	School-based- Special Education Services Compared self-reported rates of special education and educational attainment among childhood cancer diagnostic groups and sibling controls. Survivors (23%) more likely than siblings (8%) to use special education services with higher OR among survivors younger than age 6 at diagnosis and those with CNS tumor, leukemia, or HL. Survivors of leukemia (OR 1.6), CNS tumors (OR 2.7), NHL (OR 1.8), and neuroblastoma (OR 1.7) less likely to finish high school compared with siblings, but risk estimates for survivors who received education approached those of sibs who received special education.	Selection: Yes Attrition: No Detection: N/A Confounding: No Measurement: Yes Results reporting: No
Abbreviations: Mean (M), Standard deviation (SD), Years (yrs), Median (Med), Prevalence ratio (PR), Odds Ratio (OR), Relative Risk (RR), 95% Confidence Interval (95%CI), Special Education (SPED), Acute lymphoblastic leukemia (ALL), Neurofibromatosis 1 (NF1), Hodgkin lymphoma (HL), non-Hodgkin lymphoma (NHL), Cranial radiation therapy (CRT)				

Table 2. Key tasks of healthcare providers, schools, survivors, and families in obtaining appropriate educational supports for childhood cancer survivors

Stakeholder	Communication Tasks	Support Examples	Resources
Healthcare providers	- Identify main contact person to communicate with school and family - Recommend needed accommodations to family and school - Discuss home and hospital/homebound needs with school and family - Discuss referrals to needed services - Follow-up regularly regarding progress and continuation of services	- Identify children at-risk for learning problems - Assess neuropsychological functioning and learning needs - Assess sensory impacts of treatment - Inform families about available school supports (e.g., early intervention, assistive technology) and legal rights regarding education - Write letter(s) to school documenting specific medical condition/needs - Parent training –share vetted resources	- School Liaison Program - Hospital Teaching - Neuropsychological Assessment Services - Rehabilitative Therapies - https://www.cdc.gov/ncbddd/actearly/parents/states.html - https://sites.ed.gov/idea/about-idea/ - Provider training (CME)
School Team	- Identify main contact person to communicate with family and healthcare providers - Assess need for special education services, IEP, or 504 plan - Meet regularly to share student progress and response to interventions - Plan for annual transition of information at the end of every school year - Share information about specific student needs with other team members, as needed	- Regular parent-teacher conferences/ emails - Monitor student progress - Special education services - 504 accommodation plans - Peer education/training - Assistive technology - Staff training - Ensure access to school nurse, as needed - Provide informal accommodations such as reduced task length, extra time, rest breaks, copies of textbooks, teacher proximity, access to keyboarding	- US Dept of Education: https://www2.ed.gov/policy/landing.jhtml?src=pn - National PTA: https://www.pta.org/home/family-resources - COG Survivorship HealthLink Educational Issues after Cancer: http://www.survivorshipguidelines.org/pdf/2018/English%20Health%20Links/14_educational_issues%20(secured).pdf - Leukemia & Lymphoma Society Learning and Living with Cancer booklet: https://www.lls.org/education-resources - Cerebra.org.uk Returning to school after brain tumor booklet: https://cerebra.org.uk/download/returning-to-school-after-a-brain-tumour/ - Cancer Council Australia: Cancer in the school community: https://www.cancercouncil.com.au/wp-content/uploads/2020/04/UC-pub-Cancer-in-the-School-Community-CAN3526-lo-res-June-2018.pdf

Survivors & Families	- Identify main contact person for school and hospital - Monitor child skills and performance - Communicate concerns and any changes to providers and schools - Ask about home supports and assistive technology - Ask for (and include survivors in) team meetings when any concerns arise - Ask the school team about transition planning (by age 14 or 16, depending on state) - Ask about advocacy support, if needed - Ask about local foundation support for learning and social activities - Communicate about responsibilities for these tasks within the family. Survivors should be included in these tasks as developmentally appropriate. Families can support the survivor in becoming more independent in monitoring and advocating for their own needs in high school and beyond.	- Assistive technology, such as speech-to-text software, Google Cloud speech-to-text - Tutoring - Computer-based training such as CogMed - Review and share web-based resources about cancer with school staff - Student-centered transition planning - Support services or accommodations in college	- COPAA: https://www.copaa.org/? - WrightsLaw: https://www.wrightslaw.com/ - US Dept of Education: https://www2.ed.gov/policy/landing.jhtml?src=pn - National PTA: https://www.pta.org/home/family-resources - Leukemia & Lymphoma Society Learning and Living with Cancer booklet: https://www.lls.org/education-resources - Cerebra.org.uk Returning to school after brain tumor booklet: https://cerebra.org.uk/download/returning-to-school-after-a-brain-tumour/ - The IRIS Center's student-centered transition guide: https://iris.peabody.vanderbilt.edu/module/tran-scp/cresource/q1/p01/#content - Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD) Should Students Attend Their IEP Meeting: https://chadd.org/adhd-weekly/should-students-attend-their-iep-meeting/

Note. For sample communication forms, see Grandinette S. Supporting students with brain tumors in obtaining school intervention services: The clinician's role from an educator's perspective. *J Pediatr Rehab Med.* 2014;7:307–321. doi: 10.3233/PRM-140301

Figure 2. Opportunities for Future Educational Research to Support Survivors of Childhood Cancer

INSERT FIGURE 2 HERE

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Figure 1

Click here to access/download;Figure;Marchak et al Educational Supports review - fig 1 revised.png

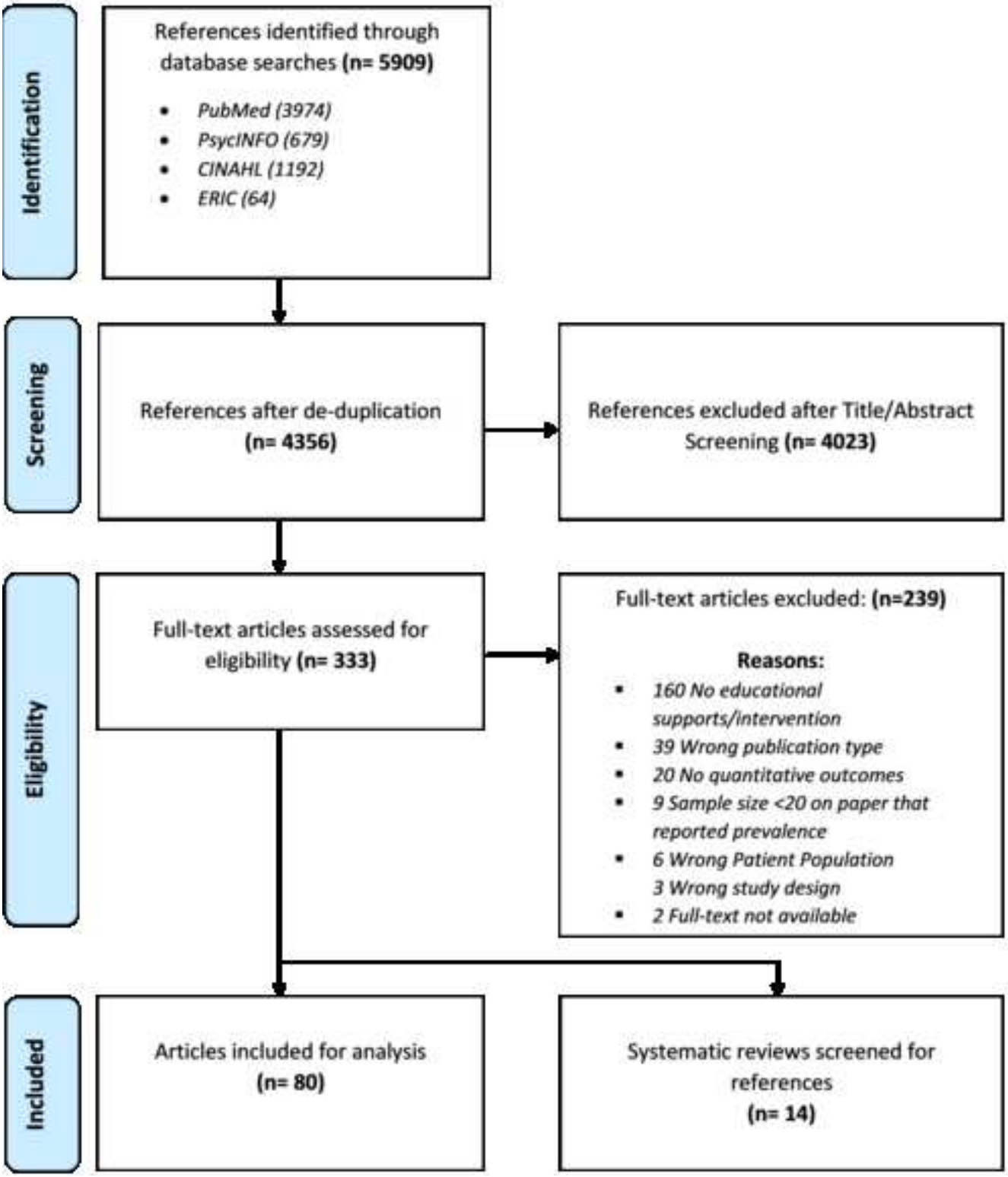
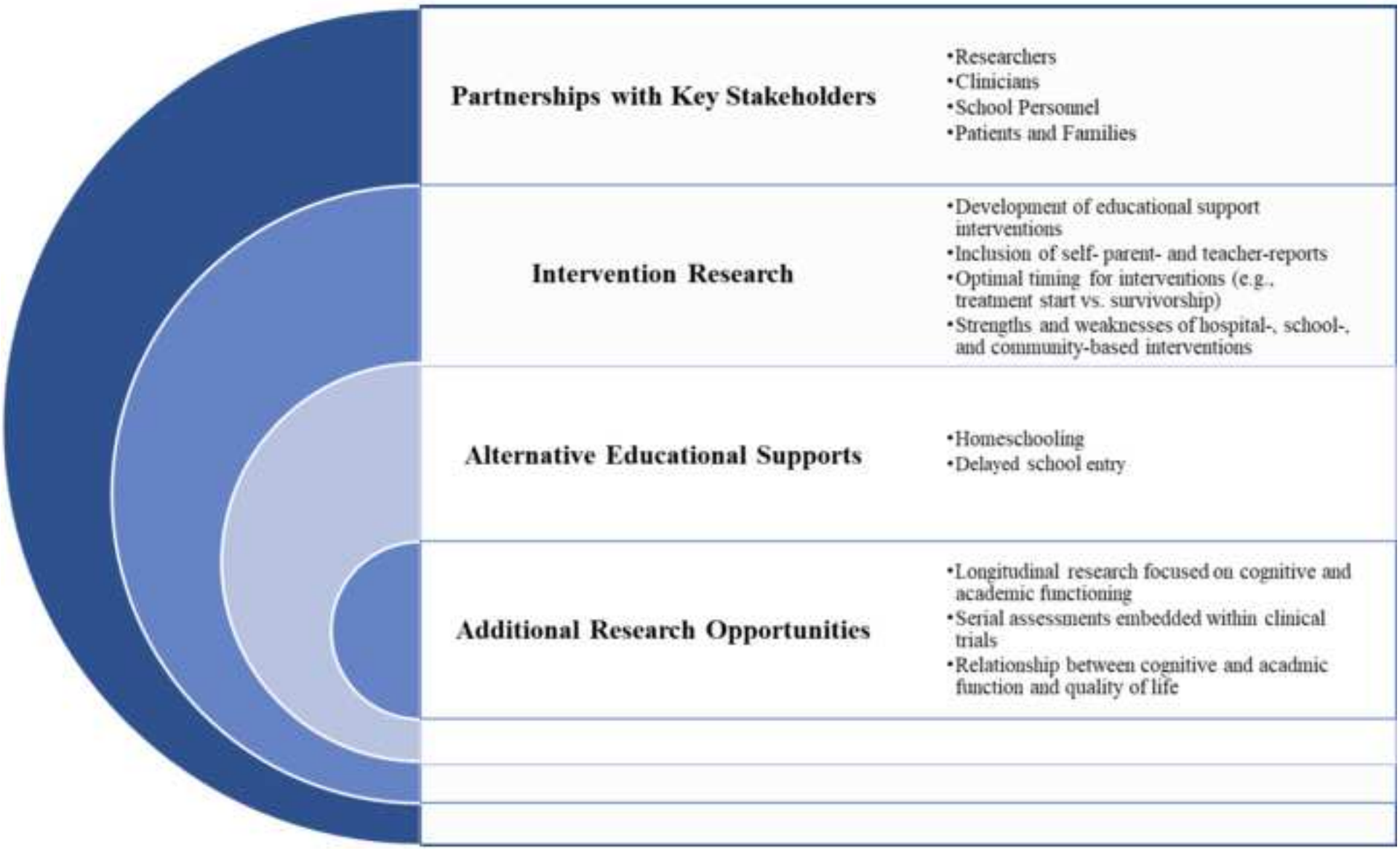


Figure 2



Supplemental Table A. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3-4
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	n/a
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4-5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	4
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Supplemental Table B
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	4
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	5 & Supplemental Table C
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	n/a
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	n/a

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Table 1
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	n/a
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	5-6, Figure 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1, Supplemental Table D
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table 1
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	n/a
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	n/a
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Table 1
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	n/a
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	9-11
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	10-12
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	12-13
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	1

Supplemental Table B. PubMed Search Strategy for Publication

#1	((childhood cancer*[tw]) OR (cancer survivor*[tw]) OR (pediatric oncolog*[tw]) OR (paediatric oncolog*[tw]) OR (pediatric cancer*[tw]) OR (paediatric cancer*[tw]) OR (brain cancer*[tw]) OR (brain tumor*[tw]) OR (brain tumour*[tw]) OR (brain neoplasm*[tw]) OR (central nervous system neoplasm*[tw]) OR (central nervous system tumor*[tw]) OR (central nervous system tumour*[tw]) OR leukemi*[tw] OR leukaemi*[tw] OR lymphom*[tw] OR hodgkin*[tw] OR sarcom*[tw] OR osteosarcom*[tw] OR Ewing*[tw] OR wilm*[tw] OR nephroblastom*[tw] OR neuroblastom*[tw] OR rhabdomyosarcom*[tw] OR teratom*[tw] OR hepatoma*[tw] OR hepatoblastom*[tw] OR medulloblastom*[tw] OR meningiom*[tw] OR gliom*[tw] OR astrocytoma*[tw])
#2	(child[tw] or children[tw] or childhood[tw] or pediatric[tw] or paediatric[tw] or infant*[tw] or baby[tw] or newborn[tw] or babies[tw] or adolescent*[tw] or adolescence[tw] or teenager*[tw] or teen* [tw] or youth[tw] or young[tw] or toddler*[tw] or preschool*[tw] or school age*[tw] or juvenile*[tw])
#3	(education*[tiab] OR academic*[tiab] OR vocation*[tiab] OR school*[tiab] OR college*[tiab] OR career*[tiab] OR "early intervention*"[tiab])
#4	#1 AND #2 AND #3
#5	#4 AND English[lang] AND ("1990/01/01"[PDAT] : "2020/12/31"[PDAT])

Supplemental Table C. Risk of bias assessment criteria

Risk of bias assessment criteria for observational studies developed by Cochrane Childhood Cancer	
Selection bias	Is the study group representative? yes/no/unclear Yes if: the study group consisted of more than 75% of the original cohort of childhood cancer survivors OR it was a random sample with respect to the cancer treatment
Attrition bias	Is the follow-up adequate? yes/no/unclear Yes if: the outcome was assessed for more than 75% of the study group
Detection bias	Are the outcome assessors blinded for important determinants related to the outcome? yes/no/unclear Yes if: the outcome assessors were blinded for important determinants related to the outcome
Confounding	Are the analyses adjusted for important confounding factors? yes/no/unclear Yes if: important prognostic factors (i.e. age, gender, co-treatment, follow-up) were taken adequately into account
Additional risk of bias assessment criteria	
Measurement	Were measured used standardized?
Results	Were all results reported-- significant and non-significant?

Supplemental Table D. Frequency of educational support use among survivors of childhood cancer

Author / Year	Study Center / Country	Educational supports	Risk of bias
Alias et al. 2020 [1]	UKM Medical Center, Malaysia	**34.2%** of brain tumor survivors were enrolled in SPED services, as compared to **0%** of ALL survivors. N=38; M=12.5 yrs at study [SD=3.6 yrs]; M=7.2 yrs at diagnosis [SD=3.7 yrs]; M=5.5 yrs since end of treatment [SD=3.9 yrs]; Controls: N=38 age- and gender-matched survivors off-therapy for ALL	Selection: No Attrition: No
Eaton et al. 2020 [2]	Massachusetts General Hospital, USA	**46%** of brain tumor survivors had an IEP, **8%** described their classroom as a SPED classroom, **36%** utilized a classroom aid, **23%** utilized an outside tutor. N= 40; Med=9.1 yrs at study [range 5.5–18 yrs]; Med=2.5 yrs at radiotherapy [range 0.3–3.8 yrs]	Selection: Yes Attrition: No
Holland et al. 2020 [3]	University of Texas Southwestern Medical Center, USA	**60%** of ALL survivors were currently utilizing academic support services (i.e., tutoring, classroom/learning-focused 504 plan, and/or SPED services). **18%** of ALL survivors had an IEP. N=107; M=12.79 yrs at study [SD=3.18, range 8-19.5 yrs]; M=5.38 yrs at diagnosis [SD = 3.13, range 1.58-15.67 yrs]; M=4.59 yrs since treatment [SD=3.53, range 0.5-14 yrs]	Selection: Unclear Attrition: Unclear
Bonneau et al. 2019 [4]	University Hospital of Rennes, France	**28.5%** of leukemia survivors repeated a grade (Med=4 yrs after diagnosis, IQR, 2-8 years); **6.9%** switched to a SPED program; during treatment, **53.4%** received educational support at home or in the hospital. N=855; ALL, AML; M= 16.2 yrs at study [SD=7.0]; M= 6.0 yrs at diagnosis [SD=4.3]; M=10.2 yrs since diagnosis [SD=6.2]	Selection: Yes Attrition: Yes
Hauff et al. 2019 [5]	Washington University School of Medicine, USA	Among survivors with known learning difficulties, **48.9%** had an IEP, **40.4%** had a 504 plan, **2.1%** had an Individual Service Plan, and **4.3%** had an informal, unwritten plan. N=47; mixed diagnoses; n=20 were 11-13 yrs at study & n=27 were 14 -21 yrs at study	Selection: Yes Attrition: Yes
Heitzer et al. 2019 [6]	Baylor College of Medicine, USA	**56.3%** of survivors of pediatric low-grade glioma were utilizing a 504 Plan or IEP. N=32; Med=10.0 yrs at diagnosis [range: 2.9-18.6 yrs]; Med=3.2 yrs since surgery [range 1.0-5.7 yrs]	Selection: No Attrition: Unclear
Kieffer et al. 2019 [7]	Rehabilitation Department for children with acquired neurological injury, France	**29%** of adult survivors of childhood medulloblastoma survivors had received SPED services. N=58; M=25.1 yrs at study [SD=3.5, range 19.0-34.7 yrs]; M= 10.2 yrs at diagnosis [SD=3.4, range 1-16.5 yrs; M= 14.9 yrs since diagnosis [SD=4.6, range 3-24.2 yrs]	Selection: Yes Attrition: No
Kristiansen et al. 2019 [8]	Uppsala University, Sweden	In primary school, **50%** of astrocytoma survivors received extra educational support. N=22; M=20.8 yrs at study [range 9-33 yrs]; M=8.7 yrs at diagnosis; M= 12.4 yrs since diagnosis [range 5-19 yrs]	Selection: No Attrition: Unclear
Lai et al. 2019 [9]	Lurie Children's Hospital, USA	**41%** of brain tumor survivors were enrolled in SPED services. N=199; M=14.1 yrs at study [SD 3.4]; M=4.1 yrs since diagnosis [SD 4.5]	Selection: Unclear Attrition: Unclear
Lee et al. 2019 [10]	Emory University School of Medicine, USA	**32.33%** of non-CNS tumor survivors who were at-risk for neurocognitive deficits were enrolled in SPED services; **14.29%** of survivors not at-risk for neurocognitive deficits based had a 504 Plan or IEP. N=70; M=17.24 yrs at study [SD = 2.27, range: 14–21 yrs]; M=6.79 yrs at diagnosis [SD = 4.97, range: 0–17 yrs]	Selection: Yes Attrition: No
Phipps et al. 2019 [11]	Great Ormond Street Hospital for Children, National Hospital for Neurology & Neurosurgery, University College London	Among long-term survivors of medulloblastoma, **16.1%** were in a normal school setting with an IEP in place, **38.7%** were in a normal school with statement of educational needs or specialist school for non-cognitive affecting disability such as sight or hearing, and **12.9%** were in special school for children with learning difficulties.	Selection: Yes Attrition: Yes

	Hospitals NHS Foundation Trust, UK	N=96; Med= 6.5 yrs at diagnosis [range: 19 days–14.9 yrs at diagnosis]	
Puhr et al. 2019 [12]	Department of Pediatric Medicine, Oslo University Hospital, Norway	**59.6%** of CNS tumor survivors with good functional status reported receiving educational adjustments and/or technical aids. N=114; M=23.4 yrs at study [SD=3.5]; M=9.4 yrs at diagnosis [range: 0.5-17 yrs]; M=13.9 yrs since treatment [range: 2.6-25.1 yrs]	Selection: Yes Attrition: No
Hocking et al. 2018 [13]	Children's Hospital of Philadelphia, USA	Among patients receiving pediatric oncology care, **30.4%** had IEPs, **31.4%** had 504 plans, and **31.4%** had homebound tutoring. Rates of 504 Plans (p=0.89) or IEPs (p=0.39) did not differ based on cancer type. N=120; mixed diagnoses; pre-kindergarten through college aged patients	Selection: Unclear Attrition: Unclear
Kosola et al. 2018 [14]	Royal Children's Hospital, Australia	**45%** of survivors had talked with an educational/vocational advisor during treatment for AYA cancer. After treatment, **32%** of survivors had met with an educational/vocational advisor. **23%** of survivors met with an educational/vocational advisor both during and after treatment. N=196; mixed diagnoses; M=21.6 yrs at study [SD=3.1]; M=19.9 yrs at diagnosis [SD=3.2]	Selection: Unclear Attrition: No
Rodriguez-Romo et al. 2018 [15]	Instituto Nacional de Pediatria, Mexico	Across centers in Mexico, **58%** of hospitals have available educational support for hospitalized children **56%** of hospitals have school reintegration programs. N=62 pediatric cancer units from 29 states in Mexico; patient volume: low (< 30 patients/year): n=21, medium (30-59 patients/year): n=16, high (≥ 60 patients/year): n=25	Selection: No Attrition: No
Bashore et al. 2017 [16]	Dallas Children's Medical Center, USA	**23%** of survivors reported utilizing special education services before therapy, while **34%** of survivors reported utilizing special education after therapy. N=50; mixed diagnoses; M= 27.4 yrs at study [range 18–43 yrs]; M= 13.9 yrs at diagnosis [range 12–18 yrs]; M= 10.8 yrs since diagnosis [range 5–24 yrs]	Selection: Yes Attrition: No
Tremolada et al. 2017 [17]	Haematology-Oncologic Clinic at University of Padua, Italy	Survivors of leukemia had lessons in hospital (**62.5%**) or at home (**66.7%**). However, school programs were not always the same as those of their school peers (**21.4%**) or not agreed with the residential school (**50%**). N=25; M=13.64 yrs at study [SD=3.08, range 10–19 yrs]; M= 6.95 yrs at diagnosis [SD=3.52]	Selection: Yes Attrition: No
Viola et al. 2017 [18]	Multisite, Children's Cancer Group (CCG 1922/1952), USA	**23.5%** of long-term survivors of standard-risk precursor-B ALL reported history of SPED services. N=256; M=12.5 yrs at study [SD=2.4, range: 7-16.99 yrs]; M=8.9 yrs post-treatment [SD=2.2]	Selection: Yes Attrition: No
Ehrstedt et al. 2016 [19]	Uppsala University Children's Hospital, Sweden	Overall, **96%** of long-term CNS-tumor survivors were enrolled in mainstream schools with **30%** of these survivors receiving remedial education, while **3%** were enrolled in classes for cognitive disabilities. Among embryonal survivors, **56%** of received remedial education and **19%** were enrolled in classes for children with cognitive disabilities. **23%** of glioneuronal tumour survivors received remedial education or were enrolled in special schools. **33%** of astrocytic tumour survivors received remedial education. N=193; mixed brain tumor diagnoses; range: 0-17.99 yrs at study; M=9.0 yrs at diagnosis	Selection: Yes Attrition: No
van't Hooft et al. 2016 [20]	Children's Hospital, Karolinska University Hospital, Sweden	**66%** of children with CNS tumors received special adaptations at school. N=43; mixed brain tumor diagnoses; range: 0.2-17.1 yrs at diagnosis	Selection: Yes Attrition: Yes
Ait Khelifa-Gallois et al. 2015 [21]	Necker Enfants Malades Hospital, France	**28%** of adolescent survivors of pediatric astrocytoma received academic support. 35% of adult survivors of pediatric astrocytoma reported a history of remedial teaching. N=64; Adolescent sample (n=18): M=15.1 yrs at study [SD=1.8, range: 12–17 yrs]; M=6.8 yrs at surgery [SD= 2.7, range: 2.3–10.8 yrs]; Adult sample (n=46): M= 21.8 yrs at study [SD=3.3, range: 18-30 yrs]; M=8.5 yrs at surgery [SD=3.9, range: 0.7–16.7 yrs]	Selection: Yes Attrition: No

Holland et al. 2015 [22]	Children's Medical Center Dallas & Cook Children's Medical Center, USA	Among survivors of medulloblastoma, **66.7%** were receiving SPED supports and **27.8%** had a 504 Plan. **11.1%** had a history of early childhood intervention. N=36; M=14.07 yrs at study [SD=3.46, range: 7-18 yrs]; M=8.55 yrs at diagnosis [SD=4.34]	Selection: No Attrition: No
Winterling et al. 2015 [23]	Karolinska Institute, Sweden	**12%** of survivors received additional tutoring. Survivors were equally likely to receive additional tutoring, as compared to peers (8%, p=0.740). N=48; mixed diagnoses; Med=16 yrs at study [range: 12-21 yrs]; Med=11 yrs at diagnosis [range: 7-15]; Med=5 yrs since diagnosis	Selection: Yes Attrition: No
Freycon et al. 2014 [24]	Childhood Cancer Registry of the Rhone-Alpes Region, France	Among ALL patients who underwent HSCT, **3.4%** of survivors with a history of 12-Gray TBI received special schooling, as compared to **5.3%** of survivors who received chemotherapy alone. N=59; Med=23.0 yrs age at study [range: 18.0-38.2 yrs]; Med=9.1 yrs at diagnosis [range: 1.1-14.6 yrs]	Selection: No Attrition: No
Kalafatçılar et al. 2014 [25]	Dokuz Eylul University School of Medicine, Turkey	**2.3%** of long-term survivors of leukemia reported receipt of SPED services, while 20.5% reported "problems in school." N=44; ALL, AML; M=16.4 yrs at study [range: 8-31 yrs]; Med=5.5 yrs at diagnosis [range: 3-16 yrs]	Selection: Unclear Attrition: No
Roberts et al. 2014 [26]	Children, Youth and Women's Health Service of Adelaide, Australia	**49%** of survivors reported having received "special help" at school. **19%** of survivors reported repeating a grade. N=70; mixed diagnoses; M=18.25 yrs at study [SD=6.86, range: 7-36 yrs]; M= 4.69 yrs at diagnosis [SD=5.00]	Selection: Yes Attrition: No
Waber et al. 2013 [27]	Dana-Farber Cancer Institute, USA	Among survivors with a history of ALL, **20%** of survivors who received prednisone group were enrolled in SPED services, as compared with **32.5%** who received dexamethasone group (p=0.09). N=170 (prednisone, N=76; dexamethasone, N=94); Prednisone group: M=11.6 yrs at study [SD=4.3, range 6.5-23.1 yrs], Dexamethosone group: M=11.4 yrs at study [SD=3.8, range 6.3-23.2 yrs]; Prednisone group: M=5.7 yrs at diagnosis [SD=4.2, range 1.0-17.8 yrs]. Dexamethosone group: M=5.4 yrs at diagnosis [SD=3.7, range 1.0-17.6 yrs]; Med=5.8 yrs since diagnosis in both groups (Prednisone, range 4.8–8.6; Dexamethasone, range 5.8–8.6)	Selection: Yes Attrition: Unclear
Kuehni et al. 2012 [28]	Swiss Childhood Cancer Survivor Study, Switzerland	Among survivors in the Swiss CCSS cohort, **35%** had received supportive tutoring, **30%** had repeated a school year, and **7%** had attended a special school. **16.4%** of patients with CNS tumors attended a special school, as compared to **4%** with leukemia, **2.6%** with lymphoma, and **9.7%** with other tumors (p< .001). Supportive tutoring had been required by **53.2%** of patients with CNS tumors, as compared to **36.4%** with leukemia, **25.5%** with lymphoma, and **34.4%** with other tumors (p< .001). **41.1%** of patients with CNS tumors repeated a school year, as compared to **28.8%** with leukemia, **25%** with lymphoma, and **30%** with other tumors (p=0.03). N=961; mixed diagnoses; M=27.0 yrs at study [SD=5.2; range: 20.0-39.6 yrs]; M=8.1 yrs at diagnosis [SD=4.7, range: 0.0-15.9 yrs]; M=19.0 yrs [SD=6.2, range: 5.8-35.7 yrs]	Selection: Yes Attrition: No
Pietila et al. 2012 [29]	Tampere University Hospital, Finland	**32%** of brain tumor survivors needed SPED services. **63%** of survivors had a history of rehabilitative therapies including physiotherapy, speech, occupational, hippotherapy, music, art, psychotherapy, or neuropsychologic rehabilitation. At the time of the study, **21%** were receiving rehabilitative therapy. N=52; mixed brain tumor diagnoses; M=14.2 yrs at study [range: 3.8-28.7 yrs]; Med=6.0 yrs at diagnosis [range: 0.1-15.5 yrs]; M=6.2 yrs since treatment [range: 1.2-14.8 yrs]	Selection: Yes Attrition: Unclear
Bonneau et al. 2011 [30]	Department of Pediatric Hematology, University Hospital, Rennes, France	**17.6%** of survivors received educational support at school, and **12.2%** received an IEP at school. **53.4%** of patients received school support while in the hospital. **64.2%** of patients received support at home (provided by local educational institutions and by parents who provided coaching lessons). **8.7%** of survivors had	Selection: Yes Attrition: No

		repeated a grade before disease onset, whereas **28.4%** repeated a grade after disease onset, with a median time after the diagnosis of 2 yrs (range, 0-7 yrs). N=148; mixed diagnoses; M=15 yrs at study [SD=5.3, range: 7.3-25.1 yrs]; M=8.72 yrs at diagnosis [SD=5.44, range: 0.1-18.2 yrs]; M=6.3 yrs since diagnosis [SD=1.3, range: 3.6-8.6 yrs]	
Edelstein et al. 2011 [31]	Princess Margaret Hospital, Canada	**90%** of long-term survivors of medulloblastoma reported receiving modified programming or accommodations at school for learning disabilities. N=20; range: 17.94-47.24 yrs at study; range: 1.07-13.75 yrs at diagnosis	Selection: Yes Attrition: No
Korinthenberg et al. 2011 [32]	University Hospital Albert-Ludwigs University, Germany	Among pediatric-aged survivors of low-grade glioma, **9%** were in a school for learning disabled, **9%** were in school for visually impaired, and **41%** received rehabilitation services (physiotherapy, speech therapy or psychological therapy). N=22; low-grade glioma survivors treated with iodine-125 brachytherapy; range: 0-17 yrs at study	Selection: Yes Attrition: No
Mört et al. 2011 [33]	University of Turku, Finland	**26.6%** of survivors from the Finnish Cancer Registry were need of remedial education at school, as compare to **27.4%** controls. N=203; mixed diagnoses; M=14.4 yrs at time of study [SD=1.94]; M=3.9 yrs at diagnosis [SD=2.97, range: 0–12 yrs]	Selection: Yes Attrition: No
Strauser et al. 2010 [34]	University of Illinois at Urbana-Champaign, USA	Using data from the U.S. Department of Education Rehabilitation Service Administration (RSA) Case Service Report, patterns of vocational services used by young adult cancer survivors included: Assessment (**67.1%**), Diagnostics & Treatment (**32.3%**), Counseling & Guidance (**63.6%**), College or University Training (**42.4%**), Occupational/Voc. Training (**18.5%**), On-the-Job Training (**3.3%**), Remedial Training (**0.5%**), Job Readiness Training (**7.1%**), Augmentative Skills Training (**1.4%**), Miscellaneous Training (**12%**), Job Search Assistance (**19.8%**), Job Placement Assistance (**23.4%**), On-the-Job Supports (**11.4%**), Transportation Services (**26.6%**), Maintenance (**15.8%**), Rehabilitation Technology (**4.9%**), Attendant Services (**0.3%**), Technical Assistance Services (**2.7%**), Information & Referral (**12%**), Other Services (**24.5%**) N=368 cancer survivors from U.S. Department of Education RSA Case Service Report; M=21.6 yrs at study [SD=2.39, range: 18-25 yrs]	Selection: No Attrition: Unclear
Kadan-Lottick et al. 2009 [35]	Multicenter study, USA	Among survivors of ALL treated with IT methotrexate, **10.3%** received SPED services during treatment and **24.4%** received SPED services after treatment. For survivors of ALL treated with triple IT therapy, **3.5%** received SPED services during treatment and **26.4%** received SPED services after treatment. N=171; ALL diagnoses treated on CCG 1952; M= 5.9 yrs at study; range: 1-9.99 yrs at diagnosis	Selection: Yes Attrition: No
Lorenzi et al. 2009 [36]	Cancer Control Research Program, British Columbia Cancer Agency, Canada	Among long-term survivors, **33%** received SPED services, including **19%** who were designated for SPED because of a physical disability. Survivors were more likely to have a SPED designation than controls (OR=3.05, 95% CI: 2.6-3.6). CNS survivors had >6 times the rate of SPED enrollees (OR=6.1, 95% CI: 4.4-8.5) compared with controls. N=782; mixed diagnoses; M= 4.6 yrs at diagnosis	Selection: Yes Attrition: Unclear
Turner et al. 2009 [37]	Dana-Farber Cancer Institute, USA	Among survivors of low grade gliomas, **41.7%** had an IEP, **8.3%** were in a self-contained classroom or required special school placement, **13.3%** had a 504 plan, **6.67%** received "other" SPED services. N=60; Med=16.3 yrs at study [range: 5.8-34.2 yrs]; M=6.8 yrs at diagnosis [range: 0.1-19.0 yrs]; M= 8.4 yrs since diagnosis [range: 3.9-20.4 yrs]	Selection: No Attrition: No

Zuzak et al. 2008 [38]	University Children's Hospital of Zurich, Switzerland	**19%** of astrocytoma survivors required remedial teaching. N=21; Med= 15.8 yrs at study [range: 8.3–41.0 yrs]; Med= 7.8 yrs at diagnosis [range: 2.4–14.3 yrs]; Med= 7.9 yrs since diagnosis [range: 5.6–27.4 yrs]	Selection: Yes Attrition: No
Gerhardt et al. 2007 [39]	Nationwide Children's Hospital, USA	**30%** of survivors repeated a grade and **7%** had a SPED class. N=56; non-CNS cancer diagnoses; M= 18.65 yrs at study [SD=0.80]; M= 7.29 yrs since diagnosis [SD=2.17, range: 3.58-12.25 yrs]	Selection: Yes Attrition: No
Gurney et al. 2007 [40]	Children's Oncology Group, USA	**28.5%** of neuroblastoma survivors reported SPED needs in school. N=137; M=12.1 yrs at study [SD=2.2]; M=1.4 yrs at diagnosis [SD=1.7]; M=11.1 yrs since diagnosis [SD=1.9]	Selection: Yes Attrition: Unclear
Lee et al. 2007 [41]	Yale School of Medicine, USA	31.1% of survivors received some form of SPED assistance in the past. N=46; mixed diagnoses; M=27.4 yrs at study [SD=5.54, range: 22–47 yrs]; range: 0-19 yrs at diagnosis	Selection: Yes Attrition: No
Punyko et al. 2007 [42]	Childhood Cancer Survivor Study (CCSS), USA	A higher proportion of survivors (**18.0%**) than siblings (8.4%) received SPED services ($p<0.01$). As compared to siblings, survivors were more likely to receive SPED due to missed school (**40.4%** versus 11.6%, $p<0.01$) and less likely to receive SPED due to problems learning or concentrating (**66.7%** versus 79.9%, $p=0.04$). Survivors and siblings were equally likely to receive SPED for low test scores and emotional/behavioral problems. A higher proportion of survivors (**13.9%**) than siblings (0.9%) received homebound education ($p<0.01$). N=417 long-term survivors of rhabdomyosarcoma; Med=26 yrs at study [range: 18–45 yrs]; Med=18 yrs since diagnosis [range: 7.3–28.8 yrs]	Selection: Yes Attrition: No
Aarsen et al. 2006 [43]	Erasmus Medical Center/Sophia Children's Hospital, Netherlands	**45%** of astrocytoma survivors required SPED or remedial teaching, while **74%** required disability services. N=38; M=7 yrs at diagnosis [range: 1.25-14.58]; M=7.58 yrs of follow-up [range: 3.58-11.33 yrs]	Selection: No Attrition: No
Buizer et al. 2006 [44]	VU University Medical Center, Netherlands	**7.1%** of children with ALL received SPED services, as compared to **0%** of children with a Wilms tumor. N=64; ALL (n=28) & Wilms tumor (n=36); ALL: Med=10.2 yrs at study [range: 4.5-17.9 yrs], Med=3.6 yrs at diagnosis [range: 1.4-11.0 yrs], Med=5.0 yrs since diagnosis [range: 2.8-15.4 yrs]; Wilms tumor: Med=10.5 yrs at study [range 4.5-17.9 yrs], Med=3.3 yrs at diagnosis [range: 0-8.3 yrs], Med=5.7 yrs since diagnosis [range 2.3-13.4 yrs]	Selection: No Attrition: No
Upton et al. 2006 [45]	University of Sheffield, UK	Among brain tumor survivors, **77.5%** were identified as having special educational needs. **12.5%** of brain tumor survivors attended special schools. **70%** of survivors had an IEP, with the following targets for improvement: literacy (**42.5%**), movement (**27.5%**), numeracy (**22.5%**), memory and concentration (**12.5%**), communication/speech (**12.5%**), social skills (**10.0%**), self-confidence (**7.5%**), attendance (**7.5%**), visual (**7.5%**), information and computer technology (**7.5%**), improve grades (**5.0%**), and aggressive behavior (**2.5%**). N=40; M=12.17 yrs at study [SD=30.15 months, range: 6-16 yrs]; M=6.33 yrs at diagnosis [SD=36.8 months, range: 0.33-13 yrs]; M=5.58 yrs since treatment [SD=32.95 months, range: 2-12.5 yrs]	Selection: Yes Attrition: No
Barrera et al. 2005 [46]	Hospital for Sick Children, University of Toronto, Canada	Among long-term survivors, **19.3%** attended learning disabled program and **19.8%** attended a SPED program. **20.6%** of survivors had repeated/failed grade. N=800; mixed diagnoses; 51.5% 6-12 yrs at study, 48.5% 13-16 yrs at study; M=2 yrs at diagnosis; M=10 yrs since diagnosis	Selection: Yes Attrition: No
Ness et al. 2005 [47]	City of Hope Cancer Center and the University of Minnesota, USA	Among pediatric-aged survivors of HSCT, **24.4%** required SPED services. Survivors were more likely than similarly aged children to have participated in SPED (OR=3.0, 95%CI: 1.5-6.0, $p=0.002$). N=78; mixed diagnoses s/p HSCT; M=13 yrs at study [SD=3]	Selection: Yes Attrition: No

Aarsen et al. 2004 [48]	Erasmus MC/Sophia Children's Hospital, Netherlands	Among survivors of cerebellar pilocytic astrocytoma, **24%** of children needed SPED services. N=23; M=12.67 yrs at study [SD=4.13, range: 6.1-22.11 yrs]; <16 yrs at diagnosis; M=3.39 yrs since surgery [SD=2.15, range: 1-8.1 yrs]	Selection: No Attrition: No
Langeveld et al. 2003 [49]	Emma Children's Hospital/Academic Medical Center, Netherlands	**9%** of male survivors were enrolled in learning disabled programs, as compared to **3%** of male controls. **6%** of female survivors were enrolled in learning disabled programs, as compared to **2%** of female controls. Significantly more survivors than controls were enrolled in learning disabled programs ($p<0.001$). N=500; mixed diagnoses; M=24 yrs at study [SD=5.1, range: 16-49 yrs]; M=8 yrs at diagnosis [SD=4.7, range 0-19 yrs]; M=15 yrs since treatment [SD=5.8, range 5-33 yrs]	Selection: No Attrition: No
Macedoni-Luksic et al. 2003 [50]	University Pediatric Hospital, Ljubljana, Slovenia	**22%** of brain tumor survivors needed a SPED program. N=61; Med=24 yrs at study [range: 15-42 yrs]; Med=9 yrs at first treatment [range: 1-16 yrs]; Med=14 yrs after treatment [range 5-28 yrs]	Selection: Yes Attrition: Unclear
Lahteenmakiet al. 2002 [51]	Turku University Hospital, Finland	7% of both survivors and siblings had started school later than normally, whereas none of the controls reported this (patients vs controls, $p=0.014$; siblings vs controls, $p=0.012$). 9.3% of patients needed to repeat a grade. No patients or siblings were placed in SPED programs. 30.8% of the patients required extra tutoring, as compared to 15.7% of controls and 3.7% of siblings. N=43; mixed diagnosis, no CNS tumors; Med=15 yrs [range: 8–18 yrs]; Med=6 yrs [range: 0–15 yrs]	Selection: Yes Attrition: No
Bessell et al. 2001 [52]	University of Miami, USA	**27.4%** of survivors received special education services. **27.4%** of survivors repeated a grade. **23.5%** of survivors received gifted services. **41.1%** of survivors received homebound services while on treatment. N=51; mixed solid tumor & leukemia/lymphoma diagnoses; M=12.68 yrs at study [SD=3.28, range 8-17 yrs]; M=7.28 yrs at diagnosis [SD=3.60]; M=3.59 yrs off therapy [SD=3.02]	Selection: No Attrition: No
Kingma et al. 2000 [53]	University Hospital of Groningen, Netherlands	**12.8%** of ALL survivors were placed in SPED classes. N=94; Med=20 yrs at study [range: 14.67-31.5 yrs]; Med=4.42 yrs at diagnosis [1.17-14.75 yrs]	Selection: Yes Attrition: No
Arvidson et al. 1999 [54]	University of Uppsala, Sweden	All survivors were in normal classes, but **28%** had extra help on individual basis. During their school history, **19.2%** of survivors had repeated at least one grade in school. N=26; ALL, AML, HL, NHL; Med=16.1 yrs at study [SD=4.4, range: 6.9-24.7 yrs]; Med=4.8 yrs at diagnosis [SD=4.8, range: 1.3-16.2 yrs]; Med= 9.6 yrs since diagnosis [range: 3.7-16.1]	Selection: No Attrition: No
Jenkin et al. 1998 [55]	SickKids/Princess Margaret Hospital, Canada	**52%** of survivors who were treated prior to age 2 yrs were in SPED or blind school education, as compared to **51%** of survivors treated between 2-4 yrs old. N=222; mixed brain tumor diagnoses; <4 yrs at diagnosis	Selection: No Attrition: Unclear
Mulhern et al. 1998 [56]	St Jude Children's Research Hospital, USA	**54.5%** of medulloblastoma survivors were either receiving or had received SPED services. N=22; M=17.44 yrs at study [SD=4.72, range: 11.33-27.5 yrs]; Med= 8.85 yrs at diagnosis [range: 4.1 to 19.0 yrs]; Med= 8.2 yrs since diagnosis [range: 6.1-9.9 yrs]	Selection: Yes Attrition: Yes
Shelby et al. 1998 [57]	University of South Carolina, USA	**55.9%** of ALL survivors were currently receiving some type of SPED services. **47.1%** of survivors were retained at least one grade in school. N=34; M=12.1 yrs at study [SD=3.1 yrs, range 6-17 yrs]; M=4.8 yrs at diagnosis [SD=2.8 yrs]; M=4.7 yrs since treatment completion [SD=2.4 yrs]	Selection: Unclear Attrition: Unclear
Radcliffe et al. 1996 [58]	University of Pennsylvania Medical School, USA	**41%** of brain tumor survivors were receiving SPED services. N=38; mixed brain tumor diagnoses; M=11.4 yrs at study [range: 6-18 yrs]; range: 2-5 yrs since diagnosis	Selection: Yes Attrition: Yes

Chadderton et al. 1995 [59]	Royal Manchester Children's Hospital, UK	**40%** of survivors of astrocytoma who received cranial radiotherapy required special school placement, as compared to **8%** of astrocytoma survivors treated with surgery alone. N=50; low-grade astrocytoma; Med=7 yrs at treatment [range 1-14 yrs]	Selection: Yes Attrition: No
Kimmings et al. 1995 [60]	The Hospital for Sick Children, Great Ormond Street, UK	**44%** of medulloblastoma survivors needed special help with their schooling. **28%** needed remedial classes for help with reading, writing and arithmetic. **8%** were a year below what would normally have been expected. **8%** attended a special school for children with learning difficulties. N=25; M=6.7 yrs at diagnosis; M=6.5 yrs since diagnosis [range: 2.66-9.5 yrs]	Selection: No Attrition: No
Sutton et al. 1995 [61]	Children's Hospital of Philadelphia, USA	**43%** of astrocytoma survivors required a special school, including resource room, learning-disabled classes, or SPED. N=33; M=4.3 yrs at diagnosis [range: 2 months-20 yrs]; M=10.9 yrs since diagnosis	Selection: No Attrition: No
Haupt et al. 1994 [62]	National Cancer Institute, USA	Survivors of ALL were more likely than siblings to enter SPED (relative risk [RR]=3.4; p<.01) or learning disabled (RR=3.6; p<.01) programs, while just as likely to enter gifted and talented programs (RR=1.0). N=593 long-term survivors of ALL; M=22.6 yrs at study [range 18.0-33.2 yrs; Med= 10.2 yrs at diagnosis [range 1 month-20 years]; Med year of diagnosis= 1977 [range 1970-1987]	Selection: No Attrition: No
Slavc et al. 1994 [63]	University of Graz, Austria	**15%** of brain tumor survivors attended SPED classes. **19%** of survivors had repeated a grade, but in 77% of these cases repletion was due to prolonged hospitalization rather than to poor school performance. N=67; mixed brain tumor diagnoses; range: 6 months-17 yrs at diagnosis; M=38.5 months since diagnosis [range 15-97 months]	Selection: No Attrition: No
Kingma et al. 1993 [64]	Pediatric Oncology Center, University Hospital Groningen, Netherlands	**40%** of young ALL survivors were referred to special schools for learning disabled. N=35; Med=11.4 yrs at study [range: 7.2-15.8 yrs]; Med=3.5 yrs at diagnosis [range: 0.11-6.5 yrs]	Selection: No Attrition: No
Williams et al. 1991 [65]	St Jude Children's Research Hospital, USA	**20.43%** survivors of ALL repeated one or more grades, as compared to 9.81% of controls. N=51; M=8.35 yrs at study [SD=1.92; range: 6.25-15.78 yrs]	Selection: No Attrition: No
Rubenstein et al. 1990 [66]	Children's Hospital of Los Angeles, USA	**50%** of survivors of ALL had received some type of SPED services by their 5-year follow-up. **12.5%** of survivors had been enrolled in a full-day SPED program for at least one year. **8.3%** of survivors had been enrolled in a resource room program for part of the school day for at least one year. **29.2%** of survivors received at least one-half hour of tutoring in school per week for a full academic year. N=24; M=10.67 yrs at study [range 8-19 yrs]; M=7.17 yrs at diagnosis [range 4-14 yrs]; M=4.92 yrs since diagnosis	Selection: Unclear Attrition: Unclear

Abbreviations: Mean (M), Standard deviation (SD), Years (yrs), Median (Med), Acute lymphoblastic leukemia (ALL), Acute myeloblastic leukemia (AML), Central nervous system (CNS) Hodgkin lymphoma (HL), non-Hodgkin lymphoma (NHL), hematopoietic stem cell transplant (HSCT), Total Body Irradiation (TBI), Intrathecal (IT), Special Education (SPED), Individualized Education Plan (IEP), Section 504 accommodation plan (504 Plan), Odds Ratio (OR), 95% Confidence Interval (95%CI)

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