06-11

1) STUDY TITLE: School Attendance Following Cancer: A Report from the Childhood Cancer Survivor Study

2) WORKING GROUP AND INVESTIGATORS: Psychosocial Working Group

Proposed investigators include:


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3) BACKGROUND AND RATIONALE: Medical advances in the area of pediatric oncology have resulted in significantly increased rates of survivorship among children diagnosed with cancer (Kupfer, 2005). As such, many agree that maintaining a typical or normalized lifestyle following diagnosis is important for positive adaptation and functioning during adulthood: this includes schooling and education, two of the most important developmental activities of childhood and adolescence (Baskin, Saylor, Furey, Finch, & Carek, 1983; Prevatt, Heffner, & Lowe, 2000). The literature suggests that school attendance can help maintain academic progress (Weitzman, 1986), encourage socialization (Davis, 1989), foster independence, mastery, and self-efficacy (Weitzman, 1984), provide a respite from the sick-role (Chekryn, Deegan, & Reid, 1986), serve as a symbol of recovery (Ross, 1984), and lessen the negative impact of repeated hospitalization (Shields, Heron, Rubenstein, & Katz, 1995). Further supporting the importance of education in long-term quality of life of adult survivors of pediatric cancer, Nagarajan et al., (2003) found evidence to suggest that education was a positive predictor of employment, health insurance coverage, and other positive psychosocial outcomes.

One way schools can support pediatric cancer patients in normalizing their educational and school experiences is through school reintegration programs. Conducting a review of school re-entry programs, Prevatt, et al. (2000) found that these programs generally take three approaches: school personnel education programs, peer education programs, and comprehensive programs (which involve both school personnel and peer education). Program treatment components include interventions for the child with cancer, family members, school personnel, classmates, and medical personnel. Overall, programs appear to be effective means of increasing knowledge regarding the child's illness, raising educator comfort in working with children who have cancer, and encouraging well-students' interest in socializing with ill peers. Unfortunately, none of the studies reviewed included outcomes of benefit to the pediatric cancer survivors (e.g., improved attendance, academic performance, etc.) and only one program reviewed had a theoretical foundation. Therefore, one should ask: 1) Which students should be identified for intervention; 2) How do school reintegration programs directly benefit patients; and 3) What psychosocial variables should be targeted for intervention?

The purpose of the proposed study is to identify the presence of *illness-related* and *personal/environmental* factors that are related to school absence among a group of child cancer survivors. A model of adjustment to pediatric chronic illness proposed by Wallander, Varni, Babani, Banis, and Wilcox (1989) identifies the presence of risk factors and resistance factors which can influence children's adaptation. A revised conceptualization of their adaptation to illness model suggests two sets of variables (see #5.c.i and ii, below): Illness-Related Factors – factors assumed to be less amenable to the effects of treatment or intervention in school or mental health settings; and Personal/Environmental Factors – factors which are helpful in guiding mental health and school-based interventions. This revised model will be used to organize the proposed study's methodology.

The study's sample will include participants from the Childhood Cancer Survivor Study (CCSS) cohort who were less than 18 years of age at the time of baseline measurement and for whom self-report and parent-report data are available. The CCSS is a retrospective, multi-institutional cohort comprising 14,054 individuals who have survived for 5 or more years following diagnosis and treatment of cancer (see #6.b below for sample sizes and power analyses). The database consists of self and parental report of demographic, medical, psychosocial, and educationally-relevant information collected at baseline and multi-year follow-up.

4) SPECIFIC AIMS/OBJECTIVES/RESEARCH HYPOTHESES: The following research questions are proposed as components of the current study:

*Research Question #1*: To what extent does each specific illness-related factor individually predict whether children diagnosed with pediatric cancer will be members of a high versus low school absence group?

After dichotomizing the outcome variable (i.e., school absence), this research question will involve the use of logistic regression. Dichotomization of the outcome variable will be based on research specifying "absence risk" from the National Center for Educational Statistics. Further, odd ratios will be used to test whether or not illness-related variables predict membership in either group (i.e., high *or* low absence). A logistic regression run will be conducted separately for each illness-related factor.

*Research Question #2*: To what extent do illness-related factors, as a set, predict school absence in children diagnosed with pediatric cancer?

This research question will involve the use of the least-squares model of linear regression. Analysis will involve entering all the illness-related factors as a set and determining if the overall model is statistically significant. Interpretation of $R^2$ will be used to determine the extent to which individual illness-related factors are related to school absence. Based on this analysis, a select set of significantly related illness-related factors will be retained for *Research Question #3*.

*Research Question #3*: Individually, to what extent do personal/environmental factors predict school absence in children diagnosed with pediatric cancer, after adjusting for select illness-related factors?

This research question will involve the use of the least-squares model of linear regression. Analysis will be conducted to determine the effects of personal/environmental factors on school attendance while controlling for the effects of select illness-related factors (retained from *Research Question #2*). Hierarchical regression methods will involve entering variables in sets (i.e., entering the select set of significant illness-related factors into the regression model before testing the effects of a specific personal/environmental factor). Each personal-environmental factor will be entered separately for a total of six regression runs. The change in $R^2$ and its significance will be used to quantify the extent to which the personal/environmental factors are related to school absence.

*Research Question #4*: To what extent is the association between illness-related factors and school absence moderated by personal/environmental factors.

This research question will involve the use of the least-squares model of linear regression. Analysis will be conducted to determine whether or not there is a moderating effect of personal-environmental factors on the relationship between illness-related factors (e.g., age at diagnosis) and school absence. In this case, the observed effect of a given illness-related factor on school attendance is dependent upon (or moderated by) the level of a given personal/environmental factor. The two most prevalent illness-related variables discussed in the literature will be analyzed using the following 6 factor pairs:

| | **Illness-Related Factor:** | | **Personal/Environmental Factor:** |
|---|---|---|---|
| Pair A: | Age at Diagnosis | and | Self-Esteem |
| Pair B: | Age at Diagnosis | and | Family Perceptions |
| Pair C: | Age at Diagnosis | and | Social Functioning |
| Pair D: | Presence of CNS Treatment | and | Self-Esteem |
| Pair E: | Presence of CNS Treatment | and | Family Perceptions |
| Pair F: | Presence of CNS Treatment | and | Social Functioning |

*Research Question #5*: To what extent is the association between illness-related factors and school absence mediated by personal/environmental factors?

This research question will involve the use of the least-squares model of linear regression. Analysis will be conducted to determine whether or not there is a mediating effect of personal/environmental factors (e.g., self-reported self-esteem) on the relationship between illness-related factors (e.g., type of treatment) and school absence. If a significant mediating effect is found, it is because a personal/environmental factor is a mechanism through which an illness-related factor influences school absence. Conditions for mediation will be verified as a preliminary step in the analysis (Baron & Kinney, 1986; see footnote to tables #5.d.v. below). Three factor pairs will be analyzed:

| **Illness-Related Factor:** | | **Personal/Environmental Factor:** |
|---|---|---|
| Additional Medical | and | Somatic Complaints |

| | | |
|---|---|---|
| Age at Diagnosis | and | Cancer Fear |
| Age at Diagnosis | and | Parent Concern |

5) ANALYSIS FRAMEWORK:
   a) Outcome of interest: School Days Missed Due to Illness or Doctors Appointments (Item #O5 from the < 18 years of age baseline questionnaire): The research literature suggests that regular school attendance is important for children following a diagnosis of cancer. Additional research indicates that pediatric oncology patients miss, on average, more than 40 days of school during the initial stages of treatment (Cairns, Klopovich, Hearne, & Lansky, 1982) and around 20 days of school 3 years following diagnosis (Lansky, Cairns, & Zwartjes, 1983). This implies that school attendance may continue to be problematic for this special population of students.

   b) Subject population: The sample, derived from the CCSS cohort, will consist of children and adolescents less than 18 years of age at baseline who have survived for 5 or more years following the diagnosis and treatment of cancer.

   c) Exploratory (predictor) variables:
      i) Illness-Related Factors (covariates):
         - Gender (dichotomous – male or female)
         - Diagnosis (categorical)
         - Age at diagnosis (continuous)
         - Severity of present illness (continuous; Item[s] #B4 *OR* #K1 – K8 on the Under 18 Questionnaire; the item[s] to be used will be based upon the one with greater strength of relationship with absenteeism)
         - Treatment modality (categorical; treatment summary data)
         - Presence of CNS treatment (dichotomous – yes or no; from Chemotherapy Summary Data; Radiotherapy Summary Data)
         - Presence of additional (parent-reported) medical problems (dichotomous – yes or no; from Item #J 22 on the Under 18 Questionnaire)

      ii) Personal/Environmental Factors (substantive predictors)

         - Patient (Self-Report) Variables (Teen Questionnaire from *Child Health and Illness Profile – Adolescent Edition* [*CHIP-AE*]):
           - Section B: Self-Esteem
           - Section C: Somatic Problems
           - Section G: Family Perceptions
         - Parental (Report) Variables (Under 18 Questionnaire from *Achenbach Scales* – a new factor analysis is being performed on these items):
           - Social Functioning – Items #J16 – 21 "Social Functioning" (from Achenbach *CBCL*)
           - Cancer Fear – Items #J23 & 24 "Social Functioning"
           - Parent Concern – Items #R1 – 3 "Other Issues"

   d) Examples of specific tables and figures:
      i) See attached methodological model (Page 10).

ii) Descriptive statistics and frequencies for sample derived from the CCSS cohort (those with baseline data at <18 years of age) in terms of the Illness-Related Factors are provided for the purposes of describing the participants:

iii) Descriptive statistics and cross-tabulations of variables:

| | | | Number of Absences | | Dichotomized Absence | |
|---|---|---|---|---|---|---|
| | **N** | **%** | **Mean** | **SD** | **% Low** | **% High** |
| **Gender:** | | | | | | |
| Male | | | | | | |
| Female | | | | | | |
| **Diagnosis:** | | | | | | |
| Leukemia | | | | | | |
| CNS | | | | | | |
| NHL | | | | | | |
| Kidney (Wilm's) | | | | | | |
| Neuroblastoma | | | | | | |
| Soft tissue sarcoma | | | | | | |
| Bone tumor | | | | | | |
| **Age at Diagnosis:** | | | | | | |
| ≤ 7 years | | | | | | |
| 8 years | | | | | | |
| Etc. | | | | | | |
| **Treatment Modality:** | | | | | | |
| Chemotherapy only | | | | | | |
| Surgery only | | | | | | |
| Radiation only | | | | | | |
| C+R | | | | | | |
| S+R | | | | | | |
| **Presence of CNS Tx:** | | | | | | |
| Yes | | | | | | |
| No | | | | | | |
| **Additional Medical:** | | | | | | |
| Yes | | | | | | |
| No | | | | | | |

iv) Preliminary analysis will yield the following matrix which will describe the intercorrelations between the illness-related factors, personal/environmental factors, and school attendance:

| | **Self-Report** | | | | | | **Parent-Report** | | | | | | **Absenteeism** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Self-Esteem | | Somatic | | Family | | Social | | Cancer Fear | | Concerns | | | |
| | *r* | *p* | *r* | *p* | *r* | *p* | *r* | *p* | *r* | *p* | *r* | *p* | *r* | *p* |
| Gender | | | | | | | | | | | | | | |
| Diagnosis | | | | | | | | | | | | | | |
| Age at Diagnosis | | | | | | | | | | | | | | |

| | | |
|---|---|---|
| Severity of Illness | | |
| Treat Modality | | |
| CNS Tx (Y/N) | | |
| Add'l Medical (Y/N) | | |
| Absenteeism | | |

v) The following are examples of tables illustrating logistic and regression analyses (*Research Questions [RQ] 1 – 4*):

**RQ1**

| | Logistic Regression | | | | | |
|---|---|---|---|---|---|---|
| Predictor | *b* | *SE* | *Wald* | *p* | *Exp(b)* | *95% C.I. for Exp(b)* (lower – upper) |
| Gender | | | | | | |
| Diagnosis | | | | | | |
| Age at Diagnosis | | | | | | |
| Severity of Present Illness | | | | | | |
| Treatment Modality | | | | | | |
| Presence of CNS Treatment | | | | | | |
| Additional Medical Problems | | | | | | |

**RQ2**

| | Linear Regression | | | | |
|---|---|---|---|---|---|
| Predictor | *B* | *SE B* | *β* | *t* | *p* |
| Gender | | | | | |
| Diagnosis | | | | | |
| Age at Diagnosis | | | | | |
| Severity of Present Illness | | | | | |
| Treatment Modality | | | | | |
| Presence of CNS Treatment | | | | | |
| Additional Medical Problems | | | | | |

$R^2$ =

**RQ3**

| | | Linear Regression | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Step | Predictor | *B* | *SE B* | *β* | $\Delta R^2$ | $R^2$ | $sr^2$ | *p* | *df* |
| 1 | Select Illness-Related Factors | | | | | | | | |
| 2a | Self-Esteem | | | | | | | | |
| 2b | Somatic Complaints | | | | | | | | |
| 2c | Family Perceptions | | | | | | | | |
| 2d | Social Functioning | | | | | | | | |
| 2e | Cancer Fears | | | | | | | | |
| 2f | Other Concerns | | | | | | | | |

**RQ4***

| | | Linear Regression | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Step | Predictor | *B* | *SE B* | *β* | $\Delta R^2$ | $R^2$ | $sr^2$ | *p* | *df* |
| A1 | Age at Diagnosis | | | | | | | | |
| A2 | Self-Esteem | | | | | | | | |
| A3 | Age x Self-Esteem | | | | | | | | |
| B1 | Age at Diagnosis | | | | | | | | |
| B2 | Family Perceptions | | | | | | | | |

| | |
|---|---|
| B3 | Age x Family Perceptions |
| C1 | Age at Diagnosis |
| C2 | Social Functioning |
| Etc. | Etc. |

* Each factor pair (Pairs A - F) utilized to test for moderating effects will involve three steps in a regression. The test of the interaction term will determine whether a moderating effect is present.

vi) The following are examples of tables illustrating the regression analysis of factor pairs that will be used in testing for mediating effects** (*Research Question #5*):

**Additional Medical Problems & Somatic Complaints**

| *Outcome:* | Somatic Complaints | | Attendance | | Attendance | |
|---|---|---|---|---|---|---|
| | *b* | *β* | *b* | *β* | *b* | *β* |
| Additional Med. Somatic Complaints | | | | | | |
| *F* test of Significance | *F* ( , ) = _____ $R^2$ = ____ | | *F* ( , ) = _____ $R^2$ = ____ | | *F* ( , ) = _____ $R^2$ = ____ | |

**Age at Diagnosis & Cancer Fear**

| *Outcome:* | Cancer Fear | | Attendance | | Attendance | |
|---|---|---|---|---|---|---|
| | *b* | *β* | *b* | *β* | *b* | *β* |
| Age at Diagnosis Cancer Fear | | | | | | |
| *F* test of Significance | *F* ( , ) = _____ $R^2$ = ____ | | *F* ( , ) = _____ $R^2$ = ____ | | *F* ( , ) = _____ $R^2$ = ____ | |

**Age at Diagnosis & Parent Concern**

| *Outcome:* | Parent Concern | | Attendance | | Attendance | |
|---|---|---|---|---|---|---|
| | *b* | *β* | *b* | *β* | *b* | *β* |
| Age at Diagnosis Parent Concern | | | | | | |
| *F* test of Significance | *F* ( , ) = _____ $R^2$ = ____ | | *F* ( , ) = _____ $R^2$ = ____ | | *F* ( , ) = _____ $R^2$ = ____ | |

** The following conditions (Baron & Kinney, 1986) will need to be met before a variable can be considered a mediator: 1) The predictor must be significantly related with both the hypothesized mediator and the outcome of interest; 2) The hypothesized mediator must be significantly related to the outcome of interest; and 3) The influence of the predictor on the outcome will be reduced after controlling for the effects of the hypothesized mediator.

6) SPECIAL CONSIDERATIONS:

a) Nature of the research: This project will constitute the doctoral dissertation of Eric G. Waldon, a doctoral candidate in the Department of Educational and School Psychology at the University of the Pacific, Stockton, California.

b) Power analyses for sample sizes: The software, *GPOWER* (Faun & Erdfelder, 1992), was used to calculate the minimum sample size needed to address the overall fit of the full models for each research question. In this regard, power for proposed analyses is deemed adequate for the detection of moderate effects sizes with $R^2 = .15$. This effect size is comparable to those observed in similar investigations and is an acceptable convention for research in the social sciences (Cohen, 1988). The method used to calculate sufficient sample size for each research question below was performed using an *F*-test in regression analyses. The following statistical considerations were used:

$f^2 = .1764$ (calculated based on $R^2 = .15$)
$\acute{\alpha} = .05$
Power = .80
Number of predictors/parameters = See below for each research question (this figure is based on the total number of parameters being estimated given the categorical variables being used, e.g., diagnosis, treatment modality).

RQ1*: (using logistic regression) Sample size available from the CCSS cohort: n = 3233 using (illness-related) 16 predictors/parameters:
Recommended sample size = 123, $F_{cv}$ (16, 106) = 1.7398, Lambda = 21.6972

* Additionally, Aldrich and Nelson (1984) recommend that there be at least 50 cases per predictor or parameter to insure adequate power. Using this convention, a sample of at least 800 cases would be needed.

RQ2: (using least-squares model for linear regression) Sample size available from the CCSS cohort: n = 296 using (illness-related) 16 predictors/parameters:
Recommended sample size = 123, $F_{cv}$ (16, 106) = 1.7398, Lambda = 21.6972

RQ3: (using least-squares model for linear regression) Sample size available from the CCSS cohort: n = 296 using 7 predictors/parameters (only 1 retained from RQ2):
Recommended sample size = 89, $F_{cv}$ (7, 81) = 2.1248, Lambda = 15.6996

(using least-squares model for linear regression) Sample size available from the CCSS cohort: n = 296 using 23 predictors/parameters (all retained from RQ2):
Recommended sample size = 144, $F_{cv}$ (23, 120) = 1.6197, Lambda = 25.4016

RQ4: (using least-squares model for linear regression) Sample size available from the CCSS cohort: n = 296 using 3 predictors for each interaction:
Recommended sample size = 66, $F_{cv}$ (3, 62) = 2.7530, Lambda = 11.6424

RQ5: (using least-squares model for linear regression) Sample size available from the CCSS cohort: n = 296 using 2 predictors to test for mediation effect: Recommended sample size = 58, $F_{cv}$ (2, 55) = 3.165, Lambda = 10.2312

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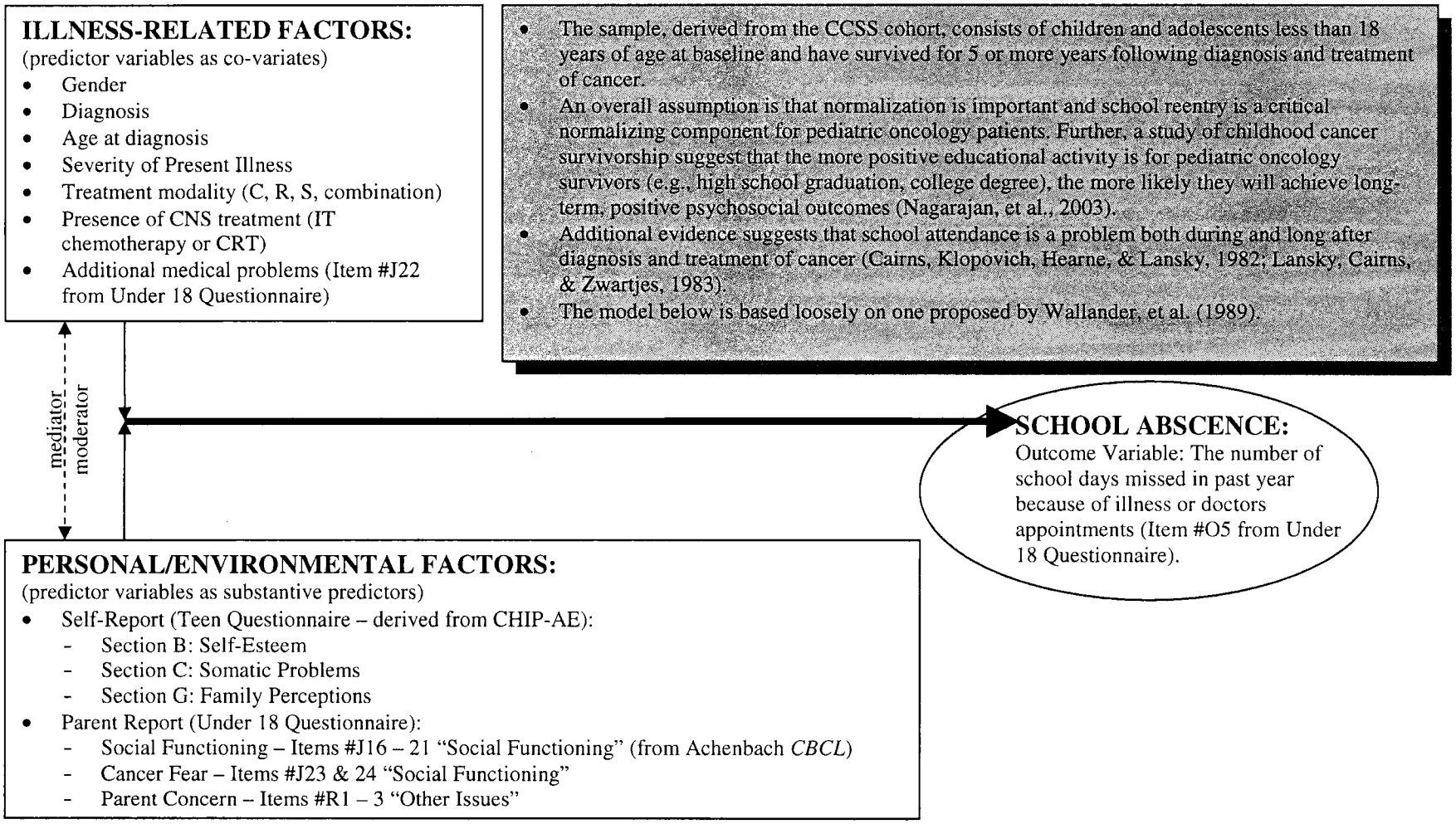


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