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Yoga for Pediatric Cancer Out-Patients

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UNIVERSITY OF CALGARY

Yoga for Pediatric Cancer Out-Patients

by

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A THESIS

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Abstract

The aggressive treatments necessary for survival in pediatric oncology are associated with adverse psychosocial and physical side effects. Physical activity (PA) has been shown to be a safe and effective strategy to positively impact the sequelae of cancer and its treatments. Although there are many types of PA, yoga is increasingly being recognized as a beneficial component of care. The objectives of this 12-week theory-based yoga intervention were to: (i) determine the feasibility and impact on health-related quality of life (HRQL); (ii) explore the potential benefits on fatigue, select fitness indices and PA behaviour; and, (iii) determine the influence on theory of planned behaviour (TPB) factors in a mixed-cancer sample of pediatric out-patients. The results provide preliminary support for the feasibility and efficacy of yoga, as well as support the utility of the TPB as framework to build and evaluate interventions for pediatric cancer out-patients.

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Dedication

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Chapter One: **Introduction**

1.1 Pediatric Oncology

Approximately 1,500 Canadian children are diagnosed with cancer each year, while 10,000 children are estimated to be living with the disease today (Childhood Cancer Canada, 2011). Pediatric malignancies are the leading cause of disease related death in children 1-19 years of age and the second leading cause of all deaths among children 1-14 years of age (Mitra, Shaw, & Hutchings, 2012). While the incidence rates of the most common childhood cancers have remained stable, mortality rates have been declining substantially, with over 80% of childhood cancer patients becoming survivors (Ellison, Pogany, & Mery, 2007; Siegel et al., 2012). Tremendous advances in treatment protocols over the last 30 years are attributed to this vastly improved 5-year, event-free survival (Pui, Carroll, Meshinchi, & Arceci, 2011; Siegel et al., 2012). Although imperative for recovery, contemporary treatment regimens (surgery, chemotherapy, radiation and hematopoietic stem cell transplant) negatively affect numerous body tissues and functions, and are associated with a myriad of early (occur during or shortly after treatment) and late (occur months or years after treatment) adverse psychosocial and physical side effects. For the purpose of this thesis, a patient will be defined as a child receiving active treatments for his/her cancer. During the course of treatment, patients may be: (i) in-patients, admitted to the hospital for prolonged periods of time while receiving treatments; or, (ii) out-patients, admitted to the hospital for day treatments. A survivor will be defined from the point of treatment completion onwards.

1.2 Psychosocial Side Effects

It is acknowledged that pediatric cancer is a major life event that impacts both the child and family (Aldridge & Roesch, 2007). Specifically, common immediate concerns revolve around unfamiliarity with the hospital setting, physical stressors and developmental challenges (Kazak et al., 2003; Kazak et al., 2010). Although one would expect an overwhelming negative response, the literature suggests the majority of children and adolescents with cancer are well adjusted, handling their diagnosis, treatments and survivorship exceptionally well (McDougall & Tsonis, 2009; Pai, Drotar, Zebracki, Moore, & Yountstrom, 2006; Patenaude & Kupst, 2005; Wechsler & Sanchez-Iglesias, 2013). Compared to healthy peers, pediatric patients have reported similar levels of depression (Chao, Chen, Wang, Wu, & Yeh, 2003; Sorgen & Manne, 2002), anxiety (Phipps, Steele, Hall, & Rai, 2001), and distress (Sorgen & Manne, 2002; Walco, Conte, Labay, Engel & Zeltzer, 2005). In a recent meta-analysis, Wechsler and Sanchez-Iglesias (2013) concluded that pediatric patients report good overall psychological adjustment, however, this does not mean they do not suffer from their treatments or do not present symptoms of maladjustment (Wechsler & Sanchez-Iglesias, 2013). Longer-term, considerable issues remain for survivors of certain types of cancers (i.e., bone tumours and CNS tumours), and a small but significant subset of the population who report issues such as depression, mood disturbances, tension, anger, confusion, anxiety, and lack of friends and involvement in social activities (Zeltzer et al., 2008; Zeltzer et al., 2009). Zebrack and Chesler (2002) found that those survivors who reported substantial physical late effects also demonstrated less positive psychosocial outcomes. Moreover, although patients and survivors reported doing well overall, they still expressed some concerns

about the physical, psychological and social quality of their lives (Zebrack & Chesler, 2002).

A concept that accounts for the impact of health and illness on the physical, psychological and social wellbeing of an individual is health-related quality of life (HRQL). Although there is no universally agreed upon definition, the Centers for Disease Control and Prevention conceptualize HRQL as a state of complete physical, psychological and social wellbeing, and as such define HRQL as an individual's perception of their functioning in these domains (Centers for Disease Control and Prevention, 2012). It is a dynamic, multidimensional, amalgamation of concepts, which change in complexity, intensity and expression throughout the cancer experience (Varni, Seid & Kurtin, 1999). With continued medical advances and enhanced knowledge about the side effects of cancer and its treatments, the assessment of HRQL has emerged as an important method of monitoring and evaluating treatment outcomes in this population. In fact, Varni et al. (1999) suggest that HRQL may be the most important outcome measure.

In pediatric oncology, studies typically find lower HRQL across all domains, especially physical and social wellbeing (Blaauwbroek, Stant, Groenier, Kamps, Meyboom, & Postma, 2007; De Clercq, Fruyt, Koot, & Benoit, 2004; Enskar & von Essen, 2008; Felder-Puig et al., 2006; Koopman et al., 2005; Landolt, Vollrath, Niggli, Gnehm, & Sennhauser, 2006; Maunsell, Pogany, Barrera, Shaw, & Speechley, 2008; Meeske, Katz, Palmer, Burwinkle, & Varni, 2004; Rueegg et al., 2013; Russel, Hudson, Long, & Phipps, 2006; San Juan et al., 2008_a; Smith et al., 2013; Speechley, Barrera, Shaw, Morrison, & Maunsell, 2006; Zeltzer et al., 2008). Table 1 provides a brief overview of the status of HRQL as indicated by self- and parent-proxy report in pediatric

oncology patients (Eiser, Davies, Jenney, Stride, & Glaser, 2006; Enskar & von Essen, 2008; Felder-Puig et al., 2006; Landolt et al., 2006; Maunsell et al., 2008; Meeske et al., 2004; Russel et al., 2006; San Juan et al., 2008_a; Smith et al., 2013) and survivors (Blaauwbroek et al., 2007; De Clercq et al., 2004; Koopman et al., 2005; Maunsell et al., 2008; Rueegg et al., 2013; Speechley et al., 2006; Zeltzer et al., 2008; Zeltzer et al., 2009). When interpreting this data, wide age ranges, different methodology, a variety of measurement tools, and substantial variation with regard to type of cancer, treatment and time elapsed since diagnosis must be taken into account. Although HRQL studies vary widely in their methodology, they collectively point to the necessity of investigating interventions to improve HRQL in childhood cancer patients and survivors.

Table 1. Health-Related Quality of Life in Pediatric Oncology Patients and Survivors

Authors	Design	Sample (N, age, Diagnosis, in-patient/out- patient/survivor)	Psychosocial Outcome Measures	Results
Smith et al., 2013	Cross-sectional Patients (n=523) compared to general USA healthy population norms (n=1273)	1796, 15-39, mixed-cancer, patients and healthy population norms	PedsQL; SF-36 self-report	Sig. worse HRQL across physical and psychosocial health scores. Greatest deficits in physical and emotional roles, physical and social functioning, and fatigue.
Rueegg et al., 2013	Cross-sectional Survivors (n=1593) compared to healthy siblings (n=695)	2288, 25, mixed- cancer, survivors (17.4 years since diagnosis) and healthy siblings	SF-36: self- report	Sig. lower physical function, roles limitation, general health and physical component summary on SF-36. Health problems were associated with worse HRQL on all scales.
Kazak et al., 2010	Cross-sectional Survivors (n=167) compared to healthy peers (n=170)	337, 16-30, mixed- cancer, survivors and healthy peers	BSI-18; PCL-C; SF-12; HCBI self-report	No sig. differences between survivors and healthy controls on psychological distress or HRQL. Survivors had less positive health beliefs. Intensity of treatments was positively correlated with anxiety.
Enskar & von Essen, 2008	Cross-sectional study patients and survivors	39, 7-12, mixed- cancer, patient/survivor	LSS-C: self- report	Pediatric patients and survivors experience more psychosocial than physical distress.

Authors	Design	Sample (N, age, Diagnosis, in-patient/out- patient/survivor)	Psychosocial Outcome Measures	Results
Maunsell et al., 2008	Cross-sectional Survivors (n=1334) compared to age- and sex- matched Canadian population sample (n=1477)	2811, 15-37, mixed-cancer, survivors (10 years since diagnosis) and healthy age- and sex-matched sample	SF-36: self- report	Small HRQL differences. Bone tumour, CNS cancer, more than one treatment, and 2+ affected organ systems were independently associated with lower HRQL in physical domain.
Zeltzer et al., 2008 CCSS	Cross-sectional Survivors (n=7147) compared healthy siblings (n=388) and US population norms	7,535, 18-54, mixed-cancer, survivors (23 years since diagnosis) and healthy population norms	SF-36: self- report	Survivors and siblings report better psychological adjustment than population norms. Survivors at increased risk of poor HRQL in physical and social domains (compared to population). Lymphoma, bone, and soft tissue had lowest HRQL.
San Juan et al., (2008 _a)	Cross-sectional Survivors (n=15) compared to healthy age- and gender-matched children (n=15)	30; 6.8 ± 3.1, ALL, maintenance therapy, patients and healthy age- and gender- matched sample	CHIP-CE/CRF: self-report	Patients reported sig. lower than healthy controls on satisfaction (with self and health), comfort (emotional and physical symptoms and limitations) and resilience (positive activities that promote health).
Blaauwbroeck et al., 2007	Cross-sectional Survivors (n=313) compared to age-matched population sample (n=772)	1085, 19-50, mixed-cancer, survivors (LTF and VLTF) and healthy age-matched sample	RAND-36: self- report	No sig. diff on RAND-36 subscales between LF and VLF. Sig. diff between VLF and population sample on physical and social functioning, vitality and general health. Gender (female) and late psychosocial effects were inversely related to HRQL.

Authors	Design	Sample (N, age, Diagnosis, in-patient/out- patient/survivor)	Psychosocial Outcome Measures	Results
Landolt et al., 2006	Longitudinal/observational study (T1: 6 weeks and T2: 1 year post-diagnosis) Patients (n=52) compared to a healthy community sample (n=1048)	1100, 10.9 ± 2.6, mixed-cancer, patients and healthy community sample	TACQOL: self- report; BSI-53: parent-proxy report	Patients report more physical complaints, reduced motor functioning and autonomy, and impaired positive emotional functioning. HRQL sig. improved one year post- diagnosis.
Russel et al., 2006	Cross-sectional Patients (n=71) compared to survivors (n=128) and healthy children (n=108)	307, 11.17, mixed- cancer, patients, survivors and healthy children	CHQ: self- and parent-proxy report	Patients reported lower HRQL in physical functioning and its impact on family scales, social/role limitation-physical scale and general health perceptions scale. Children in the control group reported better HRQL than patients and survivors. Parents and children tend to report comparable child HRQL outcomes.
Felder-Puig et al., 2006	Longitudinal/observational study (T1: 4-6 weeks before; T2: 1 week before; T3: 10 days after; T4: 28 days after; T5: 100 days after; T6: 180 days after; T7: 360 days after)	68, mixed-cancer BMT patients and families	PedsQL: self- report and parent-proxy report; HUI2; HUI3	HRQL was lowest shortly after transplant and improved steadily thereafter. Improvement was not always linear. Inter-observer agreement between parents and children was moderate to good.
Speechley et al., 2006	Cross-sectional Survivors (n=800) compared to age-and gender-matched population (n=923)	1723, 6-16, mixed- cancer, survivors (9.5 since diagnosis) and healthy age- and gender-matched sample	CHQ: parent- proxy report	Sig. lower HRQL for psychosocial and physical health (compared to general population). CNS, lymphoma, leukemia and cranial radiation reported lowest HRQL

Authors	Design	Sample (N, age, Diagnosis, in-patient/out- patient/survivor)	Psychosocial Outcome Measures	Results
Eiser et al., 2006	Longitudinal/observational study (T1: 3-6 months and T2: 1 year post-diagnosis)	45 mothers of children with ALL (7.2 ± 3.8) receiving dexamethasone (n=17) or prednisone (n=28), patients	PedsQL: parent-proxy report; SF-36: parent-proxy report	Sig. increase in child HRQL from first to second measurement. No sig. diff between treatment types.
Koopman et al., 2005	Longitudinal/observational study (T1: 3 years and T2: 8 years post-treatment) Survivors (n=20) compared to random sampled healthy school- aged children (T1: n=1122; T2: n=272)	1461, 14.4 ± 2.7 , malignant bone tumor, survivors and healthy school aged-children	TACQOL (modified); UCLA self-report parent-proxy report	Sig. lower scores on motor functioning, autonomy, cognition and positive emotions at 3 years (compared to control). At 8 years, comparably higher HRQL on motor functioning and autonomy and sig. higher HRQL on cognitive functioning, social contacts and negative mood. No sig. differences between groups on coping strategies.
De Clercq et al., 2004	Cross-sectional Survivors (n=67) compared to healthy age- and sex-matched comparison group (n=81)	148, 8-14, mixed- cancer, survivor (minimum 3 years) and healthy age- and sex-matched sample	PedsQL: self- report and parent-proxy report	Survivors reported higher HRQL overall. Sig. lower HRQL on social subscale.

Authors	Design	Sample (N, age, Diagnosis, in-patient/out- patient/survivor)	Psychosocial Outcome Measures	Results
Meeske et al., 2004	Cross-sectional ALL patients (n=170) compared to BT (86)	256, 2-18, ALL and BT, patients	PedsQL; Cancer; MFS parent-proxy report	BT experienced more problems in physical, social, psychosocial, school, cognitive and fatigue domains.

Note. ALL: Acute Lymphoblastic Leukemia; BMT: Bone Marrow Transplant; BSI-18: Brief Symptom Inventory; BSI-53: Brief Symptom Inventory; BT: Brain Tumour; CHQ: Child Health Questionnaire; CHIP-CE/CRF: Child Report Form of the Child Health and Illness Profile-Child Edition; CNS: Central Nervous System cancer; HCBI: Health Competence Beliefs Inventory; HRQL: Health-Related Quality of Life; HUI2 HUI3: Health Utilities Index; LSSC: Life Situation Scale for Children; LTF: Long-Term Follow-Up; PCL-C: Post-Traumatic Stress Checklist-Civilian Version; PedsQL: Pediatric Quality of Life Inventory; PedsQL MFS: PedsQL Multidimensional Fatigue Scale; RAND-36: HRQL measure; SF-12: Short Form-12; SF-36: Short Form-36; T: Time Measurement (i.e., T1: time 1...T5: time 5); TACQOL: Questionnaire for Children's HRQL; UCLA: Utrecht Coping List Adolescents; USA: United States of America; VLF: Very Long-Term Follow-Up.

1.3 Physical Side Effects

There is a significant negative impact of cancer and its treatments on the body (Ness & Gurney, 2007; Ness et al., 2009). For the purpose of this thesis, the overview of physical side effects will focus on fatigue and musculoskeletal impairments that may be associated with limitations in fitness, functional mobility, flexibility and range of motion (ROM). Moreover, suboptimal functioning due to fatigue or musculoskeletal impairments may be associated with reduced HRQL and physical inactivity, which may interrupt normal functioning, exacerbating the risk for comorbidities (i.e., metabolic syndrome and heart disease), early mortality, and second malignancies (Ness & Gurney, 2007; Ness et al., 2009).

According to the guidelines of the National Comprehensive Cancer Network (NCCN), cancer-related fatigue (CRF) is a subjective sense of persistent physical, emotional, and/or cognitive tiredness or exhaustion related to cancer or cancer treatments that is disproportionate to recent activity, significantly interfering with usual functioning (Campos, Hassan, Riechelmann, & Del Giglio, 2011; Mock et al., 2000). CRF is a multidimensional construct, and a variety of mechanisms are hypothesized to contribute to its development (Campos et al., 2011; Stone & Minton, 2008). Whitsett, Gudmundsdottir, Davies, McCarthy, and Friedman, (2008) confirmed fatigue was a common occurrence in their mixed-cancer sample. Furthermore, they found associations between fatigue, mood, affect, and physical factors, highlighting the multidimensional nature of CRF (Whitsett et al., 2008). In pediatric oncology, CRF has been identified as one of the most distressing treatment-related symptoms experienced (Hockenberry-Eaton et al., 1998; Whitsett et al., 2008). Hinds et al. (2007_a) and Meeske, Siegel, Globe, Mack

and Bernstein (2005) found children with acute lymphoblastic leukemia (ALL) reported fatigue as a barrier to participating in sports and other active play and subsequently substituted active time with sedentary activities such as reading, videogames, and television watching (Hinds et al., 2007_a; Meeske et al., 2005).

Musculoskeletal impairments are an increasing concern in patients and survivors. The sedentary nature of treatment, combined with the negative physical side effects of treatments, greatly impact strength, functional mobility, flexibility and ROM. Strength is the ability to exert force using ones muscles and is related to functional mobility. Functional mobility is the ability complete activities of daily living and prevent injury. As such it requires sufficient levels of strength. Evidence suggests that strength deficits occur in children during treatment for cancer and persist long after treatment ends (Ness & Gurney, 2007). Hovi, Era, Rautonen and Siimes (1993) found lower-extremity strength deficits in adolescent and young adult cancer survivors of childhood ALL, while Marchese, Chiarello, and Lange (2003) found decreased knee extension strength among children during treatment for ALL. San Juan et al. (2008_a) found strength deficits in their sample of pediatric ALL patients receiving maintenance therapy. However, despite strength deficits, there were no significant differences in functional mobility in patients as compared to healthy controls. Beulertz, Bloch, Prokop, and Baumann (2013) reported impaired strength and functional mobility in their mixed-cancer survivor population. Specifically, they reported reduced strength, endurance and coordination. Similarly, Ness et al. (2007) confirmed the relationship between reduced strength and reduced mobility in their sample of mixed-cancer survivors. Finally, Hudson et al. (2003) found survivors self-reported a 2.7 fold increased odds of functional limitations and a 5.2 fold increased

odds of functional status impairment relative to their sibling control group (Hudson et al., 2003). Overall, this research suggests that strength and functional mobility limitations are important physical effects in this population that may have a direct or indirect impact on both physical and psychosocial functioning (Gilliam & Schwebel, 2013; Ness et al., 2007; Ness et al., 2009).

Flexibility and ROM refer to the distance and direction a joint can move through its normal range. Specifically, dorsiflexion (DF)-ROM is emerging as an important issue in pediatric oncology (Beulertz, Wurz, Culos-Reed, Chamorro-Vina, Bloch & Baumann, In Preparation). Studies consistently report 21-68% of childhood cancer patients and survivors have some degree of impairment in DF-ROM (Hartman, van den Boz, Stijen, & Pieters, 2008; San Juan et al., 2008_a; Wright, Halton, Martin, & Barr, 1998; Wright, Halton, & Barr, 1999). This limitation is important, as a certain degree of DF-ROM (5-10°) is necessary for normal patterns of gait and motor activity (Wright et al., 1999). In addition to DF-ROM limitations, pediatric cancer patients, especially those with lower-extremity sarcoma, are at a risk of numerous secondary complications such as decreased knee ROM. Knee ROM is vital for normal gait patterns with limitations of 5° (to 60°) having a variety of negative effects (Norikin & White, 2003). Marchese et al. (2006) found that childhood lower-extremity sarcoma survivors at least one-year post-surgery presented with decreased knee ROM. On the basis of their results, Marchese et al. (2006) found that ROM was correlated with both functional mobility and HRQL. Although the physical effects reported in pediatric oncology vary widely, they collectively point to the necessity of investigating interventions to improve this aspect of functioning. Given the negative effects associated with cancer and its treatment in pediatric oncology, and the

interrelated nature of psychosocial and physical factors, it is imperative that efforts focus on multidimensional interventions to improve HRQL and ultimately survival.

1.4 Physical Activity in Pediatric Oncology

Physical activity (PA) has recently emerged as a potential strategy to mitigate both the early and late effects of cancer and its treatments (Courneya & Friedenreich, 2011; Speck, Courneya, Masse, Duval, & Schmitz, 2010). PA is defined as any bodily movement produced by the skeletal muscle that results in a substantial increase in energy expenditure over resting levels (Bouchard & Shepard, 1994). Exercise is PA that is performed in ones discretionary time on a repeated basis over an extended period of time, with the intention of improving fitness or health (Bouchard & Shepard, 1994). Exercise interventions thus increase overall PA. For the purpose of this thesis, PA will refer to traditionally defined exercise (i.e., aerobic and resistance training). Although there are many kinds of PA, yoga is increasingly being recognized for its unique potential to impact psychosocial and physical health and wellbeing in cancer patients. Given the acknowledged detrimental effects of treatments, the need for PA interventions to mitigate and promote positive psychosocial and physical health outcomes is increasingly important.

Appendix A provides an overview of PA intervention research in pediatric oncology. Currently, the evidence is for ALL patients (Gohar, Comito, Price, & Marchese, 2011; Hartman et al., 2009; Ladha, Courneya, Bell, Field, & Grundy, 2006; Marchese, Chiarello, & Lange, 2004; Moyer-Mileur, Ransdell, & Bruggers, 2009; Ruiz et al., 2011; San Juan et al., 2007_a; San Juan et al., 2007_b; Takken et al., 2006; Yeh, Wai, Lin, Chiang, 2011), and mixed-cancer samples (Collet, Acosta, Whitsett, McTiernan, &

Friedman, 2007; Hinds et al., 2007_b; Keats & Culos-Reed, 2008; Keats & Culos-Reed, 2009; Sharkey, Carey, Heise, & Barber, 1993; Shore & Shepard, 1999; Speyer, Herbinet, Vuillemin, Briancon, & Chastanger, 2010), with the majority of studies providing evidence for PA during medical treatment. Interventions have been hospital-based (Chamorro-Vina et al., 2010; Hinds et al., 2007_b; Keats & Culos-Reed, 2008; Ladha et al., 2006; Rosenhagen et al., 2011; Ruiz et al., 2010; San Juan et al., 2008_b; San Juan et al., 2007_a; San Juan et al., 2007_b; Speyer et al., 2010; Winter, Muller, Hardes, Gosheger, Boos, & Rosenbaum, 2013), home-based (Gohar et al., 2011; Moyer-Mileur et al., 2009; Yeh et al., 2011), community-based (Collet et al., 2007; Keats & Culos-Reed, 2008; Keats & Culos-Reed, 2009), or some combination of the three (Hartman et al., 2009; Marchese et al., 2004; Sharkey et al., 1993; Shore & Shepard, 1999; Takken et al., 2009). Duration has ranged from a single 30-minute training session (Ladha et al., 2006) to 2 years (Hartman et al., 2009). However, the majority of interventions are performed over an 8-16 week period and focus on combined resistance and aerobic training.

Seven recent reviews suggest that PA is safe, and effective at combating several of the negative symptoms experienced by pediatric cancer patients and survivors (Baumann, Bloch, & Beulertz, 2013; Huang & Ness, 2011; San Juan, Wolin, & Lucia, 2011; Soares-Miranda, Fuiza-Luces, & Lucia, 2013; Stolley, Restrepo, & Sharp, 2010; Winter, Muller, Hoffman, Boos, & Rosenbaum, 2010; Wolin, Ruiz, Tuchman, & Lucia, 2010). To ascertain safety, authors have explored the effect of PA on immune system suppression and recovery. Because chemotherapy treatment is known to suppress the immune system, concerns existed that PA would tax the already compromised immune system. Ladha et al. (2006) found no negative effects of an acute bout of PA on

neutrophil counts and immune function in children undergoing maintenance therapy for ALL. More recently, Chamorro-Vina et al. (2010) demonstrated that a daily 3-week in-hospital moderate-intensity training regimen did not negatively affect immune cell recovery in patients undergoing stem cell transplantation. To determine the efficacy researchers have explored the effect of PA on a wide variety of psychosocial and physical outcome variables.

1.4.1 Physical Activity and Psychosocial Health Outcomes

Research on the association between PA and psychosocial outcomes is emerging in pediatric oncology. To date, 9 of the 21 studies included in Appendix A assessed HRQL or some aspect of psychosocial health (Collet et al., 2007; Gohar et al., 2011; Keats & Culos-Reed, 2008; Marchese et al., 2004; Rosenhagen et al., 2011; San Juan et al., 2007_b; San Juan et al., 2008_b; Shore & Shepard, 1999; Speyer et al., 2010). Shore and Shepard (1999) found that PA improved measures of anxiety. The remaining 8 studies used self-report measures along with parent-proxy reports to assess HRQL. Three of these 8 studies found no significant differences in HRQL. Specifically, Marchese et al. (2004) explored the effects of their 16-week physical therapy intervention on ALL patients receiving maintenance therapy. The authors found no significant differences between the randomly assigned intervention and control group on the Pediatric Quality of Life Inventory (PedsQL) General and Cancer Module for both self- and parent-proxy reports. Marchese et al. (2004) suggest this may have been due to ceiling effects (as their intervention group had acceptable HRQL at baseline) or lack of power (due to small sample size) to detect HRQL differences. An abstract published by Collett and colleagues (2007) also found no significant difference on HRQL after a 12-week supervised PA

intervention in their sample of child and adolescent mixed-cancer survivors. Lastly, San Juan et al. (2007_b) reported no significant differences during their 16-week intervention and 20-week detraining intervention. However, they noted trends towards improvements on parent-proxy reports. Variables measured by their HRQL assessment tool, the Child Health and Illness Profile-Child Edition (CHIP-CE/CRF), included resilience, achievement, satisfaction, comfort, and risk avoidance.

Five of the 8 studies found improvements in HRQL post PA intervention. Keats and colleagues (2008) found significant self-reported improvements on the PedsQL General Module over their 16-week intervention. Specifically, they found improvements on overall HRQL, and physical and psychological HRQL, with significant improvements reported mid-intervention on the emotional and social domains (Keats & Culos-Reed, 2008). San Juan et al. (2008_b) also found significant improvements on some of the main items of the self- and parents-proxy report CHIP-CE/CRF. Children reported improvements on HRQL measures of comfort and resilience. Moreover, parent-proxy reports indicated improvements in their child's satisfaction and achievement after the 8-week intervention. Speyer et al. (2010) performed a cross-over study comparing hospital stays with PA to hospital stays without PA and found those children receiving the in-hospital PA intervention reported higher HRQL scores on the Child Health Questionnaire (CHQ). Parent-proxy and child self-report HRQL was higher for physical function, role/social-physical, self-esteem and mental health dimensions. In addition HRQL was significantly better for the behaviour dimension and the bodily pain dimension (Speyer et al., 2010). Gohar et al. (2011) performed a 24-28 week home-based program for pediatric patients within the first 6-months of medical treatment. They found steady improvements

in HRQL over the course of the intervention. Lastly, Rosenhagen et al. (2011) performed an in-hospital PA intervention with pediatric patients and found improvements on overall HRQL using the PedsQL general module. In summary, it appears that PA interventions may positively impact HRQL in childhood cancer patients and survivors, although the evidence to date is inconsistent.

1.4.2 Physical Activity and Physical Health Outcomes

Preliminary research on the association between PA and various physical health outcomes in pediatric oncology is promising. To date, all of the 21 studies included in Appendix A assessed some aspect of physical health. Fatigue has been assessed in 5 studies (Hinds et al., 2007_b; Keats & Culos-Reed et al., 2008; Rosenhagen et al. 2011; Takken et al., 2009; Yeh et al., 2011). Takken et al. (2009) found no significant improvement on measures of fatigue. However, the authors suggest their non-significant findings (on all measures) may have been due to low adherence to their intervention (Takken et al., 2009). Rosenhagen et al. (2011) and Yeh et al., (2011) both reported trends toward fatigue symptom improvement on the PedsQL multidimensional fatigue scale (MFS). Similarly, Keats and Culos-Reed (2008) found improvement in their community-based intervention on the PedsQL MFS. Hinds and colleagues (2007_b) explored the effects of PA on fatigue in a mixed-cancer patient sample during hospitalization. Participants in the intervention reported improved sleep efficiency, duration and overall energy, which may be associated with fatigue.

Improvements in physical fitness have been reported in the majority of studies. Specifically, positive effects have been found for muscular strength during medical treatment (Chamorro-Vina et al., 2010; Marchese et al., 2004; Ruiz et al., 2010; San Juan

et al., 2008_b; San Juan et al., 2007_a; San Juan et al., 2007_b) and into survivorship (Keats & Culos-Reed, 2008). Furthermore, PA appears to also positively impact functional mobility (San Juan et al., 2008_b; San Juan et al., 2007_a; San Juan et al., 2007_b). With regards to ROM and flexibility, Keats and Culos-Reed (2008) reported significant improvements in hamstring flexibility over the course of their 16-week intervention. Mixed results have been found regarding the efficacy of PA to improve DF-ROM. Hartman et al. (2009) and San Juan et al. (2007_b) found no improvements in DF-ROM after their 2-year and 16-week program respectively. Conversely, Marchese et al. (2004) and Wright, Hanna, Halton, and Barr (2003) reported significant improvements in DF-ROM during their PA programs. Lastly, as would be expected, PA interventions tend to improve reported PA levels (Keats & Culos-Reed, 2008; Moyer-Mileur et al., 2009; Sharkey et al., 1993). However, similar to PA's effects on HRQL, several interventions have also found non-significant effects. This lack of significant change over the course of interventions may be due to problems with power (i.e., small sample sizes), adherence, compliance to interventions and program characteristics (Collet et al., 2007; Hartman et al., 2009; Sharkey et al., 1993; Takken et al., 2009; Rosenhagen et al., 2011). In summary, it appears PA interventions may positively impact physical outcomes in pediatric cancer patients and survivors, although the evidence to date is inconsistent.

1.4.3 Limitations in Physical Activity Research

Several specific limitations in the available literature exist. One of the most pressing limitations is small sample sizes and the associated internal and external validity issues. For example, increases in type-I and type-II errors, decreased representation, and decreased generalizability are all common limitations associated with small sample sizes

(Dunn, 2001). Selection bias is another limitation. Participants and families who choose to enrol in PA may have differing characteristics than those who do not, impacting both internal and external validity. Another issue is with regards to the guidelines for this population, as currently they are unknown. Exactly what intensity, duration and frequency is optimal to produce psychosocial and physical changes and the mechanisms by which these changes are produced remain to be discovered. Therefore, the studies included in this overview varied widely in methodology, making comparison between studies difficult. Despite these limitations, the potential utility of PA to positively impact both psychosocial and physical health outcomes warrants further investigation.

1.5 Yoga

Yoga therapy is a popular complementary and alternative medicine (CAM) technique that is increasingly gaining acceptance as a beneficial strategy to improve psychosocial and physical health function and promote positive coping (Cantrell & Ruble, 2011). Contemporary western yoga practice is commonly defined as gentle PA that combines physical practice (i.e., *asana*), breathing techniques (i.e., *pranayama*) and meditation (i.e., *dhyana*) (Feuerstein, 1996; Smith & Pukall, 2009). In a recent review of studies comparing yoga with meditation techniques, psychotherapy and traditional PA (aerobic and resistance training) in adult populations, yoga was found to be an equal or superior addition to usual care practices (Ross & Thomas, 2010). This research suggests the potential utility of yoga sessions for oncology survivors as an additive to accepted psychosocial services (i.e., psychotherapy and supportive counselling) and popular CAM techniques (PA, nutrition and meditation). In addition, enhanced recognition that yoga may be a viable integrative approach has resulted in a growing demand for programs

(Culos-Reed, Mackenzie, Sohl, Ross, & Danhauer, 2012; Lin, Hu, Chang, Lin, & Tsauo, 2011; Smith & Pukall, 2009; Tindle, Davis, Phillips, & Eisenberg, 2005). Recent reviews of the literature in the adult cancer population offer preliminary support for the efficacy of yoga interventions for cancer patients and survivors. Positive effects have been noted for a variety of outcomes, including HRQL, mood, cancer-related distress and symptoms, fatigue and sleep (Culos-Reed et al., 2012; Bower, Woolery, Sternlieb, & Garet, 2005; DiStasio, 2008; Lin et al., 2011; Smith & Pukall, 2009).

1.6 Yoga in Pediatric Oncology

Based on the potential utility of PA, in combination with preliminary results for yoga in adult oncology and pediatric clinical populations (Birdee et al., 2009; Galantino, Glabavy, & Quinn, 2008), researchers have recently begun exploring the benefits of yoga for pediatric cancer patients and survivors. Furthermore, a handful of pediatric cancer centers in North America have begun offering yoga in their unit recreation centers and bedside. These sessions emphasize basic yoga positions, stretching, breathing, and relaxation techniques (i.e., Memorial Sloan-Kettering Cancer Center, 2012). Appendix B provides an overview of yoga research for pediatric oncology/hematology patients, as well as other select pediatric populations (due to limited research in pediatric oncology).

Currently only 3 studies have been performed in pediatric oncology (Geyer, Lyons, Amaze, Alishio, & Cooks, 2011; Moody, Daswani, Abrahams, & Santizo, 2010; Thygeson, Hooke, Clapsaddel, Robbins, & Moquist, 2010). These were performed in-hospital with mixed-oncology/hematology samples during medical treatment (Geyer et al., 2011; Moody et al., 2010; Thygeson et al., 2010). The remaining studies included in this overview were performed in a variety of pediatric populations in differing settings

(Benavides & Caballero, 2009; Bera & Rajapurkar, 1993; Kuttner et al., 2006; Moorthy, 1982; Platania-Solozzo et al., 1992; Stueck & Glockner, 2005; Telles & Srinivas, 1998).

1.6.1 Yoga and Psychosocial Health Outcomes

The 3 research studies in pediatric oncology/hematology have focused solely on assessing the benefits of yoga on HRQL and patient reported outcomes (i.e., pain and anxiety) via questionnaires and qualitative data. The preliminary results suggest that yoga has a significant positive impact on HRQL, specifically in child's self-reports of physical function (as measured by the PedsQL) (Geyer et al., 2011). Yoga interventions appear to significantly reduce anxiety and pain (as measured by the State-Trait Anxiety Inventory) (Moody et al., 2010, Thygeson et al., 2010), and are qualitatively reported to be relaxing and beneficial (Moody et al., 2010; Thygeson et al., 2010). However, as in the broader PA and pediatric oncology literature, sample sizes were small (42 participants total). Moreover, the interventions were short. For instance, Geyer et al. (2011) performed 1 yoga session/week for 5 weeks, while Moody et al. (2010) performed 1-3 yoga sessions total and Thygeson et al. (2010) performed 1 yoga session. The research therefore suggests the potential positive acute effects of yoga, but does little to adequately address the benefits associated with a longer-term yoga program on HRQL. Due to the limitations and lack of research in pediatric oncology, other select pediatric populations have been included in this overview as a means of further exploring the potential psychosocial benefits of yoga in pediatric populations.

Platania-Solazzo et al. (1992) explored anxiety and mood in children with depression and adjustment disorders. They found decreases in self-reported anxiety and observer ratings of anxious behaviour (Platania-Solazzo et al., 1992). Stueck and

Gloeckner (2005) found decreased aggression and feelings of helplessness in young children with abnormal examination anxiety. Interestingly, they found that participants in the intervention transferred their learned breathing techniques to situations beyond yoga as a means of enhancing overall wellbeing (Stueck & Glockner, 2005). Lastly, Kuttner et al. (2006) explored pain intensity and depression in adolescents with irritable bowel syndrome. They found participants in the yoga group reported lower levels of functional disability, and improved coping and anxiety (Kuttner et al., 2006). These results suggest the potential utility of yoga in pediatric oncology as a means of improving symptoms of anxiety and stress and enhancing overall wellbeing. However, results must be interpreted cautiously as there are several important methodological limitations in the literature. Moreover, this overview is not exclusive to pediatric oncology; therefore caution must be used when extrapolating results.

1.6.2 Yoga and Physical Health Outcomes

Research has not explored the potential physical benefits of yoga in pediatric oncology populations. However, with regards to the physical outcomes associated with yoga in other pediatric populations, there is evidence to suggest benefits (Birdee et al., 2009; Galantino et al., 2008). The physical outcomes reported in the literature include improvements in body composition (BMI) and strength. Specifically, Bera and Rajapurkar (1993) found their yoga intervention significantly improved body weight, while Benavides and Caballero (2009) found an average weight loss of 2kg with a 12-week yoga intervention, suggesting the potential utility of yoga to positively impact weight in children with at least 1 risk factor for Type II diabetes. Moorthy (1982) found approximately 80% of children in their 6-week yoga intervention, who had previously

failed a minimum fitness test (focused on muscular strength), passed. Interestingly, this randomized controlled trial (RCT) compared yoga to regular PA and found that yoga was more beneficial than traditional PA at increasing muscular fitness in children (Moorthy, 1982). In summary, yoga may be a potential tool to positively impact physical outcomes in pediatric oncology. However, results must be interpreted with extreme caution as the literature has several methodological limitations and has not been performed in pediatric oncology, thus the ability to extrapolate these findings is limited.

1.6.3 Limitations in Yoga Research

Several specific limitations in the available pediatric yoga literature exist and parallel those reported in PA research. For example, one of the most pressing limitations in the yoga research is also the small samples and associated internal and external validity issues. Selection bias is another important limitation; participants and families who choose to enrol in yoga research (like PA research) may have differing characteristics than those who do not. Finally, similar to the PA research, the lack of knowledge regarding mechanisms or appropriate guidelines is an important limitation in the yoga research. This could explain the varied interventions.

The yoga research presented in this overview also presents several unique limitations. Four of the studies included were RCTs; however, they all lacked descriptions of the randomization methods, and none of the studies provided sample size calculations. In addition, many used inappropriate statistical analyses (within-group pre-intervention vs. post-intervention changes rather than between-group comparisons), undermining the principle of conducting a RCT. Second, yoga represents a myriad of practices, and the studies reviewed here lacked appropriate detailed descriptions of the

specific protocol, the yoga style, and the qualification of instructors. Lastly, due to the lack of evidence in pediatric oncology, this overview included information from other pediatric populations. With regards to the variety of populations and the varying therapies or disease-states, health status may vary dramatically. This may modify intervention effectiveness and the ability to generalize to pediatric oncology patients. However, despite these important limitations, it appears as though yoga (as a type of PA) may be a useful tool to enhance psychosocial health and potentially physical health outcomes in pediatric oncology.

1.7 Barriers to Physical Activity

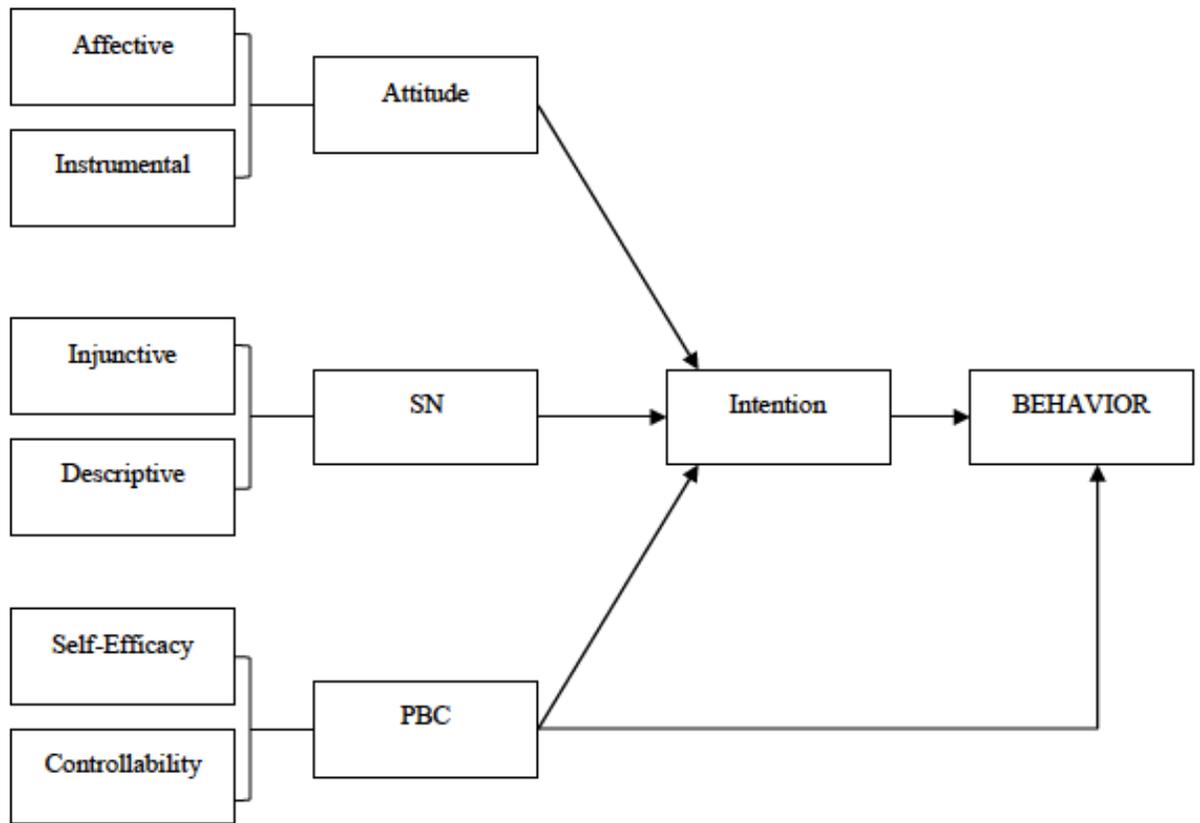
Based on the reviews of the literature, it can be concluded that PA (including yoga) during and following treatment is beneficial and holds promise to improve pediatric patients' psychosocial and physical health. Unfortunately, despite the evidence regarding the safety and efficacy of PA, pediatric cancer patients and survivors are not meeting PA recommendations. Several reviews have found that childhood cancer patients and survivors are less physically active than siblings and healthy controls (Hocking et al., 2013; Stolley et al., 2010; Winter et al., 2010). Cancer and treatment-related effects, difficulty accessing programs, and the overprotective attitudes of parents and educators have been suggested as barriers to PA in this population (Arroyave et al., 2008). Moreover, timing of diagnosis (pediatric cancers peak in incidence between the ages of 2-5 years) may be a critical factor, as it is during these years the basis for adult behaviour, lifestyle, and health status is established (Herman, Hopman, & Craig, 2010; San Juan et al., 2011). Given the known benefits of PA and its potential role in pediatric oncology, an increasing number of papers are calling for PA interventions, iterating the critical

importance of intervening in this population (Cox et al., 2009; Kelly, 2011; Ness & Gurney, 2007; Oeffinger et al., 2006; Robertson & Johnson, 2002; Zhang, Saltzman, Must, & Parsons, 2012).

1.8 Theory of Planned Behaviour

The use of theoretical frameworks provide the foundation upon which evidence-based interventions are built and play a critical role in developing and implementing best practices. Specifically, the use of theory allows researchers to identify targets for intervention and provides a systematic way of understanding events allowing researchers to assess the effects of the intervention on a given construct (Bellg et al., 2004; Borrelli et al., 2005). A number of theoretical frameworks exist, however the theory of planned behaviour (TPB: Ajzen, 1988), has received considerable attention in health behaviour research. The TPB (see Figure 1) proposes that three factors influence a person's intention to engage in a specific behaviour (Ajzen, 1988; Ajzen, 2000; Ajzen, 2002). These include: i) *Attitudes*, ones feelings and beliefs concerning the behaviours consequences. Attitudes are composed of *affective* (i.e., enjoyable/unenjoyable) and *instrumental* (i.e., beneficial/harmful) evaluations toward the behaviour. ii) *Subjective norm* (SN), the perceived expectations of important others, and motivations to adhere to these expectations. SN includes an *injunctive* component (i.e., whether one believes their social network wants them to perform the behaviour) and a *descriptive* component (i.e., whether ones social network actually performs the behaviour), and iii) *Perceived behavioural control* (PBC), the individuals' perception of their resources and capabilities. Importantly, PBC also has the ability to directly affect behaviour (Ajzen, 1988; 2000; 2002). PBC consists of *self-efficacy* (i.e., ease/difficulty confidence performing

behaviour) and *controllability* (i.e., personal control over behaviour and appraisal of level of personal control).



(Adapted from Ajzen, 2000)

Note. PBC: Perceived Behavioural Control; SN: Subjective Norm.

Figure 1. Two-component model of the theory of planned behaviour.

The TPB has proven valuable for explaining yoga/PA intention and behaviours across populations (Godin & Kok, 1996; Hausenblas, Carron, & Mack, 1997; Symons Downs & Hausenblas, 2005; Speed-Andrews, Stevinson, Belanger, Mirus & Courneya, 2012; Vallance, Courneya, Plotnicoff, & Mackey, 2008). As such, its efficacy has recently been explored in pediatric cancer and PA studies (Keats & Culos-Reed, 2008; Keats & Culos-Reed, 2009). Although the TPB is not without its critics, it is a parsimonious theory that has a sound basis for developing and evaluating interventions.

When structuring and evaluating an intervention on the TPB, attitude, SN and PBC should be targeted. Attitude has proven to be an important construct influencing behavioural intention in pediatric oncology (Keats, Culos-Reed, Courneya, & McBride, 2007; Keats & Culos-Reed, 2009). Enhancing the knowledge participants have (about health behaviours) has proven to positively influence attitude (Ajzen, 1991). Furthermore, health behaviour change interventions that are recommended, delivered, or supported by physicians or other medical staff are usually perceived more favourably than those that are not (Wald, Ewing, Cluss, Goldstrom, Cipriani, & Colborn, 2005). Lastly, Durstine et al. (2000) have suggested promoting enjoyment when enhancing PA in chronically ill patients influences affective attitudes.

SN and social influences have consistently been linked to behaviour change in pediatric oncology; therefore this is an important component to consider when conducting an intervention in this population. In a recent review, social influences were reported to be strong determinants of PA behaviour in pediatric oncology survivors (Gilliam & Schwebel, 2013). In fact, Gilliam et al. (2012) conducted a structured telephone survey with caregiver-survivor pairs and found that social influences, including

family PA, family support for PA and peer support for PA emerged as unique predictors of childhood PA. This highlights the importance of targeting both injunctive (support for PA) and descriptive (whether ones social network actually performs the behaviour) components of SN. With regards to the injunctive component, interventions should target the pediatric patients social network (i.e., family members and peers). Thus, fostering a supportive group environment (that includes family and peers) could translate to enhanced intention and PA behaviour. In fact fostering enjoyment during PA through providing a supportive group environment is strongly supported by the group cohesion literature (Fox, Rejeski, & Gauvin, 2000). With regards to the descriptive component, Norris, Moules, Pelletier, and Culos-Reed (2010) found that parents PA behaviour was significantly correlated with survivor PA highlighting the necessity of engaging parents in PA interventions either formally or informally. To recruit parental support and engagement, research in pediatric populations suggests that interventions should recognize the direct (i.e., transportation) and indirect (i.e., encouragement) support provided by parents (Gilliam et al., 2012; Shumaker, Okene, & Riekert, 2009). Interventions should also involve a large component directed to the child/adolescent and recruit peer support as this has a unique positive influence on PA (Gilliam et al., 2012; Gilliam & Schwebel, 2013).

Finally, interventions should focus on providing opportunities to increase participants PBC by enhancing feelings of control and self-efficacy (Keats et al., 2007; Keats & Culos-Reed, 2009). The literature suggests that promoting individual choice and offering flexible prescribed programming impact controllability (Shumaker et al., 2009). Self-efficacy may be enhanced by providing children with the knowledge of *how* to be

physically active and providing children with mastery experiences (Ajzen, 1991; Shumaker et al., 2009).

1.9 Research Objectives

With the growing recognition of the detrimental short- and long-term effects of diagnosis and treatments, and the recognized efficacy of PA generally, and yoga specifically, to positively impact these effects, further yoga intervention research is required. However, there are currently important limitations with regards to the state of the literature. Of the 7 published PA intervention reviews in pediatric oncology, only 1 (Baumann et al., 2013) has included a yoga intervention (Geyer et al., 2011), and none of the yoga interventions in pediatric oncology have explored objective measures of physical benefits. This lack of strong yoga evidence provides the impetus to further explore the benefits associated with yoga in this population. Moreover, of the 3 published yoga studies in pediatric oncology, the longest intervention was 5-weeks, providing evidence for the utility of yoga acutely, and highlighting the necessity of researching longer-term programs. With regards to intervention setting for pediatric oncology patients, the research to date has been hospital- or home-based, leaving community-based understudied. Finally, due to documented low rates of PA participation in pediatric oncology, a theoretical framework should be utilized to target known determinants of PA in this population. Given the stated limitations in the literature, the primary purpose of the present pilot study was to determine if a longer-term, community-based, theory-based yoga program was feasible for pediatric cancer out-patients in the Hematology, Oncology, and Transplant (HOT) program at the Alberta Children's Hospital (ACH); and, investigate its efficacy on HRQL. The secondary purpose was to explore the

potential benefits of the yoga intervention on levels of fatigue, select fitness outcomes (musculoskeletal fitness, functional mobility, flexibility and ROM) and PA levels. The tertiary purpose was to determine if the intervention enhanced TPB factors (attitude, SN, PBC and intention).

The specific research questions were:

1. Is the yoga intervention feasible?
2. What is the effect of the yoga intervention on HRQL?
3. What is the effect of the yoga intervention on fatigue, select fitness outcomes (musculoskeletal strength, functional mobility, flexibility and ROM) and PA levels?
4. What are the changes on measures of TPB factors (attitudes, SN, PBC and intention) from pre- to post-intervention?

1.9.1 Hypotheses

Based on the literature, it was hypothesized that this intervention would be feasible as measured by recruitment, attendance and retention; and beneficial as measured by improvements in HRQL, fatigue, musculoskeletal fitness, functional mobility, flexibility and PA levels. Furthermore, it was hypothesized that participants would score higher on measures of attitude, SN, PBC, and intention after the intervention, based on intervention components targeting the TPB variables.

Chapter Two: **Methodology**

2.1 Participants

Health care professionals (HCPs) obtained permission from parents of potential participants for the research coordinator to contact them. The research coordinator then contacted potential families to explain the study, confirm eligibility, and obtain: physician clearance, participant assent, and parental consent. The yoga intervention was offered in 2 separate waves (January-March and April-June) and HCP assisted recruitment took place prior to each in December 2012 and again in March 2013. Participants were required to meet the following inclusion criteria: (i) medical clearance from their treating oncologist (with no contraindications to engaging in mild to moderate PA), (ii) 5 years and older; (iii) receiving treatment as an out-patient at ACH as per accepted treatment protocols; (iv) no/limited previous yoga experience; and (v) not currently meeting the Canadian Society for Exercise Physiology (CSEP) physical activity guidelines (60 minutes moderate-vigorous PA 7 days/week). Ethics approval was obtained through the Conjoint Health Research Ethics Board.

2.1.1 Sample Size

The 3 previously published studies evaluating yoga in children with cancer were all feasibility studies (Geyer et al., 2011; Moody et al., 2010; Theygeson et al., 2010); therefore, the ability to formulate a sample size estimation utilizing this literature was limited. The sample size calculation was carried out using GPower 3.1 (Faul, Erdfelder, Lang & Buchner, 2007). The estimate was based on a clinically significant change in score on the HRQL measure, PedsQL (Cohen's $f=.25$) (Chen & Chen, 2010; Varni, Burwinkle, Seid, & Skarr, 2003), an α of .05 and a power of .80. This indicated a

minimum of 17 participants were to be recruited from the ACH. Accounting for attrition, an extra 20% (n=3) was added to this number, to total 20 children. This sample size estimate was the goal for recruitment. However, given the small sample sizes commonly reported in the literature, and the timeline limitations in this project, obtaining a smaller sample size was expected for the current study.

2.1.2 Recruitment

There are approximately 110 new pediatric cancer diagnoses/year in Alberta (Alberta Cancer Registry, 2009), and an estimated 60 to 80 of these receive their treatments at the ACH. Unfortunately, the number of out-patients receiving treatment at the ACH, between 5 and 18 years and residing in Calgary, was not available. To maximize the number of participants recruited through the HOT program out-patient clinic at the ACH, HCPs identified potential participants and gave parents a “Consent to Contact” form (see Appendix C). The research coordinator followed up with those parents who agreed to be contacted with information on the study. If participants and their guardians were interested, the coordinator ensured participants met eligibility criteria, sent the pediatric assent and parental consent forms (Appendix D and E respectively), facilitated obtaining medical clearance (Appendix F) and scheduled their baseline assessment. This on-site method of patient recruitment was chosen to enhance recruitment efforts (over and above a mail-out or other off-site method), as the families would feel supported to engage in the program. Additionally, research project information went out through the Kids Cancer Care Foundation (KCCF) email list. Interested participants and their parents contacted the coordinator, and if they met the inclusion criteria, the research coordinator sent both the pediatric assent and parental

consent forms, facilitated obtaining medical clearance, and scheduled their baseline assessment.

2.2 Design and Procedure

This theory-based intervention employed several techniques targeting the various constructs in the TPB. Affective and instrumental attitudes of patients and their parents were influenced by recruiting HCP support for the program, making the classes fun, and providing educational materials outlining the short- (affective attitude) and long-term (instrumental attitude) psychosocial and physical benefits of yoga in pediatric oncology. Injunctive and descriptive components of SN were influenced by allowing participants to bring a sibling to the sessions, encouraging home-based practice with friends and family, providing an opportunity for participants to work together, and facilitating feelings of peer support. Self-efficacy and controllability components of PBC were influenced by providing modifications for all poses, allowing for mastery experiences and allowing participants to create their own home-based practice through the yoga handouts (in select weeks). Intention was influenced by targeting attitude, SN and PBC, emphasizing regular attendance, and encouraging accountability. Table 2 highlights how each construct was targeted in the intervention.

Table 2. Summary of Theoretical Constructs and Intervention Strategies

Theoretical Construct	Intervention Strategy
Attitude: Instrumental	<ul style="list-style-type: none">- Long-term benefits and safety of yoga practice were discussed in class and an overview of yoga/PA literature was presented in the welcome package (Appendix G).- Participants and their parents were encouraged to ask the instructor any questions they had regarding the benefits of yoga.
Attitude: Affective	<ul style="list-style-type: none">- Short-term benefits and safety of yoga were emphasized. This included: making friends, having fun, and reducing stress.- Props, music and themes were used to create a fun and welcoming atmosphere.- Each pose was tailored to the wide range of functional abilities.- Participants were encouraged to engage in home-based practice with their families. Take home handouts showing the poses guided home-based practice.

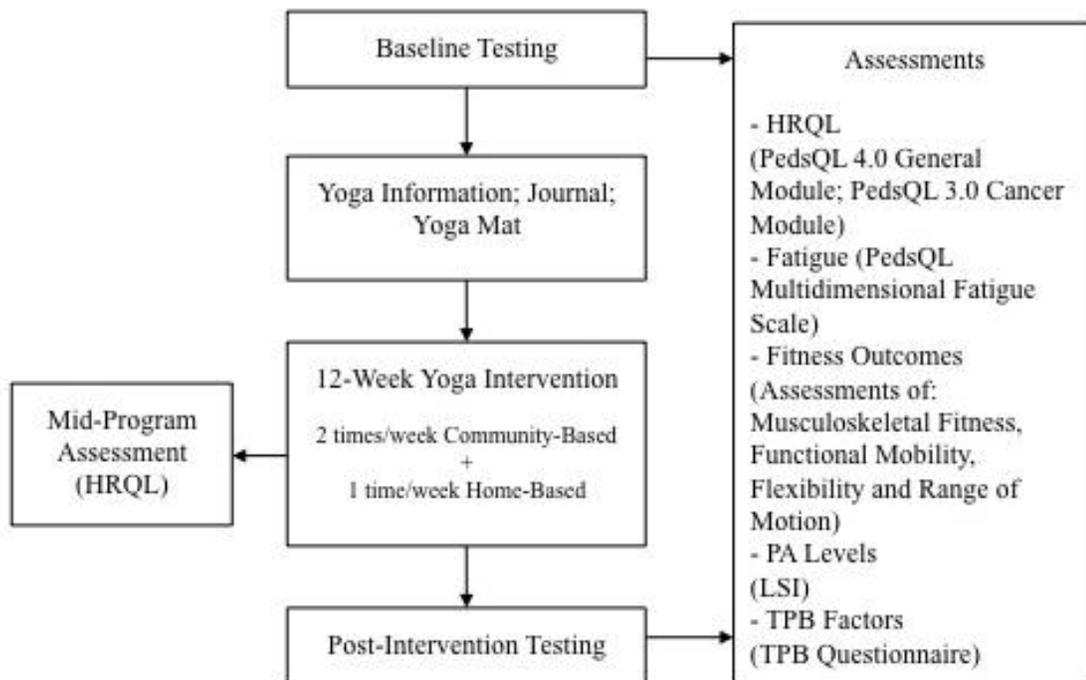
Theoretical Construct	Intervention Strategy
SN: Injunctive	<ul style="list-style-type: none"> - Enlisted the support of the HCPs at the ACH. - Enlisted the support of significant others, including: parents, siblings, cousins, friends and other survivors. - Fostered a ‘team’ environment by practicing team and partner poses.
SN: Descriptive	<ul style="list-style-type: none"> - Created home-based yoga handouts with pictures of modified poses and instructed participants to invite siblings, friends and cousins to participate with the participant (see Appendix H for home-based yoga handout).
PBC: Self-Efficacy	<ul style="list-style-type: none"> - Participants were provided with the prerequisite knowledge and basic understanding of yoga/PA during treatment in the welcome package and throughout the 12-week intervention. - Poses were broken down to make them accessible and several opportunities were provided to practice skills and ensure mastery experiences. - The intensity of poses and classes increased gradually over the 12-week intervention (see Appendix I for the full 12-week protocol).

Theoretical Construct	Intervention Strategy
PBC: Self-Efficacy (continued)	<ul style="list-style-type: none"> - Options were given to take poses further for those patients who were at a higher functional level in order to allow them to achieve their desired goals. - Participants were given a journal to record their practice and thoughts. This was used to reflect back on their weeks of practice to see how far they had come. - Participants were given home-based handouts each week so they could work on the poses and have mastery experiences.
PBC: Controllability	<ul style="list-style-type: none"> - Participants were given a journal to record their home-based practice and thoughts before and after each yoga class. - Participants were given a yoga mat that they were responsible to bring to and from each session. - Potential barriers were discussed while introducing the theme at the start of each class. - Participant choice was emphasized for home-based practice.

Theoretical Construct	Intervention Strategy
Intention	<ul style="list-style-type: none"> - The intervention attempted to target attitudes, SN and PBC. - Emphasized the importance of regular attendance and participation. - Accountability to the program and themselves was discussed.

Note. ACH: Alberta Children’s Hospital; HCP: Health Care Professional; PBC: Perceived Behavioural Control; SN: Subjective Norm.

Figure 2 illustrates the flow of the intervention. After eligible patients were contacted, assented to participation and received parental consent, their baseline assessment was scheduled and completed. Participants received a welcome package (Appendix G), a yoga mat, and journal prior to their first yoga session. The journal was given as a tool to record their weekly yoga/PA and promote mindfulness and reflection before and after each yoga class. Participants engaged in 1-hour yoga sessions at 1 of 3 locations in the Calgary community (Wellspring, the Edgemont Community Association, Yoga and Meditation Centre Calgary) 2 times/week for the duration of the 12-week intervention. Classes were kept small to ensure individual attention and safety (n=7/class). Participants were also asked to engage in home-based practice 1 time/week. The home-based practice was a handout of 4-6 poses (Appendix H), which were selected from that week's class plan (see full 12-week protocol in Appendix I). Participants were given the home-based handouts after their first class of the week. The handout was titled with that week's theme, the name of the poses, and pictures of a 12-year old child practicing the poses. The intention of the home-based handouts were for the participants to go home and practice 4 of the new poses they had learnt in their first class of the week. In weeks 4, 8 and 12, participants were asked to choose 4 poses from 6 they would practice that week. Mid-intervention (week 6) participants were asked to complete the HRQL questionnaire. Post-intervention, participants completed the same battery of measures and assessments as completed at baseline.



Note. HRQL: Health-Related Quality of Life; LSI: Godin Leisure Score Index; PedsQL: Pediatric Quality of Life Inventory; TPB: Theory of Planned Behaviour.

Figure 2. Research flow chart.

2.2.1 Yoga Protocol

A yoga instructor from the Yoga Thrive (YT) program developed the yoga protocol (Wurz, Capozzi, Mackenzie, Danhauer, & Culos-Reed, 2013). YT (<http://wcm.ucalgary.ca/healthandwellnesslab/programs/yoga-thrive>) is a 12-week evidence-informed therapeutic yoga program for adult cancer survivors and their support persons. For the current research, the instructor modified the YT protocol to create a low-impact 12-week pediatric protocol (Appendix I). The 12 weeks were divided into 12 themes, with the 2 classes/week focusing on the chosen theme. The themes included: connection, grounding, awareness, balance, stability, strength, love, creativity, body appreciation, patience and acceptance, meditation in motion and unity. Prior to being implemented, the protocol was reviewed by a team of yoga instructors, CSEP-Certified Exercise Physiologists (CEPs) and a physiotherapist from the HOT program at the ACH. This was done in an effort to enhance safety and ensure the protocol would adequately target both psychosocial and physical health outcomes. The 3 yoga instructors who taught the protocol were required to have extensive complementary backgrounds in yoga for children and yoga for cancer survivors. The classes were modeled after a standardized yoga class and consisted of warm-up, supine/seated/kneeling poses, standing poses, group activity, supine/seated/kneeling/prone poses, cool-down and a final resting pose. Before and after each class, time was allocated for journaling. Each element included in the protocol was designed to target some aspect of the outcome variables (psychosocial, physical and/or theoretical). A general class outline and reasons for use can be seen in Table 3. All poses had available modifications and participants were instructed on these when necessary.

Table 3. General Class Outline

	Category of Poses Included and Rationale for Use
Journaling	To provide participants a chance to reflect on the weekly theme and mentally prepare for their practice.
Warm-Up	<i>Breath Work</i> (pranayama): To elicit the relaxation response. To prepare for the yoga class.
Supine/Seated/Kneeling	<i>Supine, Seated or Kneeling Poses</i> : To bring awareness to the body, mind and breath. To warm the body up with gentle <i>Flexibility Poses</i> : To increase flexibility and range of motion of major joints and muscle groups. Focus on: hip flexors, hamstrings, and ankle dorsiflexion.
Standing	<i>Preparation Poses</i> : To prepare the body and mind for the standing poses to follow. Focus on: legs and feet to promote balance and equal weight distribution, hips and lower back to release tension, core to promote a sense of awareness. <i>Strengthening Poses</i> : To increase muscular strength. Focus on: major muscle groups.

Category of Poses Included and Rationale for Use	
Supine/Seated/Kneeling/Prone	<p><i>Supine, Seated, Kneeling or Prone Poses:</i> To bring awareness back to the body, mind and breath. Focus on gentle <i>Flexibility Poses:</i> To increase range of motion and flexibility of major joints and muscle groups. Focus on: hip flexors, hamstrings, core, and ankle dorsiflexion.</p>
Cool-Down	<p><i>Cool-Down Poses:</i> To mentally review the yoga class. To bring in an element of mindfulness. To cool the body down and prepare for final resting pose. Focus on <i>Breath Work</i> (pranayama): To elicit the relaxation response.</p>
Final Resting Pose	<p><i>Savasana:</i> To promote relaxation and restore balance to the body and mind.</p>
Journaling	<p>To provide participants a chance to reflect on their practice.</p>

2.3 Outcome Measures

Feasibility was assessed by recruitment, attendance and retention. At baseline (week 1) and post-program (week 12) participants completed a number of measures assessing HRQL, fatigue, fitness outcomes, PA levels and theoretical factors. Mid-program (week 6) participants completed HRQL questionnaires.

2.3.1 Program Feasibility

Recruitment, attendance and retention were measures of program feasibility. Participant recruitment was defined as the number of participants enrolled in the program out of the total number eligible. Attendance was defined as the number of yoga sessions participants came to. Retention was defined as how many participants completed the intervention and all scheduled assessments.

2.3.2 Health-Related Quality of Life

Both participants and parents completed the PedsQL General and Cancer Module to assess HRQL. Patients were asked to complete a self-report evaluating their HRQL and parents were asked to complete a parent-proxy report evaluating their perceptions of *their child's* HRQL. Given reported moderate-to-strong agreement between self- and parent-proxy ratings, both were utilized to help interpret the child's illness experience (Parsons, Fairclough, Wang, & Hinds, 2012).

2.3.2.1 PedsQL 4.0 General Module

The PedsQL 4.0 General Module (Appendix J) is composed of generic multidimensional core scales, which can be integrated with the PedsQL disease specific modules. It contains 23 items across physical, emotional, social and school domains of functioning. A Likert-type response scale is used for each item with higher scores

indicating better functioning. Summary subscales (psychosocial and physical functioning) and total scores for each category can be generated. Internal consistency reliability for the total score ($\alpha = 0.88$ self-report, 0.93 parent-proxy report), Physical Health Summary Score ($\alpha = 0.80$ self-report, 0.88 parent-proxy report), and Psychosocial Health Summary Scores ($\alpha = 0.83$ self-report, 0.86 parent-proxy report) are acceptable, and validity has been demonstrated using the known-groups method (Varni, Burwinkle, Katz, Meeske & Dickinson, 2002). Versions for 3 different age ranges were used in the present study. A young child report (ages 5-7) and associated parent-proxy report; a child report (ages 8-12) and associated parent-proxy report; and, a teen report (ages 13-18) and associated parent-proxy report.

2.3.2.2 PedsQL 3.0 Cancer Module

Participants and their parents completed the PedsQL Cancer Module (Appendix K). It was designed to measure HRQL in pediatric oncology patients. It contains 27 cancer/treatment specific-items. A Likert-type response scale is used for each item with higher scores indicating better functioning. It has been demonstrated reliably acceptable for group comparisons ($\alpha = 0.72$ self-report, 0.87 parent-proxy report). The PedsQL Cancer Module has support for use as an outcome measure in clinical trials, research and clinical practice (Varni, et al., 2002). The PedsQL has been used in several trials at the ACH. The same versions for 3 different age ranges, as previously noted, were used in the present study.

2.3.3 Fatigue

2.3.3.1 PedsQL Multidimensional Fatigue Scale

Participants and parents completed the PedsQL MFS to measure fatigue (Appendix L). It contains 18 fatigue specific-items. A Likert-type response scale is used for each item with higher scores indicating better functioning. The internal consistency reliability for this measure is acceptable ($\alpha = 0.89$ self-report, 0.92 parent-proxy report). The scale has support for use as an outcome measure in clinical trials, research and clinical practice (Varni, et al., 2002). Versions for the 3 different age ranges were used in the present study.

2.3.4 Fitness Outcomes

Assessment of the impact of the yoga program on the physical status of the pediatric cancer patients was performed through a battery of assessments. Assessments were performed by 1 CEP according to Canadian Physical Activity Fitness and Lifestyle Approach protocol (CPAFLA) guidelines (CSEP, 2003), the US Department of Health and Human Services: National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents (USDH, 2005) and the FITNESSGRAM Battery (Human Kinetics, 2005). The FITNESSGRAM battery uses criterion-referenced standards to evaluate fitness performance in children. Performance is classified in the health fitness zone (HFZ) if it is sufficient to offer some degree of protection against conditions that result from sedentary living.

2.3.4.1 Physiological Screening

As is standard in physical fitness assessments, participants heart rate (HR), blood pressure (BP), height and weight were taken to ensure they met the minimum levels of health to participate in the physical fitness tests and subsequent 12-week yoga program.

2.3.4.1.1 Heart Rate

Participants resting HR was measured using a stethoscope and stopwatch. Participants were asked to sit in a chair, and rest with feet flat on the floor for at least five minutes before the resting HR was measured (CSEP, 2003). The diaphragm of the stethoscope was placed on either the sternum or over the second intercostal space on the left side. If this was difficult, resting HR was measured by palpating the radial artery using the index and middle fingers, applying gentle pressure on the inside of the wrist just proximal to the thumb (CSEP, 2003).

2.3.4.1.2 Blood Pressure

A child size BP cuff was applied to participants right arm 2-3 cm above the antecubital space (USDH, 2005). The arm was supported at an angle of 10-45° from the trunk. The CEP located the brachial artery at the antecubital space by palpation. The cuff was inflated 20-30mmHg above the radial palpatory pressure and the diaphragm of the stethoscope was placed over the radial artery. The systolic pressure was determined by the first Korotkoff sound and the diastolic pressure was recorded at disappearance of the 4th Korotkoff sound (USDH, 2005).

2.3.4.1.3 Body Mass Index

Participants BMI's were calculated according to the CPAFLA protocol (weight/height; kg/m²) (CSEP, 2003). Standing Height (m): Assessed participant's

vertical size. This was measured on a fixed stadiometer with a vertical backboard and a moveable headboard (CSEP, 2003). Weight (kg): Participants weight was taken on a scale, following the CPAFLA protocol (CSEP, 2003).

2.3.4.2 Musculoskeletal Fitness

2.3.4.2.1 Grip Strength

The combined grip strength of the right and left hands was used to assess isometric muscular strength. A sum was determined in kilograms from the best score of 2 trials recorded for each hand using a hand-held dynamometer according to the CPAFLA protocol (CSEP, 2003). Grip strength has been shown to be strongly correlated with total muscle strength in children and adolescents, with correlation coefficients between $r = .74$ and $r = .89$ (Wind, Takken, Paul, Helders & Engelbert, 2010).

2.3.4.2.2 Knee Extension

Knee extension was measured by the maximal voluntary force participants could exert during a single contraction using the break technique, in which the examiner gradually overcomes the muscle force of the participant and stops at the moment the extremity gives way (Bohannon, 1988). The CEP demonstrated the test with each child prior to the assessment. Participants were asked to sit on the edge of a padded table with thighs fully supported and the hip and knee at 90° . The piston of the dynamometer was held perpendicular to the anterior surface of the leg. The plate of the dynamometer was placed just proximal to the ankle on the anterior surface of the leg. The CEP exerted force while the participant attempted to maintain their leg position. When the participant could no longer maintain their leg position, the force was recorded. High intraclass correlation

coefficients, from $r=.90$ to $r=.99$ within- and between-subjects have been reported for this technique (Bohannon, 1997; Bohannon, 1986).

2.3.4.2.3 Partial Curl-Up

Partial curl-up measured the muscular endurance of the abdominal muscles. Following the FITNESSGRAM battery protocol, participants were asked to assume a supine position on a mat with 140° knee angle, feet together, heels in contact with the ground, arms extending along the thighs and fingers pointing towards knees. The CEP placed a measuring strip under the participants' legs so that the participants' fingertips were just resting on the nearest edge of the measuring strip. After the participant was set up, they were asked to engage in flexion of the neck and slowly curl-up until their fingertips moved to the opposite end of the measuring strip. At this point the CEP ensured the trunk was not raised greater than 30° from the floor. During the curl-up, the CEP ensured the participant's heels remained in contact with the floor (Human Kinetics, 2005). The assessment was performed at a specified pace (40 bpm on a metronome). The assessment was stopped when: heels lifted, cadence could not be kept, or head did not return to the mat (Human Kinetics, 2005).

2.3.4.3 Functional Mobility

The Time Up and Go (TUG) test of 3m was used to assess functional mobility (Marchese et al., 2003). The test has been shown to be reliable and valid in healthy children and also in children with various diseases or disabilities with test-retest reliability in pediatric oncology reported at $r=.83$ (TUG) (Marchese et al., 2003; Marchese et al., 2004). The test is commonly used to measure the capacity of children to do daily activities. In this test the participant was instructed to sit with 90° hip and knee

flexion. At a given signal the participant was instructed to get up, walk 3m, turn and come back as fast as possible without running. The CEP measured the time spent performing this test with a timer. The test was performed three times and the best time was recorded. Between each attempt the participant was instructed to rest for two minutes. At least one familiarization session was performed prior to the test.

2.3.4.4 Flexibility and Range of Motion

2.3.4.4.1 Back-Saver Sit and Reach Test

The FITNESSGRAM battery protocol was used (Human Kinetics, 2005) to measure the flexibility of the hamstring muscles. The back-saver sit and reach test has been shown to be significantly correlated with the traditional sit and reach test and flexibility of hamstrings ($p < .01$). Additionally, the back-saver sit and reach test for the left ($p < .01$) and right ($p < .05$) leg has been significantly associated with hamstring flexibility (Baltaci, Un, Tunay, Besler & Gerceker, 2003). Furthermore, the sit and reach test has been successfully performed in school physical education classes (Human Kinetics, 2005), suggesting its feasibility and applicability as a child appropriate measure. The participants were instructed to sit with one foot fully extended and flat against the face of the box. The other knee was bent with the sole of the foot flat on the floor. The instep was placed in line with, and 2-3 inches to the side of, the straight knee. The participants were instructed to extend their arms forward over the measuring scale (with one hand placed on top of the other). With palms down, the participants were instructed to reach directly forward keeping the back straight and head up. They did this 4 times, and on the 4th reach held for at least 1 second. The participant was then asked to switch legs. The test was performed 2 times on each side.

2.3.4.4.2 Dorsiflexion Range of Motion

Participants were instructed to sit at the edge of a padded surface with the knee flexed to 90°, the foot was placed in 0° inversion and eversion. Ankle DF-ROM passive and active was assessed by aligning a goniometer, calibrated in one-degree increments, with the lateral plantar surface of the heel and foot. The centre fulcrum of the goniometer was positioned over the lateral aspect of the lateral malleolus. The CEP then instructed the participant to pull their toes up as far as they could (active ROM), after assessing active ROM, the CEP used one hand to move the foot into DF by pushing up on the bottom of the foot (passive ROM) (Norikin & White, 2003).

2.3.4.4.3 Knee Range of Motion

Both passive and active knee flexion ROM were assessed. Participants were asked to assume the supine position with hip and knee in neutral rotation. The femur was stabilized to prevent rotation, abduction or adduction of the hip. The participant was instructed to pull their heel toward their buttocks, by bending their knee up (active ROM). The CEP then held the participants ankle in one hand and moved the posterior thigh with the other hand to the end of the range of knee flexion (passive ROM). The goniometer was aligned following the protocol discussed in Norikin and White (2003), with the centre of the fulcrum over the lateral epicondyle of the femur, the proximal arm aligned with the lateral midline of the femur, and the distal arm aligned using the lateral malleolus and fibular head for reference.

Both passive and active knee extension ROM were assessed. Participants were asked to assume the supine position with hip and knee in neutral rotation and legs stretched out. The femur was stabilized to prevent rotation, abduction or adduction of the

hip. The participant was instructed to extend their leg as much as possible (active ROM). The CEP then lifted the participant's ankle in one hand to the end of the range of knee extension (passive ROM). The goniometer was aligned following the protocol discussed in Norkin and White (2003) with the centre of the fulcrum placed over the lateral epicondyle of the femur, the proximal arm aligned with the lateral midline of the femur, and the distal arm aligned using the lateral malleolus and fibular head for reference.

2.3.4.4.4 Back Scratch Test

Shoulder ROM was assessed by the back scratch test (Human Kinetics, 2005). This test was done in the standing position. The participant was asked to place one hand behind their head and back over their shoulder, and reach as far as possible down the middle of their back, their palm touching their body and the fingers directed downwards. They were instructed to place the other arm behind their back, palm facing outward and fingers upward. They were told to reach up as far as possible with the goal of touching or overlapping the middle fingers of both hands. The CEP directed the participant so the fingers were aligned. The CEP then measured the distance between the tips of the middle fingers. If the fingertips touched then the score was zero. If they did not touch, the distance between the fingertips (a negative score) was measured, if they overlapped, the amount of overlap (a positive score) was measured. Participants were given 2 practice attempts on each side, and then were tested 2 times on each side (Human Kinetics, 2005).

2.3.5 *Physical Activity Levels*

PA levels were measured subjectively using the Godin Leisure Score Index (LSI) of the Godin Leisure Time Exercise Questionnaire (GLTEQ) (Godin & Sheppard, 1985; Godin, Jobin, & Bouillon, 1986). The LSI was modified to include activity durations for

all 3 intensities (mild, moderate and strenuous; see Appendix M). To calculate the primary outcome of total PA, the frequency of each PA reported per week within each intensity category was multiplied by the average reported duration, weighted by an estimate of the metabolic equivalent (MET), summed across all intensities and expressed as average MET hours/week. The standard MET weightings for intensities are as follows: mild (3 METs), moderate (5 METs), and strenuous (9 METs). This method for assessing PA behaviour has been previously validated, with a test-retest reliability of 0.64 (Godin et al., 1986). Moreover, it has been utilized in the pediatric oncology and PA literature (Keats & Culos-Reed, 2008; Norris et al., 2010).

2.3.6 Theoretical Determinants

Participants completed the TPB questionnaire which was composed of 4 sub-components assessing attitude, SN, PBC and intentions (see Appendix N for full questionnaire). This questionnaire has been previously validated and used in pediatric oncology PA research (Keats & Culos-Reed, 2008; Keats & Culos-Reed, 2009). The sub-components are listed below. For children under 7, the questionnaire was administered with the assistance of the parent/guardian.

Attitude was measured using 14 adjective items that assessed both instrumental (n=7 i.e., useful-useless, harmful-beneficial) and affective (n=7 i.e., enjoyable-unenjoyable, boring-interesting) aspects of attitude as rated on a 7-point unipolar scale (extremely 1 and 7; quite 2 and 6; slightly 3 and 5). Internal consistency for the instrumental and affective subscales has been reported as 0.86 and 0.91 respectively (Keats & Culos-Reed, 2009).

SN was measured using 3 items rated on a 7-point bipolar scale ranging from 1 (strongly disagree) to 7 (strongly agree). The internal consistency for this scale has been reported to be 0.87. Questions include: (1) Since my diagnosis, people who are important to me think that I should be physically active; (2) Since my diagnosis, people who are important to me approve of me being physically active; and (3) Since my diagnosis, people who are important to me support me being physically active (Keats & Culos-Reed, 2009).

PBC was measured using 8 items rated on a 7-point bipolar scale ranging from 1 (strongly disagree) to 7 (strongly agree). The internal consistency's for the self-efficacy and controllability scales have been reported to be 0.94 and 0.89 respectively (Keats & Culos-Reed, 2009). This portion of the questionnaire captures an individual's confidence to perform the behaviour (i.e., self-efficacy; 4 items) as well as the individual's belief that they have control over their behaviours (i.e., controllability; 4 items) (Keats & Culos-Reed, 2009).

Intention was measured with 3 items rated on a 7-point, bipolar scale that ranged from 1 (strongly disagree) to 7 (strongly agree). The internal consistency for this scale has been reported to be 0.89 (Keats & Culos-Reed, 2009).

2.4 Data Analysis

The data were analyzed in SPSS 20. Given the exploratory nature of the study, the small sample sizes, and recruitment issues documented in pediatric oncology, a repeated measures within-subjects design was selected. All analyses and data were treated per-protocol, which was defined as those participants who completed assessments at all 3 time points (baseline, mid-intervention and post-intervention). Missing data were dealt

with conservatively by employing listwise deletion. Descriptive data analyses were performed to describe the sample and determine feasibility. The primary outcome of HRQL and one of the secondary outcomes (fatigue) were assessed using repeated measures ANOVA's. These were followed up with apriori contrasts to explore change over the course of the intervention. Violations in sphericity were handled with the Greenhouse-Geisser correction. Violations in normality were expected in the current study, however, given the exploratory nature of the project the decision was made not to transform the data. The secondary and tertiary outcomes of musculoskeletal fitness, functional mobility, flexibility and ROM, PA levels and TPB factors were assessed using related-samples analyses. Both parametric and non-parametric tests were performed. There were no differences in results, thus the parametric t-tests were reported. While it is recognized that the use of repeated t-tests increases the probability of Type I error, no statistical adjustment was made to control for the use of the repeated tests as the risk of Type II error was viewed as a greater concern. Correlations between TPB factors and PA levels were performed to see if attitude, SN, PBC or intention were related with reported PA behavior at baseline and post-intervention.

Chapter Three: **Results**

3.1 Participant Characteristics

Table 4 presents the characteristics and medical profiles of the participants who completed the intervention. In summary, a total of 8 out-patients, ranging from 5-17 years of age with a mean age of 11.88 ($SD=4.26$) participated. The sample was 50% male and 50% female. Medical data revealed a mixed-cancer sample comprised of patients diagnosed with osteosarcoma ($n=1$), central nervous system tumours ($n=2$), ALL ($n=2$), chronic myeloid leukemia (1), lymphoma ($n=1$) and multiple cancers ($n=1$; neuroendocrine tumour and Burkitts lymphoma). Half of the sample were receiving or had received chemotherapy, while the other half were receiving or had received multiple medical interventions (i.e., surgery, chemotherapy, radiotherapy, stem cell transplant).

Table 4. Characteristics and Medical Profile of Study Participants

Participant	Gender	Age (y)	Diagnosis	Treatment Protocol
1	M	14	Osteo	Chemo; Surg
2	F	14	Lymph	Chemo
3	F	5	CNS	Chemo
4	F	14	ALL	Chemo; Rad
5	M	8	CML	Chemo
6	M	15	CNS	Chemo; Rad; SCT
7	F	8	Mult	Chemo; Surg; Rad
8	M	17	ALL	Chemo
Total: N=8	F: n=4 M: n=4	$M=11.88\pm 4.26$	Osteo: n=1; CNS: n=2; ALL: n=2; CML: n=1; Lymph: n=1 Mult: n=1	Chemo: n=4 Mult: n=4

Note. F: Female; M: Male; y: Years; N: Total Sample Size; n: Sample Size; M =Mean; ALL: Acute Lymphoblastic Leukemia; CML: Chronic Myeloid Leukemia; CNS: Central Nervous System Tumour; Lymph: Lymphoma; Mult: Multiple; Osteo: Osteosarcoma; Tx: Treatment; Chemo: Chemotherapy; Surg: Surgery; Rad: Radiation; SCT: Stem Cell Transplant.

3.2 Program Feasibility

3.2.1 Recruitment

A total of 32 participants were assessed for eligibility. Ten patients self-referred through the KCCF and 25 patients were given Consent to Contact forms by their HCP. Three patients given the Consent to Contact form declined to be contacted regarding the study. Of the 32 responding families, 24 were eligible. Eight participants were excluded for not meeting the inclusion criteria (specifically, being less than 5 years of age). The remaining 13 declined to participate due to the timing of the classes, going on holidays and/or planning to return to school/extra-curricular activities (n=9) or because their condition was worsening and they were not sure their child could complete the 12-week program (n=4). Thus, the recruitment rate was 46% (11 enrolled/24 eligible). See Figure 3 for participant recruitment.

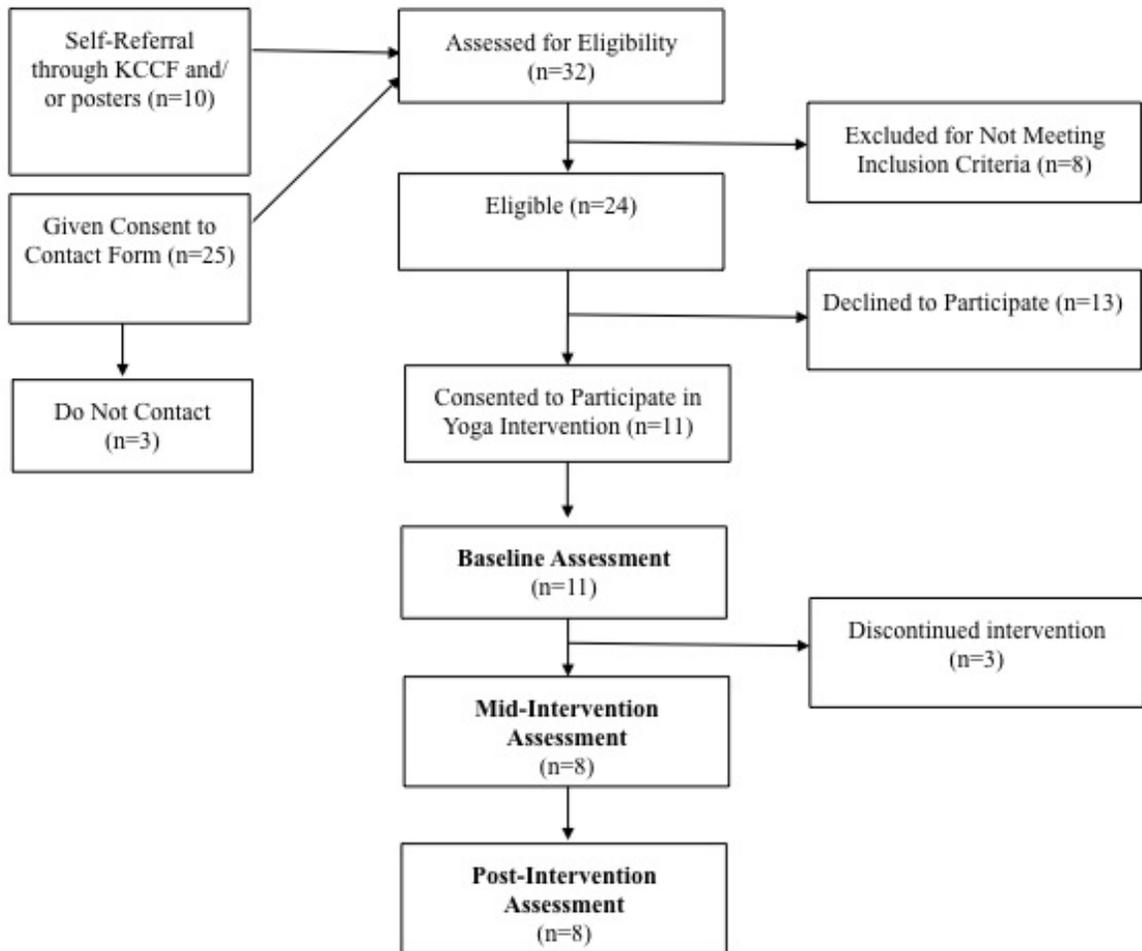


Figure 3. Participant recruitment and retention.

3.2.2 Attendance

Attendance for intervention completers in the current study was 55%, ranging from a minimum of 42% (10/24 sessions attended) to a maximum of 88% (21/24 sessions attended). Main reasons for not attending included treatment schedule conflicts (i.e., being admitted as an in-patient), too busy, going on holiday, and not feeling well. Home-based practice was not assessed, as the journals were used only as a tool to enhance PBC for the individual participant.

3.2.3 Retention

Of the 11 out-patients enrolled, 73% (8/11) of patients completed the 12-week program. Of the completers, 100% (8/8) of out-patients completed all assessments, while 88% (7/8) of parents completed all parent-proxy reports. Non-completers (27%) attended baseline assessments and an average of 1.67 classes before dropping out. Reasons for discontinuing included: not liking yoga (n=1), returning to school (n=1) and being too busy with appointments (n=1). See Figure 3 for participant retention.

3.3 Health-Related Quality of Life

Descriptive statistics, changes in HRQL and apriori contrasts are presented in Table 5 and Table 6. Repeated measures ANOVA's were performed on all HRQL data to determine changes over the 12-week intervention. When running repeated measures ANOVA's there are 3 important assumptions that must be met: sphericity, normal distribution, and homogeneity of variance (Dunn, 2001). Mauchly's Test of Sphericity could be assumed for all HRQL variables (with the exception of patient-reported (aka self-reported) school health which did not meet the assumption). Thus, Greenhouse-Geisser degrees of freedom and associated *p* values were reported for this variable. With

regards to normal distribution of scores, 55% (23/42) of patient- and parent-proxy reported HRQL measures (at time 1, time 2 and time 3) violated kurtosis of ± 1 . Kurtosis is a measure of whether the data are peaked or flat relative to normal distribution. In this study, the majority (74%; 17/23) of violations were negative, meaning that the data were flatter than normal. Of these, 76% (13/17) were -1.0 to -2.0, and 24% (4/17) were -2.0 to -3.0. The remaining 26% (6/23) of the exceptions were positive, meaning that the data was more peaked than what is assumed to be normal. Of these, 17% (1/6) were 1.0 to 2.0, 50% (3/6) were 2.0 to 3.0 and 33% (2/6) were 3.0 to 3.5. Skewness, a measure of symmetry was violated in 19% (8/42) of time 1, time 2 and time 3 HRQL measures (patient-reported total HRQL and psychosocial health and parent-proxy reported total HRQL, physical, school and psychosocial health). Twenty-five percent (2/8) were skewed left and ranged from -1.2 to -1.5, while the remaining 75% (6/8) were skewed to the right and ranged from 1.0 to 1.8. Although there are techniques that could be used to normalize the data, such as the square-root or logarithmic transformation (Dunn, 2001), given the preliminary nature of the study, no transformations were used and subsequent analyses were performed with violations in mind. Homogeneity of variance is assessed with Box's M or Levene's test. However, given that there was no between factor, it was possible to overlook this assumption. Given the small sample size ($n=8$), and exceptions to the tests of sphericity and normal distribution discussed above, results must be interpreted cautiously.

Both patients ($n=8$) and parents ($n=7$) completed HRQL assessments. Results suggest positive trends on all measures of HRQL across the 12-week intervention (Table 5). Patients reported significant improvements in overall ($F(2,14)=5.23, p=.020$) and

psychosocial health ($F(2,14)=3.81, p=.048$), while parents reported significant improvements in their child's overall HRQL ($F(2,12)=8.05, p=.006$), psychosocial ($F(2,12)=8.43, p=.005$), physical ($F(2,12)=6.05, p<=.015$), emotional ($F(2,12)=4.16, p=.042$), social ($F(2,12)=6.08, p=.015$), and school ($F(2,10)=5.72, p=.022$) functioning, as well as improvements on measures of cancer-specific symptoms ($F(2,12)=4.76, p=.030$).

Apriori contrasts of patient-reported outcomes revealed the largest differences from pre- to post-intervention on overall HRQL ($p=.033$) and psychosocial health ($p=.043$) scores (Table 6). Mid-program to post-program, participants noted significant improvements on their school functioning ($p=.017$). The largest changes on parent-proxy report HRQL were pre- to post-intervention. Specifically, parents reported their child's overall HRQL ($p=.026$), psychosocial ($p=.028$), physical ($p=.030$), and social ($p=.037$) health, as well as measures of cancer-specific symptoms ($p=.033$) significantly improved from pre- to post-intervention. After 6-weeks in the yoga program, parents reported significantly improved perceptions of their child's overall HRQL ($p=.020$), psychosocial ($p=.009$) and school ($p=.023$) functioning, as well as improved measures of cancer-specific symptoms ($p=.034$) (Table 6).

Importantly, measures on the PedsQL General Module reached the minimal clinically important difference (MCID) for HRQL improvements over the course of the 12-week intervention. The MCID has been previously defined as the smallest difference in a score that would mandate a change in the patient's care (Jaeschke, Singer, & Guyatt, 1989). A 4.4 change in patient-reported HRQL and a 4.5 change in parent-proxy reported HRQL on the PedsQL General Module has been determined as a MCID (Varni et al.,

2003). Table 6 highlights 88% (32/36) of change scores (pre- to mid- difference, mid- to post- difference, and pre- to post- difference) for both patient and parent-proxy reports on the PedsQL General Module are greater than the pre-determined MCID.

Table 5. Repeated Measures ANOVA Changes in HRQL Across the 12-week Program

	Baseline	Mid-Program	Post-Program	Within-Subjects		
	Mean (SD)	Mean (SD)	Mean (SD)	df	F	<i>p</i>
PedsQL 4.0 General Module						
<i>Total HRQL</i>						
Patient	65.51 (15.47)	69.63 (13.70)	75.57 (17.06)	2,14	5.23	.020*
Parent	53.67 (19.26)	72.11 (13.17)	79.19 (17.45)	2,12	8.05	.006**
<i>Psychosocial Health</i>						
Patient	64.79 (14.65)	69.74 (15.67)	76.25 (17.97)	2,14	3.81	.048*
Parent	55.30 (20.75)	73.61 (14.20)	77.86 (19.50)	2,12	8.43	.005**
<i>Physical Health</i>						
Patient	66.79 (23.56)	69.53 (17.42)	75.00 (23.27)	2,14	.920	.421
Parent	51.34 (25.76)	69.01 (20.72)	81.70 (17.62)	2,12	6.05	.015*

	Baseline	Mid-Program	Post-Program	Within-Subjects		
	Mean (SD)	Mean (SD)	Mean (SD)	df	F	<i>p</i>
<i>Emotional Health</i>						
Patient	67.50 (18.90)	76.88 (16.89)	78.13 (22.51)	2,14	1.40	.279
Parent	58.57 (24.10)	72.14 (15.24)	81.43 (17.01)	2,12	4.16	.042*
<i>Social Health</i>						
Patient	77.50 (16.90)	79.38 (18.01)	84.38 (17.00)	2,14	2.30	.137
Parent	67.14 (17.76)	82.86 (13.80)	87.86 (14.68)	2,12	6.08	.015*
<i>School Health</i>						
Patient	50.00 (29.30)	56.43 (30.10)	64.29 (27.45)	1,4,9,7	.752	.423
Parent	30.83 (34.70)	62.78 (24.28)	60.83 (34.56)	2,10	5.72	.022*
PedsQL 3.0 Cancer Module						
Patient	74.77 (13.15)	71.00 (15.33)	75.74 (17.14)	2,14	.70	.515
Parent	64.08 (23.09)	78.08 (15.74)	76.71 (17.85)	2,12	4.76	.030*

	Baseline	Mid-Program	Post-Program	Within-Subjects		
	Mean (SD)	Mean (SD)	Mean (SD)	df	F	<i>p</i>
PedsQL Multidimensional						
Fatigue Scale						
Patient	69.27 (20.81)	63.72 (20.24)	68.23 (23.68)	1,2,8.1	.70	.449
Parent	50.20 (24.55)	68.06 (15.96)	69.64 (22.34)	2,12	4.47	.035*

**Significant at $p < .01$; *Significant at $p < .05$

Note. df: Degrees of Freedom; HRQL: Health-Related Quality of Life; *p*: Level of Significance; PedsQL: Pediatric Quality of Life Inventory; SD: Standard Deviation.

Table 6. Apriori Pairwise Contrasts in HRQL Across the 12-week Program

	Baseline to Mid Difference ¹			Mid to Post Difference ²			Baseline to Post Difference ³		
	Mean (SD)	df	<i>P</i>	Mean (SD)	df	<i>P</i>	Mean (SD)	df	<i>p</i>
PedsQL 4.0 General									
Module									
<i>Total HRQL</i>									
Patient	4.12(2.44)	1,7	.134	5.93(3.01)	1,7	.089	10.05(3.79)	1,7	.033*
Parent	18.44(5.88)	1,6	.020*	7.09(4.43)	1,6	.161	25.52(8.67)	1,6	.026*
<i>Psychosocial Health</i>									
Patient	4.96 (4.43)	1,7	.30	6.50 (3.30)	1,7	.089	11.46 (4.63)	1,7	.043*
Parent	18.31 (4.88)	1,6	.009**	4.25 (4.15)	1,6	.346	22.56 (7.84)	1,6	.028*
<i>Physical Health</i>									
Patient	2.73 (4.70)	1,7	.579	5.47 (5.11)	1,7	.320	8.20 (8.10)	1,7	.345
Parent	17.67 (8.84)	1,6	.093	12.69 (6.07)	1,6	.081	30.36 (10.76)	1,6	.030*

	Baseline to Mid Difference ¹			Mid to Post Difference ²			Baseline to Post Difference ³		
	Mean (SD)	df	<i>P</i>	Mean (SD)	df	<i>P</i>	Mean (SD)	df	<i>p</i>
<i>Emotional Health</i>									
Patient	9.38 (7.99)	1,7	.279	1.25 (6.60)	1,7	.855	10.63 (6.08)	1,7	.124
Parent	13.57 (7.69)	1,6	.128	9.29 (5.39)	1,6	.136	22.86 (10.11)	1,6	.064
<i>Social Health</i>									
Patient	1.875 (2.30)	1,7	.442	5.00 (3.13)	1,7	.155	6.88 (4.22)	1,7	.147
Parent	15.71 (6.59)	1,6	.054	5.00 (3.45)	1,6	.197	20.71 (7.75)	1,6	.037*
<i>School Health</i>									
Patient	6.43 (14.71)	1,6	.677	7.86 (2.41)	1,6	.017*	14.29 (13.65)	1,6	.335
Parent	31.94 (9.23)	1,5	.023*	1.94 (6.45)	1,5	.775	30.00 (14.08)	1,5	.086
PedsQL 3.0 Cancer									
Module									
Patient	-3.76 (4.74)	1,7	.453	4.74 (2.60)	1,7	.111	.971 (4.98)	1,7	.851
Parent	14.00 (5.12)	1,6	.034*	-1.37 (5.29)	1,6	.804	12.63 (4.58)	1,6	.033*

	Baseline to Mid Difference ¹			Mid to Post Difference ²			Baseline to Post Difference ³		
	Mean (SD)	df	<i>P</i>	Mean (SD)	df	<i>P</i>	Mean (SD)	df	<i>p</i>
PedsQL									
Multidimensional									
Fatigue Scale									
Patient	-5.56 (6.23)	1,7	.401	4.51 (2.03)	1,7	.061	-1.042 (5.67)	1,7	.859
Parent	17.86 (7.14)	1,6	.047*	1.59 (4.34)	1,6	.727	19.44 (9.31)	1,6	.082

**Significant at $p < .01$; *Significant at $p < .05$

Note. Difference¹: Mean Change from Baseline to Mid-Program; Difference²: Mean Change from Mid-Program to Post-Program; Difference³: Mean Change from Baseline to Post-Program; df: Degrees of Freedom; HRQL: Health-Related Quality of Life; *p*: Level of Significance; PedsQL: Pediatric Quality of Life Inventory; SD: Standard Deviation.

3.4 Fatigue

Descriptive statistics and changes in fatigue outcomes are presented in Table 5 and Table 6. Repeated measures ANOVA's were performed on all fatigue data to determine changes over the 12-week intervention. As discussed above, there are 3 important assumptions that must be met: sphericity, normal distribution, and homogeneity of variance (Dunn, 2001). Mauchly's Test of Sphericity could be assumed for parent-proxy reported fatigue, but not patient-reported fatigue. Thus, Greenhouse-Geisser degrees of freedom and associated p values were reported for the patient-reported fatigue variable. With regards to normal distribution of scores, 50% (3/6) of patient- and parent-proxy reported fatigue measures (at time 1, time 2 and time 3) violated kurtosis of ± 1 . The majority (67%; 2/3) of violations were negative, meaning that the data were flatter than normal, and ranged from -1.0 to -2.0. The remaining 33% (1/3) of the exceptions were positive, meaning that the data was more peaked than would be assumed to be normal. Skewness, a measure of symmetry was violated in 16% (1/6) of time 1, time 2 and time 3 HRQL measures (parent-proxy report time 1). Again, although there are techniques that could be used to normalize the data, such as the square-root or logarithmic transformation (Dunn, 2001), given the preliminary nature of the study, no transformations were used and subsequent analyses were performed with violations in mind. Homogeneity of variance is assessed with Box's M or Levene's test. However, given that there was no between factor, it was possible to overlook this assumption. Given the small sample size (patient-report $n=8$; parent-proxy report $n=7$), and exceptions to the tests of sphericity and normal distribution discussed above, fatigue results must be interpreted cautiously.

Both patients (n=8) and parents (n=7) completed fatigue assessments at 3 time points (baseline, mid-intervention and post-intervention). Patient-reported symptoms of fatigue did not change over the course of the 12-week yoga intervention. However, there were statistically significant changes in parent-proxy reported fatigue ($F(2,12)=4.47$, $p=.035$). Apriori contrasts revealed, parents reported their child's overall fatigue improved significantly after 6 weeks in the yoga program (from baseline to mid-intervention) ($p=.045$) (Table 6).

3.5 Fitness Outcomes

Table 7 highlights the changes across fitness parameters over the 12-week intervention.

3.5.1 Physiological Screening

As is standard in physical fitness assessments, participants HR, BP, height and weight were taken to ensure they met the minimum levels of health to participate in the physical fitness tests and subsequent 12-week yoga program. The CEP's did not exclude any participants due to above or below average HR or BP, and all participants BMI's were within the normal range.

3.5.2 Musculoskeletal Fitness

There were non-significant improvements in grip strength, knee extension and partial curl-ups over the course of the intervention.

3.5.3 Functional Mobility

There were significant improvements baseline to post-intervention on the measure of functional mobility ($t(7)=2.71$, $p=.030$), with participants taking significantly less time to complete the task.

3.5.4 Flexibility and Range of Motion

There were large improvements in hamstring flexibility. Participants left hamstring flexibility improved by 5.01 ($SD=2.95$) inches ($t=-4.81, p=.002$) while their right hamstring flexibility improved by 4.95 ($SD=2.96$) inches ($t=-4.43, p=.004$). There were no changes over the course of the intervention on DF-ROM, knee ROM or shoulder ROM.

Table 7.**Changes in Physical Fitness Outcomes Across the 12-week Intervention**

	Baseline	Post-Program	Difference		
	Mean (SD)	Mean (SD)	t	df	p
<i>Musculoskeletal Fitness</i>					
C Grip Strength (kg)	41.50 (20.47)	46.13 (22.70)	-1.9	7	.099
C Knee Extension (kg)	27.75 (9.77)	29.76 (13.74)	-.98	7	.359
Partial Curl-Up (#)	8.88 (8.59)	11.00 (11.21)	-.570	7	.587
<i>Functional Mobility</i>					
Timed Up and Go (s)	5.70 (1.24)	4.74 (.42)	2.71	7	.030*
<i>Flexibility</i>					
Back Saver Sit and Reach					
(inches)					
Left Leg	3.53 (2.28)	8.54 (4.46)	-4.81	7	.002**
Right Leg	4.63 (2.07)	9.58 (4.08)	-4.43	6	.004**

	Baseline	Post-Program	Difference		
	Mean (SD)	Mean (SD)	t	df	p
DF-ROM (degrees)					
LA	6.63 (15.19)	7.38 (7.21)	-.19	7	.856
LP	14.00 (15.06)	11.25 (9.29)	.98	7	.361
RA	5.88 (15.42)	2.38 (10.45)	1.27	7	.246
RP	13.00 (15.59)	9.75 (11.68)	1.42	7	.200
Knee Extension (degrees)					
LA	173.50 (5.86)	171.00 (3.12)	1.75	7	.123
LP	178.75 (7.44)	175.63 (3.85)	1.57	7	.160
RA	168.50 (11.64)	169.38 (5.48)	-.39	7	.707
RP	175.00 (10.88)	174.50 (7.09)	.28	7	.790

	Baseline	Post-Program	Difference		
	Mean (SD)	Mean (SD)	t	df	p
Knee Flexion (degrees)					
LA	145.25 (5.47)	148.50 (6.50)	-1.51	7	.175
LP	153.38 (5.24)	157.50 (5.71)	-2.03	7	.082
RA	138.50 (10.35)	142.38 (17.18)	-1.33	7	.227
RP	149.50 (12.60)	150.88 (17.27)	-.52	7	.623
Back Scratch Test (inches)					
Left	6.98 (14.08)	-.17 (2.60)	1.54	7	.168
Right	.10 (3.04)	1.01 (2.50)	-1.75	7	.124

**Significant at $p < .01$; *Significant at $p < .05$

Note. C: Combined Right and Left; df: Degrees of Freedom; DF-ROM: Dorsiflexion Range of Motion; LA: Left Active; LP: Left Passive; RA: Right Active; RP: Right Passive; p: Level of Significance; s: Seconds; SD: Standard Deviation.

3.6 Physical Activity Levels

Related samples t-tests were performed on the PA data (see Table 8). There were no significant differences over the course of the intervention in the number of times/week participants engaged in PA (frequency). There were however significant increases in the number of minutes (duration) participants spent in PA. Participants reported significant increases in amount of time spent in mild ($t(6)=-3.96, p=.007$), moderate ($t(7)=-3.21, p=.015$) and strenuous ($t(7)=-4.07, p=.005$) PA. Mild activity minutes increased 3-fold from baseline ($M=15, SD=15.48$) to post-intervention ($M=45.00, SD=22.91$). There was a 3-fold increase in moderate activity as well from 12.81($SD=10.13$) minutes at baseline to 36.25($SD=22.00$) minutes post-intervention. Strenuous activity increased approximately 5-fold from 5.31($SD=10.39$) minutes at baseline to 28.44($SD=21.67$) minutes post-intervention. There was a significant increase in total PA (MET hours/week) from baseline to post-intervention ($t(6)=-2.30, p=.039$). Moreover, there was a significant increase in strenuous ($t(7)=-2.20, p=.046$) MET hours/week and a trend toward increases in mild ($t(7)=-2.08, p=.058$) MET hours/week.

Table 8. Changes in Physical Activity

	Baseline	Post-Program	Difference		
	Mean (SD)	Mean (SD)	t	df	p
<i>Frequency (times/week)</i>					
Mild	3.36 (2.56)	3.79 (3.34)	-.65	6	.539
Moderate	5.31 (6.78)	3.93 (3.12)	.88	7	.407
Strenuous	.88 (1.80)	2.43 (1.95)	-1.77	7	.120
<i>Duration (minutes)</i>					
Mild	15.00 (15.48)	45.00 (22.91)	-3.96	6	.007**
Moderate	12.81 (10.13)	36.25 (22.00)	-3.21	7	.015*
Strenuous	5.31 (10.39)	28.44 (21.67)	-4.07	7	.005**
<i>METs (hours/week)</i>					
Total MET	7.87 (10.69)	18.57 (22.72)	-2.30	6	.039*
Mild MET	1.89 (2.72)	3.34 (4.05)	-2.08	6	.058
Moderate MET	4.18 (7.14)	7.47 (10.18)	-1.59	7	.135
Strenuous MET	1.79 (5.55)	7.57 (10.80)	-2.20	7	.046*

**Significant at $p < .01$; *Significant at $p < .05$

Note. df: Degrees of Freedom; MET: Metabolic Equivalent; p : Level of Significance; SD: Standard Deviation.

3.7 Theoretical Factors

Theoretical factors associated with the TPB were also examined. There were no differences reported from baseline to post-intervention (see Table 9).

Table 9. Changes in TPB Factors

	Baseline	Post-Program	Within-Subjects		
	Mean (SD)	Mean (SD)	t	df	p
Attitude	6.40 (2.27)	5.67 (1.18)	1.06	7	.323
SN	6.54 (.56)	6.29 (1.08)	1.11	7	.303
PBC	4.86 (1.03)	5.50 (.97)	-1.58	7	.159
Intention	5.83 (1.25)	6.00 (1.70)	-.39	7	.708

**Significant at $p < .01$; *Significant at $p < .05$

Note. df: Degrees of Freedom; p: Level of Significance; PBC: Perceived Behavioural Control; SD: Standard Deviation; SN: Subjective Norm.

Correlations between TPB factors and PA behaviour were performed at baseline and post-intervention. At baseline, Table 10 illustrates that 50% of the correlations were low (0 to $< .33$), 40% were moderate ($.33$ to $.66$) and 10% were high ($.66$ to 1). SN was the only construct highly correlated with intention, and none of the constructs were highly correlated with behaviour (MET hours/week). Post-intervention, Table 11 highlights the shift in correlations to 50% being moderate and 50% being high. Furthermore, attitude, SN and PBC were all moderately to strongly correlated with intention (attitude $r(6) = .71$; SN $r(6) = .89$; PBC $r(6) = .57$) and all constructs were moderately to strongly correlated with actual PA behaviour (MET hours/week) (attitude $r(6) = .73$; SN $r(6) = .64$; PBC $r(6) = .71$; intention $r(6) = .65$).

Table 10. Correlations Between TPB Factors and PA Behaviour at Baseline

	Attitude (r)	SN (r)	PBC (r)	Intention (r)	MET hrs (r)
Attitude (r)	–	.41	.25	.25	.38
SN (r)	–	–	.10	.76*	.48
PBC (r)	–	–	–	.34	.15
Intention (r)	–	–	–	–	.03
MET hrs (r)	–	–	–	–	–

**Significant at $p < .01$; *Significant at $p < .05$

Note. PBC: Perceived Behavioural Control; r: Correlation Coefficient; SN: Subjective Norm.

Table 11. Correlations Between TPB Factors and PA Behaviour at Post-Intervention

	Attitude (r)	SN (r)	PBC (r)	Intention (r)	MET hrs (r)
Attitude (r)	–	.65	.73*	.71*	.73*
SN (r)	–	–	.51	.89*	.64
PBC (r)	–	–	–	.57	.71*
Intention (r)	–	–	–	–	.65
MET hrs (r)	–	–	–	–	–

**Significant at $p < .01$; *Significant at $p < .05$

Note. PBC: Perceived Behavioural Control; r: Correlation Coefficient; SN: Subjective Norm.

Chapter Four: **Discussion**

There is a growing recognition of the psychosocial and physical benefits of yoga for adult cancer patients and survivors. Taken together with yoga's preliminary evidence in childhood populations, its utility in adjunctive pediatric cancer care is worthy of further research. The primary purpose of this pilot project was to investigate the feasibility and effects of a 12-week theory-based yoga intervention on HRQL. The secondary purpose included examining select fitness outcomes, and PA levels. The tertiary purpose included evaluating the theoretical factors on which the intervention was based. This study is unique in many aspects. It is the first examination of the benefits of a 12-week theory-based yoga program and the first exploration of yoga's effects on fitness indices and PA levels in a pediatric oncology sample. The results discussed below demonstrate a number of preliminary findings within this population. In particular, feasibility, improved HRQL, improved fitness outcomes and increased PA level results were encouraging. Exploratory correlations bolstered support for the use of the TPB to structure yoga interventions in pediatric oncology. Based on the results, several future directions are proposed, and limitations are discussed.

4.1 Participant Characteristics

The small mixed-cancer out-patient population in the current study is comparable to previous studies exploring yoga in pediatric oncology, which had mixed-oncology sample sizes of 6 (Geyer et al., 2011) to 20 (Moody et al., 2010). However, the current sample is unique in the larger field of PA intervention research, which has focused largely on mixed-cancer survivor (Hinds et al., 2007_b; Keats et al., 2008; Sharkey et al., 1993; Shore & Shepard, 1993; Speyer et al., 2010) and ALL patient populations (Gohar

et al., 2011; Ladha et al., 2006; Ruiz et al., 2010; Suan Juan et al., 2007 both; Takken et al., 2009; Yeh et al., 2011). Those PA studies that have focused on mixed-cancer patient populations have performed their interventions in-hospital; therefore, the present study adds to the small body of literature performed in mixed-cancer patient populations, suggesting a community-based intervention during out-patient treatment may be feasible and beneficial.

4.2 Program Feasibility

Feasibility of yoga/PA interventions in pediatric oncology can be assessed through a variety of methods. Most commonly, research has examined the percentage of patients/families consenting to participate (Thygeson et al., 2010) and overall adherence/attendance rates (Hartman et al., 2009; Keats et al., 2008; San Juan et al., 2008; San Juan et al., 2007_a; San Juan et al., 2007_b). However, it should be noted, in the PA literature, only a handful of studies included in Appendix A actually listed “feasibility” as an outcome measure (Gohar et al., 2011; Ladha et al., 2006; Rosenhagen et al., 2011; Takken et al., 2009; Thygeson et al., 2010).

4.2.1 Recruitment

In an effort to reach as many out-patients as possible, there were 2 primary points of recruitment: (i) HCP assisted recruitment, and (ii) KCCF assisted recruitment. HCP assisted recruitment was the primary source for recruitment and was utilized as a means of enhancing participant attitudes to engage in yoga. Specifically, Wald et al. (2005) suggest that health behaviour change interventions that are recommended, delivered, or supported by HCPs are perceived more favourably and may in turn enhance participants attitudes toward the behaviour. KCCF, the secondary source for recruitment,

was utilized to enhance outreach to potential participants. However, the scope was limited to out-patients who had participated in KCCF events in the past, and were signed up for their distribution emails.

In the present study, a total of 32 potential participants were assessed for eligibility. Figure 3 illustrates the flow of participant recruitment and retention. Of the 32 responding families, 8 were excluded for not meeting inclusion criteria. Therefore, a total of 24 participants were eligible. A total of 9 families declined to participate for reasons associated with the timing/location of yoga classes, going on holidays and/or planning to return to school/extra-curricular activities. A total of 4 families declined due to the worsening condition of the patient. Thus the recruitment rate was 46% (11 enrolled/24 eligible). Comparing recruitment to other yoga studies is difficult given the difference in intervention length and delivery. For example, Geyer et al. (2011) reported that 256 children and their families were eligible to participate in their yoga program, however, inclusion in the study was limited to participants who were able to attend 5 consecutive weekly yoga sessions over a 5-week period, lowering the number of participants to 6. This would translate to a 0.02% recruitment rate (6/256). Thygeson et al. (2010) recruited for their single yoga session over a 9-month enrollment period. They invited 20 children (7-12 years), 12 adolescents (13 to 18 year), and 45 parents. Eleven children, 5 adolescents, and 33 parents chose to participate in the study for recruitment rates of 55% (11/20), 42% (5/12), and 73% (33/45), respectively. Within the larger PA intervention literature, 4 studies have examined 12-week interventions (Collet et al., 2007; Takken et al., 2009; Sharkey et al., 1993; Shore & Shepard, 1999). Takken et al. (2009) evaluated a 12-week combined community and home-based intervention, comparable to the current

study. Of the 16 eligible patients, 7 declined due to time constraints (extra travel to the hospital), not being interested in PA, and wanting to leave the disease behind. Nine children were included in their study for a recruitment rate of 56% (9/16). Thus, although difficult to compare, the recruitment results in the current study are within the ranges of previous research.

4.2.2 Attendance

There has been wide variability in intervention design, with interventions ranging from 1-30 minute session to 2 years (Baumann et al., 2013). However, the majority of research has focused on interventions ranging in length from 8 (San Juan et al., 2007_a; San Juan et al., 2008_b; Yeh et al., 2011) to 16-weeks (Keats & Culos-Reed, 2008, Marchese et al., 2004; Ruiz et al., 2010; San Juan et al., 2007_b). Attendance for these interventions has been reported as ranging from 70% (San Juan et al., 2008_b) to 85% (Keats & Culos-Reed, 2008; Ruiz et al., 2010; San Juan et al., 2007_a; San Juan et al., 2007_b). There is also substantial variability in the number of sessions reported/week, varying from 1 time/week (Keats & Culos-Reed, 2008) to 7 times/week (Winter et al., 2013) and a split in designs that are home-based (n=3), community-based (n=2), hospital-based (n=10), or some combination of the three (community/home (n=2); in-hospital/home (n=3)). The current study was community-based and required participants to attend 2 times/week. Attendance ranged from a minimum of 42% (10/24 sessions) to a maximum of 88% (21/24 sessions). The observed overall 55% bi-weekly attendance at yoga classes is therefore lower than the majority of PA research. Main reasons reported for not attending included treatment schedule conflicts, being too busy, going on holiday, and not feeling well. These reasons are comparable to previous yoga intervention

research by Geyer et al. (2011), who reported main reasons for low rates of participation in their 5-week intervention were medically related. Takken et al. (2009) also found that scheduling issues were also a concern in their 12-week, 4 times/week combined community and home-based intervention (2 times/week community-based and 2 time/week home-based).

4.2.3 Retention

The retention rate was 73% in the current study, with 8 of 11 participants completing the 12-week intervention. It is difficult to compare the current intervention to the 3 previous yoga studies in pediatric oncology, as they explored the shorter-term effects of yoga (1-5 sessions) (Geyer et al., 2011; Moody et al., 2010; Thygeson et al., 2010). For example, Thygeson et al., (2010) reported a single session completion rate of 90% for children and 100% for adolescents. With regards to traditional PA intervention research, it is again difficult to compare. For example, in a 12-week combined community- and home-based intervention study, Takken et al. (2009) reported 44% retention, with 4 of the 9 participants completing the intervention. The primary reasons for stopping were that participants found the intervention too time demanding and/or too difficult to combine with school attendance or other activities. One participant stopped training because her mother did not support the program. These reasons are similar to those reported in the current study, which primarily included being too busy (i.e., returning to school and not having enough time (n=1) and appointment conflicts (n=1)). The other participant stopped because they did not like yoga. Takken et al. (2009) reported that non-completers attended an average of 4.25 training sessions before

dropping out, while in the current study, non-completers only attended 1.67 yoga sessions before dropping out.

Based on the reported recruitment, attendance and retention outcomes, and in comparison to previous literature, the current intervention appears feasible. Importantly, no adverse reactions were noted or reported for any of the participants during the community-based sessions, home-based practice, or at the fitness assessments; thus, the program may also be considered safe. It is believed that several program features contributed to the reported recruitment, attendance and retention. As all participants were dependent on parent(s)/guardian(s) to get to the yoga studio, parental support was instrumental. The educational materials handed out at the beginning of the intervention, and availability each week of the yoga instructor and research coordinator to answer questions and address concerns, were also important. Furthermore, the program provided a safe, supportive supervised environment, offering a variety of poses and activities that accommodated each participant's ability and needs. Participants were provided individualized attention and modifications based on their cancer diagnosis and treatment outcomes. Anecdotally, patients reported this was a beneficial program component. All participants were advised to participate at a level that felt comfortable. Moreover, the program emphasized social support and created opportunities for partner/group work, peer bonding and group cohesion. Group cohesion literature suggests enjoyment during PA and subsequent intention for continued participation is optimized when a supportive group environment is provided (Fox et al., 2000).

4.3 Health-Related Quality of Life

Given the increase in pediatric cancer survivorship over the last 30 years, HRQL has emerged as an important construct and method of monitoring and evaluating treatment outcomes. Moreover, there is evidence that lifestyle behaviours adopted early in life can have an important impact on long-term health and wellbeing (Herman et al., 2010). Currently, the majority of research suggests that pediatric cancer patients and survivors consistently rate HRQL lower than healthy controls across all domains of functioning, especially physical and social (Landolt et al., 2006; Meeske et al., 2004; San Juan et al., 2008_a; Speechley et al., 2006; Varni et al., 2002; Zeltzer et al., 2008; Zeltzer et al., 2009). Thus, it was selected as the primary outcome in the current study. Patients reported their overall HRQL at baseline to be slightly lower than the standardized means presented by Varni et al. (2002). Interestingly, post-intervention both patient-reported and parent-proxy reported ratings of HRQL were above standardized means.

Improvements in patient-reported and parent-proxy reported HRQL are consistent with the 9 previous interventions that reported on HRQL. The majority found significant improvements on one or more of the HRQL domains (Keats & Culos-Reed, 2008; San Juan et al., 2008_b; Shore & Shepard, 1999; Speyer et al., 2010), while just under half found trends, but no significant improvements (Rosenhagen et al., 2011; San Juan et al., 2007; Marchese et al., 2004; Gohar et al., 2011). Additionally, Thygeson et al. (2010) and Moody et al. (2010) found that patients and parents qualitatively reported yoga to be beneficial for HRQL, especially for relaxation. And Geyer et al. (2011) found trends across HRQL domains, but significance only on self-reports of physical functioning.

Taken together, the results from the current study, in conjunction with the literature to date, suggest the potential for yoga to improve HRQL in pediatric oncology out-patients.

Anecdotally, patients reported they noticed small differences in their own HRQL over the course of the 12-week intervention, while parents reported they noticed large differences in their child's HRQL. Both patients and parents attributed the yoga intervention to these improvements. Although MCID and significant improvements were noted, given the current study's small sample size (patient-reported n=8; parent-reported n=7) and violations to assumptions of normality previously discussed, the results reported are preliminary and should be interpreted with caution. Moreover, given the scope of the current study, it is not possible to determine the causative influence of yoga or the potential influence of other confounding factors. However, given the growing body of literature suggesting the efficacy of PA generally, and yoga more specifically in adult oncology and select pediatric populations, the current results suggest yoga may be a useful lifestyle behaviour to assist pediatric cancer out-patients improve their HRQL.

4.4 Fatigue

In pediatric populations, CRF has only recently been addressed by research and has been identified by children and adolescents who are receiving treatment as one of the most distressing treatment-related symptoms experienced (Hockenberry-Eaton et al., 1999; Whitsett et al., 2008). There were no improvements reported by patients but significant improvements in parent-proxy reported fatigue. Parents noticed the largest improvements in their child's fatigue symptoms after the first 6-weeks of the yoga intervention. The lack of change reported by patients could be attributed to the heterogeneity in the sample, with many of the children being at different stages in their

out-patient care and experiencing varying symptoms of fatigue during their treatment cycles. The contradictory findings between patient and parent-proxy report align with the 5 PA interventions that have explored CRF (Hinds et al., 2007; Keats et al., 2008; Takken et al., 2009; Rosenhagen et al., 2011; Yeh et al., 2011). The majority of the findings suggest improved symptoms and sleep, however findings range from trends to statistical significance with one study finding no effect (Takken et al., 2009). Thus, the findings in the current study in conjunction with the larger PA literature suggest that a 12-week yoga intervention may have an impact on fatigue, however much more research is needed to ascertain its role.

4.5 Fitness Outcomes

Fitness outcomes have not been reported with yoga participation in pediatric oncology and are seldom reported with yoga interventions for children with various chronic conditions (Bera & Rajapurkar, 1993; Benavides & Caballero, 2009; Birdee et al., 2009; Galantino et al., 2008; Mandanmohan et al., 2003; Moorthy, 1982). The improvements across fitness parameters in the present study are thus an important addition to the current literature. Although non-significant, measures of musculoskeletal fitness (grip strength, knee extension and partial curl-up) improved over the course of the 12-week intervention. Only a handful of studies have explored upper body strength as an outcome variable in the PA and pediatric cancer literature (Chamorro-Vina et al., 2010; Rosenhagen et al., 2011; San Juan et al., 2007_a; San Juan et al., 2007_b; San Juan et al., 2008_b) and the majority of these have assessed upper-body *strength endurance* (Chamorro-Vina et al., 2010; San Juan et al., 2007_a; San Juan et al., 2007_b; San Juan et al., 2008_b). Only one study to date has utilized hand-held dynamometry to determine

isometric muscular strength (Rosenhagen et al., 2011). The findings from the current study are similar to Rosenhagen et al. (2011), demonstrating improved grip strength (non-significant). With regards to knee extension, scores demonstrated trends toward improvements. This is comparable to Marchese et al. (2004) who noted improved knee extension strength in their sample of ALL patients during maintenance therapy after a physical therapy intervention. Regarding core strength, at baseline, participants were below the HFZ recommendation. Post-intervention, participants increased by 2 curl-ups, however they were still below the HFZ recommendation of ≥ 15 curl-ups. Individually, participant scores revealed that at baseline, 75% of participants were below the HFZ for their age and 25% were above. Post-intervention, this improved to 50% of participants below the HFZ for their age and 50% above the HFZ for their age.

Functional mobility was significantly improved, with participants completing the TUG-3m significantly faster post-intervention. San Juan et al. (2007_a; 2007_b) found similar improvements with their supervised 16-week, 3 time/week, aerobic and resistance conditioning program. San Juan et al. (2007_a; 2007_b) note these improvements were related to a significant gain in muscle functional capacity and tasks of daily living.

There were substantial improvements in hamstring flexibility in both the left and right leg. Currently, no yoga intervention and only one PA intervention (Keats & Culos-Reed, 2008) has explored this dimension of physical fitness. Interestingly, at baseline none of the participants were in the HFZ, as determined by criterion-referenced standards, but after the 12-week intervention 62% (5/8) were in the HFZ (greater than the 8”).

Measures of ROM (DF-ROM, knee ROM and shoulder ROM) did not improve significantly, with the majority of scores staying relatively the same or declining non-significantly. This could be due to the variability in goniometry measurement (Norkin & White, 2003). Although precautions were taken to avoid this (such as assessor consistency), there could still have been inaccuracy in measurement. The second has to do with the well-documented declines in DF-ROM and knee ROM during treatment (Hartman et al., 2008; Marchese et al., 2003; San Juan et al., 2008_a; Wright et al., 1999; Wright et al., 1998). The patients in the current study avoided these declines and in some cases demonstrated improvements, warranting further investigation into the role of yoga for ROM. Specifically, with regards to DF-ROM, the literature has consistently found varying results on DF-ROM outcomes post-PA intervention. For example, Hartman et al. (2009) and San Juan et al. (2007_a; 2007_b) found no improvements after their 16-week and 2-year exercise interventions, while Marchese et al. (2004) and Wright et al. (2003) found small significant improvements in their 4-month and 2-year interventions respectively. In the current study, participants had minimally sufficient passive DF-ROM to sustain normal gait (exception post-intervention right passive DF-ROM ($M=9.75$, $SD=11.68$)), which has been defined by Wright (1999) as greater than 10° .

Measures of knee ROM and shoulder ROM have not been assessed to date in PA and pediatric oncology literature. Normal knee ROM in healthy pediatric populations has been defined as neutral (fully extended, approximately 180°) to 140° in flexion (Wells & Sehgal, 2011). Hyperextension of up to 10 - 15° is considered normal in a child. In the current study, both active and passive measures of extension and flexion were taken. The mean combined (right and left) knee active extension at baseline was 171° , while passive

extension was 177°. Post-intervention active and passive extension decreased slightly (non-significantly) to a mean combined knee active extension of 170°, and passive extension of 175°. The mean combined active flexion at baseline was 141° and combined passive flexion was 151°. Post-intervention combined active flexion increased non-significantly to 145° and mean combined passive flexion increased non-significantly to 154°. Thus, while there was no statistically significant change in knee ROM over the course of the 12-week intervention, both flexion and extension were close to normal ranges (Wells & Sehgal, 2011). With regards to shoulder ROM, the HFZ as defined by the FITNESSGRAM battery is the fingers touching (behind the back on both the right and left sides). At both baseline and post-intervention, participants were able to touch their fingers on their right side, however, on the left side, there was a small non-significant decline in shoulder ROM. One potential explanation for this could be related to the 12-week yoga protocol (Appendix I), which focused heavily on lower body strengthening and stretching. Future research could explore the effects of targeted yoga protocols on varying physical health outcomes (i.e., shoulder ROM, balance etc.).

4.6 Physical Activity Levels

The CSEP PA Guidelines for Children and Youth suggest 60 minutes of moderate-vigorous PA 7 days/week. This would correspond to roughly 49-MET hours/week. Data from the current study demonstrated that participants improved their PA levels over the course of the intervention. Importantly, there were highly significant increases in the duration of time spent in mild, moderate and strenuous PA/session, with duration almost tripling across all intensities. This substantial increase in minutes likely translated to the overall significant difference in MET hours/week. These results are

comparable to other studies reporting significantly improved subjective reports of PA behaviour post-intervention (Keats et al., 2008; Moyer-Mileur et al., 2009; Sharkey et al., 1993). After the 12-week intervention, pediatric cancer out-patients had an approximately 2.5 fold increase in their MET hours/week from baseline ($M=7.87$, $SD=10.69$) to post-intervention ($M=18.57$, $SD=22.72$). However, this still was not enough to bring them to the recommended 49-MET hours/week. These findings suggest a need for greater efforts to determine appropriate interventions to enhance PA, which may include educating out-patients and their parents about the risks associated with physical inactivity. Although preliminary, yoga may be a viable gentle alternative to traditional PA and may be a tool to get out-patients closer to meeting PA guidelines. As Geyer et al. (2011) suggested, there is the potential for yoga to be easily implemented as an alternative or in conjunction with more traditional PA programs, 1 to 2 times per week, in an effort to enhance overall time children spend in activity.

4.7 Theoretical Factors: TPB as a Basis for Intervention

Research suggests the TPB holds promise for developing effective PA and yoga interventions (Courneya, Blanchard, & Liang, 2001; Keats & Culos-Reed, 2008; Keats & Culos-Reed, 2009; Speed-Andrews et al., 2012; Vallance et al, 2008). Accordingly, the TPB was selected as the guiding framework for the current study. Ajzen (2006) notes, when selecting targets for behavioural interventions, it is important to consider whether there is room for change in the target belief. Given there were no statistical differences in theoretical factors over the course of the intervention, it would appear the intervention had little impact on the TPB constructs (in terms of change). This could be due to the high ratings (i.e., ceiling effects) of attitude, SN, PBC and intention at baseline. These

findings may be related to the selection bias that often occurs in PA intervention research. By agreeing to participate in the study, patients and their families already demonstrated positive attitudes, SN, PBC, and intention toward PA behaviour. Despite no significant changes, an interesting finding was with regards to the correlations. At baseline, the majority of correlations between attitude, SN, PBC, intentions and behaviour were moderate to low. However, post-intervention, attitude, SN, PBC and intentions were strongly correlated with PA behaviour. It was likely the targeted methods used throughout the intervention to influence attitude, SN and PBC that resulted in the observed stronger correlations post-intervention. Interestingly, SN was the strongest correlate of intention in the current study. This is consistent with previous research suggesting a strong link between the social influences of family and friends and subsequent PA behaviour (Gilliam & Schwebel, 2013). In fact, family and peer support for PA have been suggested as unique predictors over and above other determinants (Gilliam et al., 2012; Gilliam & Schwebel, 2013). This is supported by Keats et al. (2007) who found normative beliefs were significantly correlated with both SN and intention to be physically active (Keats et al., 2007). Thus, it is possible in the intervention, family and peer aspects of social influence may have been consequential. For example, family support to engage in yoga, having a sibling present, and seeing similar others do yoga, likely had a strong positive influence on SN, intention and ultimately behaviour. Therefore, this study adds to the theoretical literature examining the utility of the TPB in pediatric oncology (Keats et al., 2006; Keats et al., 2008), and overall adds to the data suggesting that the TPB may be a viable framework in which to build interventions for pediatric cancer survivors.

4.8 Future Directions

The current results demonstrate a number of preliminary findings within this population and provide opportunities for future research. On the basis of the promising pilot data with a small sample size, future work should continue exploring the efficacy of yoga in this population. Specifically, researchers should utilize mixed-methods to provide rich data despite the small sample sizes commonly reported. Integrating both quantitative and qualitative knowledge focused on the benefits (psychosocial and physical), acceptability and barriers associated with yoga will result in a better understanding of the impact of yoga in pediatric oncology, as well as provide information to optimize future interventions.

With more in-depth understanding, future work can then focus on multisite RCTs to determine the cause-effect relationship between yoga and improved psychosocial and physical health outcomes. Results from these larger studies will provide important information regarding causality, as well as the optimal frequency, intensity, duration and type of yoga for this population. Researching heterogeneous samples (i.e., age, diagnosis, treatment and treatment protocol) will be important to enhance external validity (generalization) and explore and examine the impact of various medical and demographic factors.

Further attention should also be focused on the potential for yoga to influence psychosocial health and HRQL in patients. Specifically, there is currently a gap with regards to the efficacy of yoga to impact psychosocial outcomes such as anxiety, depression, distress, and social support in pediatric oncology. Utilizing larger sample

sizes and having consistency in measurement tools will be important next steps to ascertain the effects of yoga on these psychosocial outcomes.

This was the first study in pediatric oncology exploring the effects of a 12-week yoga intervention on various fitness outcomes. Continued efforts should be made to explore the utility of yoga to improve physical factors in pediatric oncology. Based on the reported findings, there may be the potential to include yoga as an alternative form of PA or in conjunction with more traditional PA programs for pediatric cancer patients and survivors. Yoga could be valuable to simply get pediatric patients moving, allowing them to avoid some of the negative effects of sedentary behaviour. For example, studies could compare yoga to varying control groups (i.e., social supports groups, art groups etc.) to determine the unique influence of gentle movement over and above sedentary activities.

Research should also focus on modifying yoga protocols to impact desired functional outcomes and improve many of the physical function limitations known to be related to childhood cancer and its treatment. With regards to theoretical factors, in the current study the individuals involved had favourable views towards yoga (as illustrated by high scores on the TPB questionnaire). Future efforts should be made to reach patients, survivors and families who may not be inclined to participate in yoga interventions. Differences between groups and the psychosocial processes that influence motivation and subsequent yoga behaviour should be explored. Given the preliminary efficacy of the TPB, future research should continue exploring its utility. Although the TPB does not provide direct guidance on how to change behaviours, it does help to identify what needs to be modified to induce change. Future work must continue to both structure and evaluate the TPB in yoga/PA intervention settings as well as explore how to

translate behavioural determinants into methodologically sound behavioural change strategies. As a greater emphasis is placed on impacting quality of survival in pediatric oncology, future research will be necessary to continue exploring and identifying the unique benefits of PA interventions, including yoga, to reduce or minimize the effects of cancer and its treatment.

4.9 Limitations

Despite the strengths (i.e., theoretically-based innovative program with high participant retention and promising preliminary findings), this study has several limitations that have to be taken into account when interpreting outcomes. First, the small sample is associated with internal and external validity issues, such as increases in type-I and type-II errors. With regards to the heterogeneity of the sample (i.e., cancer diagnosis, date of diagnosis, stage of treatment), the treatment protocols between different risk classifications and across cancer diagnoses may have varied dramatically based on readily apparent clinical features of patients and the cancer cells. These varying treatment protocols may have modified intervention effectiveness. An additional limitation in the present study relates to response bias (aka selection bias), which can create systematic differences between the sample and the larger population. Although recruitment criteria were stringent (required low PA participation and no yoga experience), it is likely that a more motivated group of out-patients, whose experiences and attitudes may vary significantly from those who are more reluctant to participate, volunteered for the study. This threatens the internal and external validity of the study. It is hoped that the physician referral reduced this threat, by increasing the likelihood that patients and families who normally would not have enrolled in a yoga intervention were referred to the study. There

are also limitations with regards to the design of the pilot study. The lack of a randomly assigned control condition has important consequences when interpreting results.

Because there was no control, no causal conclusions can be made and we cannot state with certainty that the results from the study are due to the intervention, as there may be other variables contributing to the change. However, given the preliminary state of the field, a pilot study was an appropriate first step to begin understanding the potential benefits of yoga in a sample of pediatric cancer out-patients.

4.10 Transitioning to the Community

There is a growing population of pediatric cancer out-patients who will experience the negative psychosocial and physical side effects associated with cancer and its treatments. Based on a quote by Green (2001), “Where did the field get the idea that evidence of an intervention’s efficacy from carefully controlled trials could be generalized as THE best practice for widely varied populations and settings?” (p. 48), and the acknowledged gap between research and practice in many areas of health care and public health, transitioning the results from the current yoga intervention to the community was a major goal of the research team. Glasgow and Emmons (2007) continue challenging the notion of best evidence, arguing that it goes beyond evidence from tightly controlled RCTs. In some instances, they suggest we need to start moving forward with the best *available* evidence, as opposed to waiting for the best *possible* evidence (Glasgow & Emmons, 2007). Thus, although there are several limitations in the current study, the translation of the results from this research to a sustainable community-based program (Yoga Thrive for Youth (YTY)) supported by the KCCF, acknowledges the growing demand for PA programming that addresses the psychosocial and physical

effects of pediatric cancer and its treatments. YTY

(<http://www.ucalgary.ca/healthandwellnesslab/node/44>) is a 12-week registered yoga program offered free to pediatric cancer patients and survivors once a week at yoga studios throughout Calgary. Participants are instructed on a modified version of the 12-week yoga protocol. It is expected the results from this initial pilot research and subsequent program will begin to impact the pediatric patients at the ACH, and eventually the thousands of Alberta children living with cancer today.

4.11 Conclusion

The contemporary treatment regimens in pediatric oncology are associated with a myriad of adverse late psychosocial and physical side effects that exacerbate the risk for comorbidities and increase the risk of secondary malignancies. The tremendous burden of treatments in pediatric oncology necessitates further research into yoga programming, which aims to enhance HRQL, reduce treatment-related fatigue, improve select fitness outcomes (musculoskeletal fitness, functional mobility, flexibility and ROM), improve PA levels and enhance attitudes, support, control and confidence for being active during out-patient therapy. This study is the first to report the effects of a 12-week yoga intervention for pediatric cancer out-patients. Overall, the results support the feasibility and efficacy of a 12-week yoga program during out-patient treatment. Despite the study's limitations, the results provide initial data that yoga may positively influence HRQL, select fitness outcomes, PA levels and theoretical factors. Furthermore, it adds to the literature examining the utility of the TPB as a guiding framework. It is hoped the results from this study will provide the impetus to continue developing research programs focusing on the potential role of yoga for pediatric oncology patients.

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APPENDIX A: OVERVIEW OF PHYSICAL ACTIVITY INTERVENTIONS IN PEDIATRIC ONCOLOGY

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Winter et al., 2013 Case-Control Study	31; 10-17 years; malignant bone tumour patients IG: n=16; CG: n=15 (usual care)	34±94 day; In-hospital supervised; 7x/week; 30-60 minutes; Combined aerobic, resistance and flexibility exercises	PA levels	Physical: No sig. differences between IG and CG	Despite no sig. diff, positive increases in all PA parameters were noted. This study suggests that exercise interventions may increase PA levels.
Rosenhagen et al., 2011 Case-Control Study	23; 15.3±3.7 years; mixed-cancer PBSCT patients IG: n=13; CG: n=10 (retrospective usual care)	6-week; In-hospital supervised; 3x/week; 50 minutes; Combined cycle ergometer and strength/coordination exercises	HRQL (KINDL, PedsQL MFS), Physiologic adaptations, guided interviews regarding sports activities	Psychosocial: No sig. differences Acceptance: Participants reported positive opinion on exercise Physical/Feasibility: Avoided loss in muscular power on ergometer	Exercise programs during isolation should be flexible and the differing psychological and physical conditions of the patients should be anticipated and integrated into training programs.
Gohar et al., 2011 Case-Series	9; 2-14 years; ALL patients	~24-28 weeks Home- based unsupervised; 5x/week; variable; Initial physical therapy and exercise program (stretching, strengthening, aerobic exercise).	GMFM; HRQL (PedsQL and parent satisfaction questionnaire)	Feasibility: 98% of evaluations completed Psychosocial: ↑HRQL Physical: ↑ GMFM	In-hospital and home-based exercise physical therapy during the first four phases of medical treatment is feasible for children with ALL.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Yeh et al., 2011 Case-Control Study	22; 7-15 years; ALL maintenance therapy IG: n=12; CG: n=10 (usual care)	6-week; Home-based unsupervised; 3x/week; 30 minutes; aerobic exercise intervention with exercise video.	Fatigue (PedsQL MFS); PA log; Children's OMNI Walk/Run Scale; Stage of Change- Exercise Behaviour	Adherence: 67-83% Physical: ↑ General fatigue	The exercise program is feasible and warrants being tested in a clinical trial. It is suggested that a home-based exercise program may reduce fatigue for ALL children who are undergoing maintenance chemotherapy.
Chamorro- Vina et al., 2010 Case-Control Study	7; 4-12 years; High- risk pediatric cancer patients undergoing allogeneic HSCT IG: n=7; CG: n=13 (usual care)	3-week; In-hospital supervised; 5x/week; ~50 minutes aerobic exercise and one set, 8 resistance training exercises (12-15 repetitions)	Immune cell recovery (blood counts of leukocytes, monocytes, lymphocytes, and lymphocyte subpopulations); body composition (body mass, BMI, and estimated fat- free mass)	Feasibility: Adherence: >90%, no adverse effects Physical: No sig. difference for transplant outcomes between groups; Sig. improvements on anthropometric variables (weight, BMI, body fat, and fat-free mass)	Exercise training is feasible for immune- compromised children.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Speyer et al., 2010 Randomized Controlled Trial (Two- sequence, four-period cross-over study)	30; 9-18 years; hematology/oncology patients	During hospitalization; In- hospital supervised; 3x/week; 30 min; APA sessions	HRQL (CHQ)	Psychosocial: ↑ Child-report HRQL (domains: physical functioning, role/social-physical, self-esteem and mental health and behaviour), ↑Parent- proxy report HRQL (domains: physical functioning, role/social-physical, self-esteem and mental health and pain)	APA during hospitalization for children with cancer was associated with better HRQL for most of the psychological and physical dimensions.
Ruiz et al., 2010 Case-Series	7; 4-7 years; ALL maintenance therapy	16-week; In-hospital supervised; 3x/week; 90-120 minutes; 30 minutes aerobic and one set, 11 resistance training exercises (8- 15 repetitions) + 20- week detraining period	IGF-1 and IGF-2; GH	Adherence: >85% of sessions completed Physical: No sig. changes observed on any of the outcome variables	Exercise training can be safely executed in pediatric patients undergoing treatment against ALL with no major adverse effects.
Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length;	Outcome Variables	Findings	Conclusions

		Setting; Frequency; Duration; Content)			
Takken et al., 2009 Case-Series	4; 9.3±3.2 years; ALL survivors	12-week; Community-based supervised; 2x/week; 45 minutes; strength and endurance based exercise, changing focus every 4 weeks + 2x/week home-based	Functional capacity (CPET); muscular strength (dynamometer); functional mobility (TUDS; TUG); fatigue (CIS-20)	Feasibility: Adherence: 44% Physical: No sig. differences before and after training	Several variables must be considered when designing a community-based exercise-training program for this population: stage of disease, age, variety of exercises, location of implementation and views and motivation of parents.
Moyer-Mileur et al., 2009 Randomized Controlled Trial	13; 4-10 years; ALL maintenance therapy IG: n=6; CG: n=7 (standard nutrition and exercise recommendations)	12 months; Home-based unsupervised; >3x/week; 15-20 minutes; aerobic and resistance training and nutrition program	Body composition (anthropometry); dietary intake; physical activity (ACTIVITY GRAM) and fitness (PACER)	Physical: ↑ PACER laps, positive correlation with muscle mass Activity: ↑ Pedometer steps, positive correlation with muscle mass and BMI	Home-based exercise interventions during maintenance therapy should be encouraged.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Hartman et al., 2009 Randomized Controlled Trial	51; 5.4; ALL patients IG: n=20; CG: n=21 (usual care)	2-years; Home-based unsupervised (supervised hospital-based every 6-weeks); frequency NR; duration NR; focused on arm and leg exercises, DF stretching, short high-intensity exercise	BMD; BMI and % body fat (anthropometry); passive ankle DF-ROM	Physical: ↑ % Body fat, no sig. differences in motor performance and DF-ROM	The exercise program was not more beneficial than standard care in preventing reduction in BMD, motor performance and passive ankle dorsiflexion; however, increased BMI and body fat in the intervention normalized more quickly post-therapy. The authors suggest nonsig. findings may be due to poor compliance.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Keats et al., 2009 Case-Series	10; 16.2±1.6 years; mixed-cancer survivors (5.2 years post diagnosis)	16-week; Community- based supervised; 1x/week, 90 minutes; first 8-weeks group- based 60 minutes PA (45 minutes aerobic, 15 minutes core strength and flexibility) and 30 minutes education intervention. Last 8- weeks informal non- competitive activities.	Intention; attitude; subjective norm; perceived behavioural control; PA (GLTEQ-LSI)	Psychosocial: Instrumental attitudes, controllability and SE moderately to strongly correlated with intention. Intention, controllability, and SE strongly correlated with behaviour <u>Follow-Up:</u> Instrumental attitudes, controllability and SE moderately to strongly correlated with intention. Intention, controllability and SE strongly correlated with behaviour SE most important predictor in the maintenance of behaviour	The TPB may be a viable framework from which to build interventions for pediatric cancer survivors.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
San Juan et al., 2008 _b Case-Control Study	16; 10.9±2.8 years; IG: <12 months post BMT for leukemia (n=8); CG: age-gender matched healthy controls (n=8)	8-week; In-hospital supervised; 3x/week 90-120 minutes; 10-30 minutes aerobic exercise and one set of 11 resistance exercises (8-15 reps)	Functional capacity (VO _{2peak} , VT); functional fitness (TUDS/TUG); muscular strength (6RM seated row, bench press and leg test) DF-ROM; HRQL (CHIP-CE/CRF)	Feasibility: Adherence: 70% Psychosocial: ↑ Comfort and resilience (self-report), ↑ Satisfaction and achievement (parent-proxy report) Physical: ↑ Functional mobility, ↑ Strength, ↑ Functional capacity	Children who have received BMT experience health benefits (i.e., functional capacity, functional fitness, muscular strength and HRQL) after an 8-week supervised exercise training program.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Keats & Culos-Reed, 2008 Case-Series	10; 16.2±1.6 years; mixed-cancer survivors (5.2 years post diagnosis)	16-week; Community- based supervised; 1x/week, 90 minutes; first 8-weeks group- based 60 minutes PA (45 minutes aerobic, 15 minutes core strength and flexibility) and 30 minutes education intervention. Last 8- weeks informal non- competitive activities.	Physical fitness (Fitnessgram); quality of life (PedsQL); fatigue (PedsQL-MFS); physical activity behaviour (GLTEQ-LSI)	Attendance: 81.5% Psychosocial: ↑ HRQL (overall and domains: emotional, social, physical) <u>Follow up:</u> ↑HRQL (overall and domains: physical, emotional, psychological) Physical: ↑Fatigue, ↑Endurance, body strength and flexibility <u>Follow up:</u> ↓ Endurance, ↑ Body strength and flexibility, ↑ Symptoms of fatigue. Activity: ↑ Levels of PA Follow up, ↓ levels of PA	Physical activity improves physical fitness and HRQL. Innovative interventions aimed at improving adherence are necessary.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Hinds et al., 2007 _b Randomized Controlled Trial	29; 8-15 years; solid tumour and AML patients; IG: n=14; CG: n=15 (usual care)	2-4 days; In-hospital supervised; 2x daily; 30 minutes; stationary bike	Fatigue, sleep duration; sleep efficiency (actigraph, sleep diary, fatigue scales)	Adherence: 85.4% Physical: ↑Sleep efficiency/duration, no effect on fatigue, sleep intensity scores were related to sleep duration and negatively related to sleep efficiency.	In-patient intervention of EPA can be delivered to children and adolescents receiving chemotherapy.
San Juan et al., 2007 _a Case-Series	7; 4-7 years; ALL maintenance therapy	8-week; In-hospital; 3x/week; 90-120 minutes; 30 minutes aerobic and one set, 11 resistance training exercises (8-15 repetitions)	Muscular strength (6 RM); functional mobility (TUDS, TUG); DF-ROM	Physical: ↑Strength tests and TUG	Interventions as short as 8-weeks are enough to produce clinically relevant changes in ALL patients during maintenance therapy (i.e., improved functional mobility and muscle strength).

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
San Juan et al., 2007 _b Case-Series	7; 4-7 years; ALL maintenance therapy	16-week; In-hospital supervised; 3x/week; 90-120 minutes; 30 minutes aerobic and one set, 11 resistance training exercises (8-15 repetitions) + 20-week detraining period	Functional capacity (VO_{2peak} , VT); strength (6 RM); functional mobility (TUDS, TUG); DF-ROM; quality of life (CHIP-CE/CRF)	Adherence: >85% Psychosocial: No sig. difference Physical: ↑ Functional capacity, ↑ Strength, ↑ Functional mobility, ↓ DF-ROM. <u>Detraining:</u> strength and functional mobility were maintained but functional capacity was only partially retained	Exercise during maintenance therapy is safe and beneficial (i.e., increases in aerobic fitness, strength and functional mobility). During detraining, strength and functional mobility are maintained while cardiovascular gains are only partially maintained.
Collet et al., 2007 Randomized-Controlled Trial Abstract	36; 18; mixed-cancer survivors (12 years post treatment) IG: n=NR; CG: n=NR (received exercise and nutrition material)	12-week; Community-based supervised; frequency NR; duration NR; individualized programs emphasizing cardiovascular programs	HRQL, PA levels, fatigue, BMI and VO_{2max}	Psychosocial: Low scores at baseline, no sig. change Physical: No sig. change Activity: ↑PA levels, ↑ Symptoms of fatigue	A 12-week intervention positively influences PA levels and fatigue. More research is necessary.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Ladha et al., 2006 Case-Control Study	10; 7-18 years; IG: ALL maintenance therapy (n=4); CG: healthy matched controls (n=6)	Acute; In-hospital supervised; 2 visits Visit 1: Determine peak aerobic fitness (VO _{2peak}). Visit 2: 30- minute exercise session consisting of an intermittent run- walk on a treadmill (70% to 85% of (VO ₂ peak)	Complete blood count and neutrophil function assay	Physical: ↑ Absolute neutrophil count from pre- to post-exercise in both groups, neutrophil oxidative capacity was sig. depressed in ALL at baseline but increased after exercise	30 minutes of moderate intensity exercise in ALL patients provides similar neutrophil responses to healthy age and gender- matched controls.
Marchese et al., 2004 Randomized Controlled Trial	28; 4-15 years; ALL maintenance therapy IG: n=13; CG: n=15 (usual care)	16-week; Home-based (5 PT sessions); 5x/week ankle stretching, 3x/week resistance, 7x/week aerobic training	Functional capacity (9 min run-walk); muscular strength (dynamometer, knee extension and DF-ROM); functional mobility (TUDS); flexibility (DF- ROM); HRQL (PedsQL)	Psychosocial: No sig. improvements Physical: ↑DF-ROM and knee extension strength	PT interventions for ALL patients receiving maintenance chemotherapy are important for normal gait.

Authors/ Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Shore and Sheppard, 1999 Case-Control Study	17; 13-14 years; IG: mixed-cancer mostly ALL (more than 4 weeks post-induction) (n=6); CG: healthy children (n=11)	12-week; In-hospital supervised and home- based unsupervised; frequency NR; duration NR; aerobic training program	Mood state (Piers-Harris test); anthropometric data; maximal oxygen intake; standard immune measures (differential count, cytolytic activity, and mitogen-induced lymphocyte proliferation)	Psychosocial: ↑Improvements in anxiety Physical: ↑ Body fat, ↑ Fitness, Exercise impaired immune function, changes remained insufficient to cause concern for health	Exercise therapy may be beneficial following treatment. It should be prescribed individually with careful monitoring of immune responses.
Sharkey et al., 1993 Case-Series	10; 16-22 years; mixed-cancer survivors	12-week; In-hospital supervised and home- based unsupervised; 2x/week; 45-60 minutes aerobic (at 7- weeks, 1x/week home-based exercise program supplemented)	Functional capacity (VO _{2peak}); exercise test anthropometry (% body fat); exercise time and tolerance	Physical: No sig. changes in physical variables Activity: ↑PA time	Patients did benefit from the conditioning program. Their exercise tolerance subjectively and objectively improved.

Note. ↑: Improved/better; ↓: Deteriorated/worsened; ACTIVITYGRAM: PA behaviour questionnaire; ALL: Acute Lymphoblastic Leukemia; AML: Acute Myeloid Leukemia; APA: Adapted Physical Activity; BMD: Bone Mineral Density; BMI: Body Mass Index; BMT: Bone Marrow Transplant; CG: Control Group; CHIP-CE/CRF: CHIP- Child Health and Illness Profile-Child Edition; CHQ: Child Health Questionnaire; CIS-20: Checklist Individual Strength-20; CPET: Cardiopulmonary Exercise Test; DF-ROM: Dorsiflexion-Range of Motion; EPA: Enhanced PA; GH: Growth Hormones; GLTEQ-LSI: Godin Leisure Time Exercise Questionnaire-Leisure Score Index; GMFM: Gross Motor Function Measure; HSCT: Hematopoietic Stem

Cell Transplant; HRQL: Health-Related Quality of Life; IG: Intervention Group; IGF: Insulin-Like Growth Factors; KINDL: HRQL questionnaire; N: Sample Size; NR: Not Reported; PA: Physical Activity; PACER: Progressive Aerobic Cardiovascular Endurance Run; PBSCT: Peripheral Blood Stem Cell Transplant; PedsQL: Pediatric Quality of Life Inventory; PedsQL-MFS: PedsQL Multidimensional Fatigue Scale; PT: Physical Therapy or Physical Therapist; RM: Repetition Maximum; SE: Self-efficacy; TUDS; Timed Up-and-Down Stairs; TUG: Timed Up and Go; $VO_{2\text{peak}}$: Maximal Oxygen Consumption; VT: Ventilator Threshold.

**APPENDIX B: OVERVIEW OF YOGA INTERVENTIONS IN PEDIATRIC ONCOLOGY/HEMATOLOGY AND
OTHER PEDIATRIC POPULATIONS**

Authors/Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
*Geyer et al., 2011 Case-Series	6; 6-19 years; mixed-cancer and hematology patients	5 week; In-hospital led by physical and occupational therapists; 1x/week; ~1hour; Group-based BKY session (low-impact focused on stretching, strengthening, balance, breathing techniques, relaxation and body awareness).	HRQL (PedsQL general module)	Psychosocial: ↑ Physical function domain	6 children out of two 256 children were able to attend 5 consecutive weekly sessions over a 5-week period. Further studies are needed to confirm the effect of therapeutic Yoga in pediatric oncology-hematology.

Authors/Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
*Thygeson et al., 2010 Case-Series	16; 7-18 years; mixed-cancer and hematology patients	1 session; In-hospital led by registered yoga instructor; N/A; 45 minutes; Group-based yoga session (seated meditation, warm-up and centering poses, standing poses, balance poses, cool down/spinal twists and final resting pose) classes divided by age (7-12 years and 13-18 years).	Feasibility, anxiety, general wellbeing, qualitative questions	Feasibility: Enrolment rate: 55% (child), 42% teen. Completion rate: 90% (child), 100% (teen) Psychosocial: No change in anxiety for children, ↑ anxiety in teens Qualitative: Child: yoga was relaxing, calming, fun, and helped them feel good, Teen: yoga was relaxing, calming, fun and a useful self-care tool	Yoga is a feasible intervention for this population and contributes to reduced anxiety in adolescents.
*Moody et al., 2010 Case-Series	20; 11-26 years; mixed-cancer and hematology patients	1-3 sessions; in-hospital led by a registered yoga instructor; frequency N/A; duration NR; Individualized yoga session (relaxation, meditation, physical poses and breath work).	Pain, anxiety, and qualitative quotes	Psychosocial: ↑ Pain and anxiety scores Qualitative: Yoga was beneficial (esp. for relaxation)	Further research on Yoga as an effective intervention for pediatric hematology-oncology survivors for pain and anxiety is needed.

Authors/Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Kuttner et al., 2006 Randomized Controlled Trial	25; 11-18 years; IBS IG: n=14; CG: n=11 (usual care)	4 week; Home-based utilizing a video and 1 60 minute instructional session with a yoga instructor; 7 days/week; 10 minutes; Hatha and Iyengar influences (physical poses and breath work).	Pain intensity, gastrointestinal symptoms, functional disability inventory, pain coping questionnaire, revised child manifest anxiety scale, children's depression inventory	Psychosocial: ↓ Anxiety, ↑ Emotion-focused avoidance Physical: Participants in the yoga group reported lower levels of functional disability, coping and anxiety. No differences in pain, depression or overall gastrointestinal symptoms.	Yoga holds promise as an intervention for adolescents with IBS.
Stueck & Glockner, 2005 Case-Control Study	48; 11-12 years; abnormal examination anxiety IG: n=21; CG: n=27 (usual care)	3 months; Community and home-based instructor credentials NR; 15 sessions; 60 minutes; yoga focused on physical poses, breath work, group games and relaxation	Psychological anxiety	Psychosocial: ↑ Aggression, ↑ Helplessness in school, ↑ Physical complaints, ↑ yoga use when dealing with stressors (stress-coping ability)	The effects found out here indicate that yoga is suited for children as an independent control method.

Authors/Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Telles & Srinivas, 1998 Randomized Controlled Trial	28; 12-17 years; congenital blindness IG: n=NR; CG: n=NR	3 weeks; Community-based led by a yoga instructor; days/week; 60 minutes; PA (moderate, comparable activity) or yoga (physical poses, breath work, relaxation).	ECG, respiration and skin resistance level	Physical: ↑ Breath rate of the IG	The results showed that children with impaired vision have a marginal reduction in breath rate following yoga.
Bera & Rajapurkar, 1993 Randomized Controlled Trial Abstract	40; 12-15 years; healthy adolescents IG: n=20; CG: n=20 (no intervention)	1 year; Community-based instructor NR; frequency NR; duration NR; yoga included physical poses, breath work, yogic diet, and informational sessions	Body mass index; cardiovascular fitness (Harvard Step Test); anaerobic power (sergeant jump - vertical standing jump)	Physical: ↑ Cardiovascular endurance and anaerobic power, ↑ Weight management (loss of body weight)	Suggests yoga's utility to improve some aspects of body composition, cardiovascular endurance and aerobic power.

Authors/Design	Sample (N; Age; Diagnosis)	Intervention (Intervention Length; Setting; Frequency; Duration; Content)	Outcome Variables	Findings	Conclusions
Platania-Solazzo et al., 1992 Case-Control Trial Abstract	60; 8-19 years; depression or adjustment disorder patients IG: n=60; CG: n=20 (relaxing video)	Intervention length NR; In-hospital instructor NR; 2 times/week; 60 minutes 2 times/week, yoga included relaxation therapy with progressive relaxation	Heart rate, saliva cortisol, activity, anxiety and depression	Psychosocial: ↑ Anxiety, anxious behaviours and fidgeting in IG, ↑ Positive affect Physical: No sig. differences in cortisol Activity: ↑ Activity levels	Both diagnostic groups appeared to benefit from the yoga class.
Moorthy, 1982 Randomized Controlled Trial Abstract	120; 6-11 years; failed minimum fitness testing; IG: n=NR; CG: n=NR (non-yogic exercise)	6 week; Community-based instructor NR; frequency NR; duration NR; yoga program (not specified)	Physical fitness (Kraus-Weber test)	Physical: 76% (males) and 83% (females) passed the minimum fitness test.	Suggests yoga is more beneficial than non-yoga exercises to increase muscular fitness in children.

* Oncology/Hematology Populations

Note. ~: Approximately; BKY: Bendy Kids Yoga; CG: Control Group; ECG: Electrocardiogram; HRQL: Health-Related Quality of Life; IG: Intervention Group; IBS: Irritable Bowel Syndrome; N/A: Not Applicable; NR: Not Reported; PA: Physical Activity; PedsQL: Pediatric Quality of Life Inventory.

APPENDIX C: CONSENT TO CONTACT



Dear Parent or Guardian,

My name is Amanda Wurz and I am currently recruiting participants for my MSc research, funded by the Canadian Institutes of Health Research (CIHR), Psychosocial Oncology Training Program, Thrive Research Funding, University of Calgary, and the CIHR training program in genetics, Child Development and Health - Alberta Children's Hospital Research Institute under the supervision of Dr. Nicole Culos-Reed in the faculty of Kinesiology, University of Calgary.

We are recruiting pediatric all pediatric cancer out-patients for our study titled "Yoga for Pediatric Cancer Out-Patients". This study is exploring the potential benefits of a 12-week yoga program. Both the interventions groups and comparison group will complete measures at baseline, mid-program and post-intervention.

The measures will include: visual analogue scales (before and after each yoga session assessing anxiety, sadness, anger, worry, fatigue and pain), health-related quality of life, physical activity levels, physiological variables (heart rate, heart rate variability, blood pressure, body mass index), musculoskeletal fitness (strength), functional mobility, balance and flexibility.

I would like to ask permission to contact you to discuss the study further.

No, do not contact

OR

Yes, I may contact

Signature: _____ Date: _____

Name: _____

Phone Number: _____ Email: _____

If you have any questions or concerns, please do not hesitate to contact me: Phone: (403)210-8482 Email: ajwurz@ucalgary.ca

APPENDIX D: PEDIATRIC ASSENT



Pediatric Assent Form

TITLE: Yoga for Pediatric Cancer Out-Patients

SPONSOR: Canadian Institutes of Health Research (CIHR), CIHR-Psychosocial Oncology Training Program, CIHR in Genetics, Child Development and Health- Alberta Children's Hospital Research Institute, Thrive Research Funds, University of Calgary

INVESTIGATORS:

Dr. S Nicole Culos-Reed (Principle Investigator)
Amanda Wurz, MSc Student (Co-Applicant and Research Coordinator)
Dr. Carolina Chamorro (Co-Applicant)
Dr. Fiona Schulte (Co-Applicant)
Dr. Gregory Guilcher (Co-Applicant)
Karen Mazil, RN (Co-Applicant)

Contact: Amanda Wurz
Telephone: (403) 210-8482
Email: ajwurz@ucalgary.ca

This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, please ask. Take the time to read this carefully and to understand any accompanying information. You will receive a copy of this form.

WHAT IS THIS STUDY ABOUT?

This study is going to look at the effects of a 12-week yoga program on health-related quality of life outcomes, sadness, anger, worry, pain, anxiety and tiredness from treatment, physical activity levels, and physical ability.

WHAT WILL HAPPEN DURING THE STUDY?

If you want to participate in the study, you will be part of the yoga group. You will attend two yoga sessions/week for 60 minutes at a location TBD. We will also give you a book (to write how much yoga you do each week) and a yoga mat that you will be responsible for taking care of. We will also give you yoga poses that we will ask you to use at least one time a week in addition to your yoga classes. Right before and after each class, the yoga instructor will ask you to rate your feelings of anxiety, worry, anger, sadness, tiredness and pain.

If you decide that you don't want to be in the study, or you live out of the city of Calgary, you will be in the comparison group and will be asked to continue your regular activities for 12-weeks.



We will mail both groups an envelope with booklets of questions that you will have to complete and a small device that you will wear on your belt for 4 days. The questions will ask you to circle how you feel generally, how your cancer treatment affects you and how tired you feel. Both groups will come in to the University before and after the 12-weeks. All the things you will be asked to do are listed:

- Heart rate, blood pressure, height and weight
- Squeezing a machine as tight as you can
- Performing partial curl-ups
- Sitting and pushing your leg against a hand
- Standing up from a chair, walking 3 and 10m turning around, and sitting back down
- Balancing
- Sitting and reaching as far as you can
- Moving your ankle, knee and shoulder

All tests will be done with your parents in the room and an exercise testing professional.

ARE THERE GOOD THINGS AND BAD THINGS ABOUT BEING IN THE STUDY?

All testing will be performed under appropriate and close supervision. If you are in the yoga group you may experience muscle soreness, which will disappear within a few days. During the assessments there is a small risk of muscular damage that exists in the participation of any sport activity. Special precaution will be taken to reduce this risk.

Your doctor will let us know how you are doing and will make sure you are ok to do the tests. How you feel and your physical ability may or may not improve over the course of the study. There is no guarantee that this research will benefit you. The information we get from this study may help us to provide better therapies in the future for patients undergoing cancer treatments.

WHO WILL KNOW WHAT I DID IN THE STUDY?

We will not share anything you said with anyone who is not part of this study. No one else will know it was you who said these things.

CAN I DECIDE IF I WANT TO BE IN THE STUDY?

You do not have to be in the study if you don't want to. Even if you say you want to be in the study now, you can stop later if you change your mind. If you change your mind later, tell your doctor, nurse, parents, yoga instructor or Amanda.

You can ask the doctor or nurse questions before you make up your mind. You can also talk to your mom/dad or the person who takes care of you and ask to read the information the doctor gives them. If you want to be in this study, you will be asked to sign this form.

If you do not want to take part, that's O.K. You can tell your parents, your doctor or the research coordinator that you don't want to take part in this study. That will be O.K. This will not affect how we take care of you. If you say yes now, you can change your mind later. You can still say no and that will be O.K. Your parents know about this study. Ask them questions if you don't understand what this is about. You can also talk to the study doctor or nurse or the research



coordinator about the study before you decide whether or not you want to be involved. If you want, your brother, sister, cousin or friend will be allowed to take part in the yoga program with you if there is room. There may also be other cancer survivors who will do the yoga as well.

WHO CAN I TALK TO ABOUT WHAT I DO IN THE STUDY?

You can ask questions about the study any time, now or later. You can call or email the research coordinator, Amanda Wurz any time.

Phone. (403) 210 8482

Email. ajwurz@ucalgary.ca

Additionally, if you have any questions concerning your rights as a possible participant in this research, please contact The Chair of the Conjoint Health Research Ethics Board, University of Calgary, at 403-220-7990.

ASSENT:

Do you want to be in this study?

Please check one box:

Yes, I want to be in the study.

No, I do not want to be in the study.

Name of Child (Print)

Signature of Child

Date

Name of Parent or Legal Guardian (Print)

I was present when _____ read this form and gave his/her verbal assent.

Name of person obtaining assent (Print)

Signature

Date

APPENDIX E: PEDIATRIC PARENTAL CONSENT



Consent Form

TITLE: Yoga for Pediatric Cancer Out-Patients

SPONSOR: Canadian Institutes of Health Research (CIHR), CIHR-Psychosocial Oncology Training Program, CIHR in Genetics, Child Development and Health- Alberta Children's Hospital Research Institute, Thrive Research Funds, University of Calgary

INVESTIGATORS:

Dr. S Nicole Culos-Reed (Principle Investigator)
Amanda Wurz, MSc Student (Co-Applicant and Research Coordinator)
Dr. Carolina Chamorro (Co-Applicant)
Dr. Fiona Schulte (Co-Applicant)
Dr. Gregory Guilcher (Co-Applicant)
Karen Mazil, RN (Co-Applicant)

Contact: Amanda Wurz
Telephone: (403) 210-8482
Email: ajwurz@ucalgary.ca

This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your child's participation will involve. If you would like more detail about something mentioned here, or information not included here, please ask. Take the time to read this carefully and to understand any accompanying information. You will receive a copy of this form.

BACKGROUND

Tremendous advances in research and technology over the past 30 years have resulted in improved treatment protocols and increased survival rates for childhood cancer patients. Despite this improved rate of survival, current treatment protocols are associated with several negative psychosocial and physical side effects. These side-effects result in greatly reduced health-related quality of life (HRQL), increased pain, anxiety and fatigue, diminished functional mobility, limited range of motion, and decreased flexibility. These late side effects increase the risk for chronic illnesses such as diabetes and heart disease and also increase your child's risk for secondary cancers. Exercise is recognized as a potential strategy to reduce some of the long-term effects experienced by childhood cancer survivors, and has recently gained recognition as a safe, effective and beneficial strategy during treatment. Given the increasing rates of survivorship and the burden of treatment, the need for exercise interventions to address the late-effects of treatment is essential. Based on results from yoga interventions for adult cancer patients and on early results from the applications of yoga for pediatric populations, researchers have begun exploring the benefits of yoga for childhood cancer patients. Due to the encouraging early results, it is important that the benefits of yoga in pediatric cancer patients is further explored.

Given the special considerations inherent with this population and the lack of evidence about interventions designed to motivate patients to adopt physical activity behaviors, it is suggested that a theoretical framework be used as a basis for developing the proposed intervention, thus, the proposed randomized-controlled yoga intervention will be designed and evaluated according to the Theory of Planned Behavior, a popular theory in health behavior research. The effects of the yoga intervention will be assessed through various psychosocial and physical outcome measures.

WHAT IS THE PURPOSE OF THE STUDY?

To: (i) explore the effects of a theory-based yoga intervention on health-related quality of life for pediatric cancer patients during out-patient treatment at the Alberta Children's Hospital; (ii) explore the potential benefits the yoga intervention has on select treatment-related side-effects (anxiety, worry, anger, sadness, fatigue and pain), physical activity levels, physiological measures (heart rate, heart rate variability, blood pressure, height and weight), and fitness indices (strength, functional mobility, balance and flexibility); and (iii) determine if the intervention enhances theoretical factors (attitude, intention etc. to be physically active).

WHAT WOULD MY CHILD HAVE TO DO?

If you live outside of the city of Calgary, or do not have time to commit to this intervention, your child will be placed in the comparison condition and will be asked to complete the pre-, mid- and post-assessments (see below for full descriptions).

If your child is able to commit to the 12-week intervention, we will ask that your child attend 2 yoga sessions/week for 60 minutes at one of three locations (the Elks Club, Edgemont or Wellspring) and practice 1 time/week at home using the yoga program that will be prescribed in their first session. Additionally, we will provide your child with a logbook (to record weekly yoga practice) and a yoga mat. The yoga program that your child will participate in has been developed by a team of hematology/oncology health care professionals at the Alberta Children's Hospital with the help of individuals from the YogaKids® program and Yoga Thrive, a modified therapeutic yoga program for adult cancer survivors. Immediately before and after each yoga session (2 times/week), the instructor will ask your child to rate their levels of anxiety, sadness, anger, fear, pain and fatigue (using a visual analogue scale). We will use the Pediatric Quality of Life (PedsQL) Visual Analogue Scales (VAS).

Measures: Participants in both groups (yoga and comparison) will be asked to complete a number of questionnaires assessing their health-related quality of life, their feelings towards physical activity and physical activity levels before the yoga intervention, mid-way through and after the yoga intervention. These questionnaires will be mailed (or emailed) to you. The questionnaires included should take no more than 30 minutes for your child to complete. You will be asked to complete a parent proxy report of your child's health-related quality of life that should take 15 minutes to complete.



The physical assessments will be scheduled before and after the 12-week intervention and will take no longer than 1 hour for your child to complete. The physical assessments include: physiological status, musculoskeletal fitness, functional mobility, balance and flexibility. These measures will be scheduled for before the intervention, and after the intervention. We will give your child an accelerometer after this assessment and ask that your child wear it for 4 days.

Questionnaires:

1. Health-related Quality of Life: PedsQL: Your child will be asked to complete this questionnaire which asks questions about your child's thoughts about their levels of physical, emotional, social and school functioning. They will also be asked specific questions about their cancer experience and their levels of fatigue.

2. Theory of Planned Behavior Questionnaire: The questionnaire will be composed of 4 sub-components assessing attitude (14-items), subjective norm (3-items), perceived behavioral control (8-items) and intentions (3-items).

3. Physical Activity Level: Will be assessed with an accelerometer, leisure score index questionnaire and your child's completed activity logs.

- **Accelerometer:** Your child will be asked to carry on his/her belt an accelerometer (Actical accelerometer, Phillips – Respironics, Oregon, USA) for 4 days before each testing time (pre- and post-intervention).
- **Leisure Score Index (LSI):** Your child will be asked to recall how many times in the last week they engaged in strenuous, moderate and mild activity and for how long.
- **Activity Logs:** These will be used to verify the information from the accelerometer and leisure score index and will be completed every day and will be collected weekly by the researcher.

Physical Assessments:

All assessments will be conducted according to the Canadian Physical Activity, Fitness and Lifestyle Approach (CPAFLA) protocol and will be conducted by a Canadian Society for Exercise Physiology (CSEP)-Certified Exercise Physiologist (CEP) in the Thrive Centre, University of Calgary. You can view the assessments on our website, through the link provided by the research coordinator.

1) Physiological Status

- Blood Pressure
- Heart Rate
- Heart Rate Variability: This will be measured using a polar heart rate monitor that your child will wear for 10 minutes while lying down.
- Height
- Weight

2) Musculoskeletal Fitness:

- **Grip Strength:** To assess muscular strength, this test uses the combined grip strength of the right and left hands using a hand dynamometer. Your child will be asked to squeeze the device as hard as they can.
- **Knee Extension:** Will measure the maximal voluntary force participants can exert during a single contraction in which your child will be asked to resist the force the examiner places on the leg.
- **Partial Curl-Up:** Your child will be asked to perform a maximum of 25 partial curl-ups.

3) Functional Mobility:

- **Timed Up and Go Test (3m and 10m):** Your child will be asked to stand up from a seated position in a chair, walk 3m and 10m respectively, turn around, return to the chair and sit down. This test will be timed.

4) Balance

- **Balance Error Scoring System (BESS):** Your child will be asked to close their eyes and perform 3 testing positions: double leg stance; single leg stance (right and left leg); and, the tandem stance (right and left leg), which they will be asked to hold for 20 seconds. They will be asked to complete this task on both firm and foam testing surfaces.

5) Flexibility:

- **Sit-and-reach:** Your child will be asked to sit with one leg bent at the knee and reach forward as far as possible.
- **Dorsiflexion-Range of Motion:** Your child will be asked to sit with the knee flexed to 90° and the foot in neutral alignment. The CSEP-CEP will then move your child's ankle through its range of motion, using a ruler-like device to measure range of motion.
- **Knee extension:** Your child will be asked to sit. The CSEP-CEP will then move your child's knee through its range of motion, using a ruler-like device to measure ROM.
- **Shoulder ROM:** Your child will be asked to place one hand behind the head and back over the shoulder, and reach as far as possible down the middle of their back, their palm touching their body and the fingers directed downwards. They will be instructed to place the other arm behind their back, palm facing outward and fingers upward. They must then reach up as far as possible attempting to touch or overlap the middle fingers of both hands.

WHAT ARE THE RISKS?

The physical fitness tests that your child will perform are routine tests in patients with a variety of chronic conditions and are regarded as safe. All testing will be performed under appropriate and close supervision by a CSEP-CEP.

Following the yoga sessions your child may experience muscle soreness, which will disappear within a few days. During the physical fitness evaluations there is a minimal risk of muscular damage that exists when participating in any sport activity. Special precaution will be taken to reduce this risk.



Each participant's health status will be monitored over the course of treatment and clearance will be provided by your physician prior to each testing session. Every effort will be made to ensure that the confidentiality of your information is protected (through unique identifier codes rather than names and through confidentiality agreements).

ARE THERE ANY BENEFITS FOR MY CHILD?

Your child's health-related quality of life, treatment-related side-effects, physical activity levels, physiological status, strength, functional mobility, balance and flexibility may or may not improve over the course of the study. There is no guarantee that this research will benefit them. The information we get from this study may help us to provide better adjuvant treatments and therapies in the future for patients undergoing oncology treatments.

If you agree for your child to participate in this study there may or may not be a direct medical benefit to them. Their quality of life and fitness may be improved during the study but there is no guarantee that this research will help them. The information we get from this study may help us to provide better treatments in the future for pediatric oncology patients and survivors.

DOES MY CHILD HAVE TO PARTICIPATE?

Participation in this study is completely voluntary and you may withdraw your child at any time without jeopardizing their health care. Please inform the yoga instructor, researcher or your physician if you choose to withdraw your child from the study.

If new information becomes available that might affect their willingness to participate in the study, you will be informed as soon as possible. Siblings, survivors and supports will be permitted to take part in the yoga program as non-research participants as space allows.

WHAT ELSE DOES MY CHILD'S PARTICIPATION INVOLVE?

Please put a checkmark on the corresponding line that would allow us to:

1) Contact you in the future for additional research related to the present project.

Yes ___ No ___

WILL WE BE PAID FOR PARTICIPATING, OR DO WE HAVE TO PAY FOR ANYTHING?

You will not be paid for participating. Your child will receive a yoga mat at the beginning of the program that they will use during the program and may keep after the intervention. There will be no additional costs associated with participating in this program.

WILL MY CHILD'S RECORDS BE KEPT PRIVATE?

The information obtained in this study will be stored on a secure (password protected) computer, and the written assessments will be stored in a secure and locked file cabinet. The information



will be kept in Dr. Culos-Reed's research office in the Kinesiology Complex. All records will be coded with non-descriptive ID numbers and kept in the strictest confidence by the principal investigator. Individual results will not be disclosed to anyone other than the participant, the University of Calgary Conjoint Health Research Ethics Board.

IF MY CHILD SUFFERS A RESEARCH-RELATED INJURY, WILL WE BE COMPENSATED?

In the event that your child suffers injury as a result of participating in this research, no compensation will be provided to you by, the University of Calgary, the Alberta Health Services or the Researchers. You still have all your legal rights. Nothing said in this consent form alters your right to seek damages.



SIGNATURES

Your signature on this form indicates that you have understood to your satisfaction the information regarding your child’s participation in the research project and agree to their participation as a subject. In no way does this waive your legal rights nor release the investigators, or involved institutions from their legal and professional responsibilities. You are free to withdraw your child from the study at any time without jeopardizing their health care. If you have further questions concerning matters related to this research, please contact Amanda Wurz, research coordinator (403) 210-8482 or speak with Dr. Culos-Reed, Dr. Schulte, Dr. Chamorro-Vina, Dr. Guilcher or Karen Mazil.

If you have any questions concerning your rights as a possible participant in this research, please contact The Chair of the Conjoint Health Research Ethics Board, University of Calgary, at 403-220-7990.

Parent/Guardian’s Name	Signature and Date
Child’s Name	Signature and Date
Investigator/Delegate’s Name	Signature and Date
Witness’ Name	Signature and Date

The investigator or a member of the research team will, as appropriate, explain to your child the research and his or her involvement. They will seek your child’s ongoing cooperation throughout the study.

The University of Calgary Conjoint Health Research Ethics Board has approved this research study.

A signed copy of this consent form has been given to you to keep for your records and reference.

APPENDIX F: MEDICAL CLEARANCE



Yoga for Pediatric Cancer Out-Patients

Yoga for Pediatric Cancer Out-Patients is a 12-week intervention. Children will be asked to attend 2 yoga sessions/week for 60 minutes and practice 1 time/week at home using the yoga program. The intensity of the sessions will be mild/moderate. Participants will complete fitness assessments at baseline and post-intervention. If you consider that your patient is able to participate please indicate by checking: progressive physical activity OR unrestricted physical activity.

PHYSICAL ACTIVITY READINESS

Based upon a current review of the health status of _____ I recommend:

- Unrestricted physical activity- start slowly and build up gradually
- Only a medically-supervised exercise program until further medical clearance
- Physical activity under the supervision of a CSEP-professional Fitness & Lifestyle Consultant
or CSEP exercise therapist
- Progressive physical activity
- With avoidance of:

—

- With the inclusion of:

—

- No physical activity

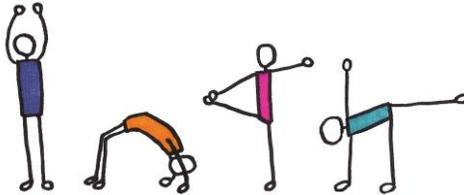
_____ M.D. (printed)

Date: _____

Physician Signature:

NOTE: This physical activity clearance is valid for a maximum of six months from the date it is completed and becomes invalid if the medical condition of the patient becomes worse.

APPENDIX G: WELCOME PACKAGE



Yoga for Pediatric Cancer Out-Patients

What is Physical Activity?

Physical activity is widely accepted as a positive lifestyle behaviour that we all should engage in, and the evidence indicates that pediatric cancer patients and survivors have even more to gain from being regularly physically active. Specific benefits include physical (i.e., maintain ideal body weight), psychosocial (i.e., enhance mood, decrease depression), and overall enhanced quality of life. Despite these benefits, relatively few childhood cancer survivors maintain regular physical activity.

What is the Difference Between Physical Activity and Exercise?

It is important to understand the difference between physical activity and exercise. The terms are often used interchangeably, but do mean different things!

Physical Activity (PA): Any bodily movement produced by the skeletal muscles that results in a substantial increase in energy expenditure.

Leisure-Time PA: Activity undertaken during discretionary time based on personal choice.

Exercise: A form of leisure-time PA that is performed on a repeated basis over an extended period of time with the intention of improving fitness, performance or health.

Most of the cancer research has focused on exercise – specific bouts of PA for the purpose of improving fitness and health. However, there is growing interest in researching and promoting lifestyle physical activity – getting people to engage in more active lifestyles during their everyday activities (i.e., walking to the store instead of driving).

Why Physical Activity?

Currently, studies examining the effects of regular exercise in pediatric cancer patients and survivors are limited. However, three recent reviews suggest that exercise is tolerated, safe, beneficial and effective at combating several of the negative side-effects experienced during treatment and into survivorship. Research on the association between exercise and psychosocial outcomes is still developing in pediatric oncology, however, researchers have found that exercise improves measures of anxiety and health-related quality of life. These results are bolstered by studies conducted in the adult cancer

population, which have consistently reported positive effects on similar outcomes (eg. health-related quality of life, anxiety, and mood).

Furthermore, researchers are consistently noting that exercise is useful to improve reduced functional capacity and motor performance. For example, research has found significant pre- and post-intervention differences on measures of fitness, functional mobility, strength and body fat in exercise interventions. Recently, authors have begun exploring the effect of exercise on immune system suppression and recovery. Because chemotherapy treatment is known to suppress the immune system, concerns exist that exercise may tax the already compromised immune system. So far, researchers have found no negative effects of exercise on neutrophil counts and immune function in children during cancer treatment. This work has been supported by a recent study that found a daily 3-week in-hospital moderate-intensity training regimen did not negatively affect immune cell recovery in patients undergoing stem cell transplantation. Based on the reviews of the literature and in conjunction with evidence in the adult cancer population, it can be concluded that exercise therapy during and following treatment is potentially beneficial to participants' health. Unfortunately, studies focusing on the myriad of unique psychosocial and physical changes in pediatric oncology, such as anxiety, specific health-related quality of life concerns, impaired gross motor performance and functional mobility, decreased muscle strength, and body composition are still quite limited, emphasizing the need to further explore exercise and its effects in pediatric oncology.

Why Yoga?

Yoga therapy is a popular complementary and alternative medicine (CAM) technique that is increasingly gaining acceptance as a beneficial strategy to improve psychosocial and physical health function.

Based on the results from adult cancer populations and reviews that highlight the psychosocial and physical benefits of yoga for pediatric populations, researchers have recently begun exploring the benefits of yoga for pediatric cancer patients and survivors. To date, three studies have explored the benefits of yoga for pediatric cancer patients, and all found encouraging results for the efficacy of yoga to diminish treatment-related side-effects and improve quality of life. Based on the trends, and these early results, a handful of pediatric cancer centers in North America have begun offering yoga in their unit recreation centers and bedside. These sessions emphasize basic yoga positions, stretching, breathing, and relaxation techniques (e.g., Memorial Sloan-Kettering Cancer Center, 2012).

The emerging yoga and pediatric oncology research highlights the potential role of yoga sessions for pediatric oncology survivors. Given the special considerations inherent with this population and the lack of evidence, it is suggested that the utility of yoga be further explored.

What Should your Child Bring to their Yoga Session?

Clothing:

Wear breathable comfortable clothing to avoid overheating.

Shorts or comfortable pants

Loose fitting t-shirt

Hydration:

Hydration is very important during exercise. Dehydration will impair your child's ability to exercise and can lead to serious issues. It is important to drink water before, during and after the yoga session to ensure proper hydration and recovery.

Water bottle

Nutritional Recommendations:

It is important that your child eats a small, healthy snack prior to exercise their yoga session and then a meal 1-2 hours following the yoga session. Good snacks to eat before include fruit (e.g., banana, apple, orange), granola bar, or cheese and crackers.

Canadian Physical Activity Guidelines

FOR CHILDREN - 5 – 11 YEARS

Guidelines



For health benefits, children aged 5-11 years should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily. This should include:



Vigorous-intensity activities at least 3 days per week.



Activities that strengthen muscle and bone at least 3 days per week.



More daily physical activity provides greater health benefits.

Let's Talk Intensity!

Moderate-intensity physical activities will cause children to sweat a little and to breathe harder. Activities like:

- Bike riding
- Playground activities

Vigorous-intensity physical activities will cause children to sweat and be 'out of breath'. Activities like:

- Running
- Swimming

Being active for at least 60 minutes daily can help children:

- Improve their health
- Do better in school
- Improve their fitness
- Grow stronger
- Have fun playing with friends
- Feel happier
- Maintain a healthy body weight
- Improve their self-confidence
- Learn new skills

Parents and caregivers can help to plan their child's daily activity. Kids can:

- Play tag – or freeze-tag!
- Go to the playground after school.
- Walk, bike, rollerblade or skateboard to school.
- Play an active game at recess.
- Go sledding in the park on the weekend.
- Go "puddle hopping" on a rainy day.

60 minutes a day. You can help your child get there!



Canadian Physical Activity Guidelines

FOR YOUTH - 12 – 17 YEARS

Guidelines



For health benefits, youth aged 12-17 years should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily. This should include:



Vigorous-intensity activities at least 3 days per week.



Activities that strengthen muscle and bone at least 3 days per week.



More daily physical activity provides greater health benefits.

Let's Talk Intensity!

Moderate-intensity physical activities will cause teens to sweat a little and to breathe harder. Activities like:

- Skating
- Bike riding

Vigorous-intensity physical activities will cause teens to sweat and be 'out of breath'. Activities like:

- Running
- Rollerblading

Being active for at least 60 minutes daily can help teens:

- Improve their health
- Do better in school
- Improve their fitness
- Grow stronger
- Have fun playing with friends
- Feel happier
- Maintain a healthy body weight
- Improve their self-confidence
- Learn new skills

Parents and caregivers can help to plan their teen's daily activity. Teens can:

- Walk, bike, rollerblade or skateboard to school.
- Go to a gym on the weekend.
- Do a fitness class after school.
- Get the neighbours together for a game of pick-up basketball, or hockey after dinner.
- Play a sport such as basketball, hockey, soccer, martial arts, swimming, tennis, golf, skiing, snowboarding...

**Now is the time. 60 minutes
a day can make a difference.**



APPENDIX H: HOME-BASED YOGA HANDOUT

Yoga for Pediatric Cancer Out-Patients Take Home Poses - Week 1

Yoga is Connection

Extended Tabletop
(Breathe 2-5 breaths)



Lunge (Breathe 2-5 breaths)



Crescent Moon (Breathe 2-5 breaths)



Savasana (Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 2

Yoga is Grounding

Fierce Pose (Breathe 2-5 breaths)



Stork with Turns (Breathe 2-5 breaths)



Boat Pose (Breathe 2-5 long breaths)



Legs up the Wall (Relax and breathe)



Yoga - Take Home Poses - Week 3

Yoga is Awareness

Standing Arm Flow

(Breathe 2-5 breaths)



Warrior III

(Breathe 2-5 breaths)



Extended Tabletop Crunches

(Breathe 2-5 long breaths)



Legs up the Wall w/Hip Release

(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 4

Yoga is Balance

Tree

(Breathe 2-5 long breaths)



Eagle

(Breathe 2-5 long breaths)



Warrior III

(Breathe 2-5 long breaths)



Yoga is Balance

Flowing Fierce Pose w/Knee Hugs

(Breathe 2-5 long breaths)



Half Moon

(Breathe 2-5 long breaths)



Reclining Butterfly

(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 4

Yoga is Balance
Choose a pose that made you feel balanced with....

Focus

(Breathe 2-5 long breaths)

Strength

(Breathe 2-5 long breaths)

Courage

(Breathe 2-5 long breaths)

Acceptance

(Breathe 2-5 long breaths)

Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 5

Yoga is Stability

Modified Cow Face
(Breathe 2-5 breaths)



One Legged Hip Turns
(Breathe 2-5 breaths)



Plank
(Breathe 2-5 long breaths)



Legs up the Wall
(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 6

Yoga is Strength

Dynamic Deltoids
(Breathe 2-5 breaths)



Dynamic Surfer
(Breathe 2-5 breaths)



Dolphin/Plank
(Breathe 2-5 long breaths)



Supported Bridge
(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 7

Yoga is Love & Gratitude

Reclined Angel Arms
(Breathe 2-5 breaths)



Warrior II/Reverse Warrior
(Breathe 2-5 breaths)



Sphinx
(Breathe 2-5 long breaths)



Savasana II
(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 8

Yoga is Creativity

Seated Bee Breath
(Breathe 2-5 long breaths)



Modified Fish Pose
(Breathe 2-5 long breaths)



Warrior I
(Breathe 2-5 long breaths)



Yoga is Creativity

Seated Wide Legged Forward Bend

(Breathe 2-5 long breaths)



Modified Upward Plank

(Breathe 2-5 long breaths)



Supported Bridge Variation

(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 8

Yoga is Creativity
Choose 4 poses that helped you feel....

Centered

(Breathe 2-5 long breaths)

Empowered

(Breathe 2-5 long breaths)

Expressive

(Breathe 2-5 long breaths)

Confident

(Breathe 2-5 long breaths)

Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 9

Yoga is Patience & Acceptance

Wide Legged Side Bend
(Breathe 2-5 breaths)



Reclined Hand to Big Toe
(Breathe 2-5 breaths)



Happy Baby
(Breathe 2-5 long breaths)



Reclined Pigeon Twist
(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 10

Yoga is Body Appreciation & Healing

Seated Breath Release

(Inhale Positive Thought -
Exhale Negative Thought)



Standing Arm Flow to Forward Bend

(Inhale nostrils - Exhale Mouth)



Fierce Pose

(Breathe 2-5 long breaths)



Reclined Twist

(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 11

Yoga is Meditation in Motion

Seated Moon Breath

(Inhale through left nostril
Exhale through right nostril
Repeat x 5 cycles)



**Meditation in Motion
Sequence**

(Exhale to Child's Pose
Inhale in Cow
Exhale in Cat
3 full breaths in Lunge
Repeat 2- 3 times alternating
Lunge sides)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 11

Yoga is Meditation in Motion

Warrior III Variation

(Inhale Up - Exhale Hinge Forward)



Seated Forward Fold
w/ Arm Flow

(Inhale Open - Exhale Hinge Forward)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 12

Yoga is Unity

Tabletop Knee Lifts
(Breathe 2-5 long breaths)



Warrior III Variation
(Breathe & repeat 2-5 times
Inhale open - exhale hug in)



Side Plank Variation
(First stage or both
Breath 2-5 long breaths)



Yoga is Unity

Reclined Rope Pulls

(Reach on exhale 5x
modify head down)



½ Revolved Belly Twist

(Relax & breathe
Modify with support)



Savasana

(Relax and breathe)



Yoga for Pediatric Cancer Out-Patients
Take Home Poses - Week 12

Yoga is Unity
Choose a pose that made you feel in union
with or connected to....

Your Breath

(Breathe 2-5 long breaths)

Your Mind

(Breathe 2-5 long breaths)

Your Body

(Breathe 2-5 long breaths)

Your Self

(Breathe 2-5 long breaths)

APPENDIX I: FULL 12-WEEK PROTOCOL

Week 1: Connection: Introduction to Each Other, Yoga and Ourselves

Goal: Teach participants about their connection to: others in the group (as a means of instilling a sense of support); their yoga practice; themselves (body, mind, and spirit).

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Introduce journals and explain how they will be used over the course of the intervention. Introduce the theme and have participants write their name and write or draw their thoughts about connection and yoga.	Journals	
Name Web (Seated)	Each child takes the yarn and introduces themselves and then passes the yarn, holding on to a piece, this continues and a web is formed; illustrating their physical connection to each other.	String/yarn	
Peace Breath (Seated)	On exhale quietly whispering “peace”.		
Prayer Presses (Seated)	Hands at chest height, elbows at shoulder height, in prayer position. Gently press heels of hands together.		
Take 5 Breath (Seated)	Inhale press each finger together starting at pinky and adding subsequent fingers – exhale do reverse.		
Cat/Cow (Kneeling)	On hands and knees moving with breath; on inhale dropping back down and opening the chest (cow); on exhale arching back up to close the chest (cat).	Optional: knee support (blanket, foam pad or bolster under shins)	<ul style="list-style-type: none"> - Perform standing, hands on chair and moving through the spine. - Perform seated, hands on knees moving through the spine. - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).

Tabletop with Limb(s) Extended (Kneeling)	On hands and knees, alternating extending right (R) arm with left (L) leg and L arm with R leg.	Optional: knee support (blanket, foam pad or bolster under shins)	- Start with one limb at a time (i.e., moving just the R arm and then adding the L leg). - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Lunge (Standing)	In lunge position, alternating R and L. One leg/hip moving into flexion, the other extension.		- Drop knee down if necessary for balance or due to strength limitations.
Arm Flow (Partial Sun Salute) (Standing)	First part in a Sun Salute – from standing, inhale, bring the arms around and up overhead, opening the chest/heart and filling with breath. Exhale as you hinge at the hip and bend over the legs.	Optional: Chair	- Knees stay bent. - Bend to hands on a chair (keeping head at heart height to reduce dizziness).
Joint Awareness (Standing)	Stacking of joints (knees over ankles, hips over knees, etc.) after the last <i>Partial Sun Salute</i> .		
Mountain (Standing)	Standing tall, planting feet into the ground. Briefly introduced the 4 corners of the feet and aligning the body up from the ground.	Optional: Wall	- Use wall to assist with balance and reduce weight bearing.
Crescent Moon (Standing)	Standing, reaching hands overhead and interlocking fingers, tilting gently to R and L side trying to keep equal weight between both feet throughout.		
Tree (Standing)	Standing on one leg with opposite leg pressing into ankle, inside of calf or thigh (alternate legs).	Optional: Wall, chair	- Perform at wall for balance (sacrum only point of contact). - Perform seated if

			<p>there are issues with weight bearing.</p> <ul style="list-style-type: none"> - Perform in a reclined position if there are issues with weight bearing.
Single Leg Balance (Standing)	Once steady in tree, close eyes.	Optional: Wall, chair	<ul style="list-style-type: none"> - Perform at wall for balance (sacrum only point of contact). - Perform seated if there are issues with weight bearing. - Perform in a reclined position if there are issues with weight bearing. - Use a bolster to allow foot to rest down lightly.
Warrior III (Standing)	Standing on one leg, hinging forward at hips and reaching leg out behind and arms out in front. Alternate legs.	Optional: Wall, chair	<ul style="list-style-type: none"> - Perform at wall for balance (sacrum only point of contact). - Perform seated if there are issues with weight bearing. - May be performed on one side only if there are issues with weight bearing.
Triangle (Standing)	Abduct legs and external rotate front leg then take the upper body into a hinged forward position with the spine staying in neutral position. Hinge back up to standing to complete the	Optional: Wall, chair	<ul style="list-style-type: none"> - Perform at wall for balance (sacrum only point of contact).

	pose.		- Perform seated if there are issues with weight bearing.
Windshield Wipers (Supine)	Lying on back with knees bent, feet wider than hip distance apart, gently and slowly tipping knees side to side.		
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant. Teach participants Namaste is used like a ‘thank-you’ for practicing together.		
Journaling	Ask participants to reflect on their practice.	Journals	

Week 2: Grounding: Finding a Place of Calm

Goal: Create a sense of “groundedness” in participants that helps them find a place of calm.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Introduce the theme and ask them to reflect on what/where/who makes them feel grounded and calm.	Journals	
Eye Palming (Seated)	Rub hands together to create friction, energy and warmth. Once created, gently cup one palm over each eye and allow energy to transfer once dissipated, take hands away and repeat 3 time.		
Legs up the Wall (Supine)	Lying on back, with legs straight up the wall.		
Legs up the Wall with Supta P Variation (Supine)	Inhale leg gently off the wall by drawing on strap that is looped around the ball of the foot.	Straps	
Peace Breath (Seated)	On exhale quietly whispering “peace”.		
Take 5 Breath with Prayer Presses (Seated)	Hands at chest height, elbows at shoulder height, in prayer position. Gently press heels of hands together. Inhale press each finger together starting at pinky and adding subsequent fingers, exhale do reverse.		
Prayer Circles (Seated)	Stabilizing at the scapula in above position, “wind” fingers to turn away from body and then back to point into chest/body.		
Toe Stretches (flexion and extension) (Kneeling)	Before coming to stand, turn/tuck toes under, gently place a bit of weight if possible/comfortable. Switch to tuck under to stretch the tops of the feet		- Standing with no pressure if there are issues with weight bearing or peripheral neuropathy.
Tennis Ball Rolling (feet) (Standing)	Standing, placing a tennis ball under feet and gently applying pressure and rolling the ball around the foot to release fascia and muscle tissue.	Tennis Ball	- Standing with little/no pressure if there are issues with weight bearing or

			peripheral neuropathy.
Marble Toes (Standing)	Using toes pick up and place marbles into small cups.	Marbles, Cups	
Mountain (Standing)	Standing tall, planting feet into the ground and working to align posture.		
Pelvic Tilt (Standing)	Posterior and anterior tilting of the pelvis. Focus on an isolated movement		
Chair Pose (Standing)	From mountain pose, bending at the knees and slightly hinging at hip to come into “Chair” position.	Optional: Wall, Chair	- Perform at wall for balance (sacrum only point of contact). - Perform seated if feeling fatigued and focus on opening up through chest and arms.
Forward Fold (Standing)	Bend over and fold forward, letting arms hang loosely.		
Mountain with Heel Raises (Standing)	Standing tall, planting feet into the ground, lifting up to balls of feet. Focus on awareness to keeping weight evenly distributed in balls of the feet so heels draw a straight line up the back.		
Stork with Turns (Standing)	Balancing on one leg with hands crossed over chest, keeping eyes forward, slowly twist into the standing leg R to L. Alternate legs.		
Warrior I (Standing)	From standing at top of mat, step one leg back into a high lunge position. Move arms overhead.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support. - Entwine arms into Eagle position (day 2).
Warrior II (Standing)	Abduct legs apart – externally rotate front leg and then hinge into a high lunge position with arms extending over front and back legs.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support. - Entwine arms into Eagle position (day 2).
Squat (Garland,	Feet hip distance apart or slightly wider kids came into	Optional:	- Come half-way down into

Frog) (Standing)	a 'squat' position keeping heels down on floor	Chair	Goddess Pose if hips are tight.
Partner Boat (Seated) (Partner/Group Activity)	Seated, facing a partner, place bottoms of feet together, reach forward and link hands, slowly lift feet together between the two of you, and lean back.		
Forward bend (Paschimott Anasana) (Seated)	Seated on floor with both legs extended out in front. Hinge from the hip to bend slightly forward keeping spine in neutral.		
Windshield Wipers (Supine)	Lying on back with knees bent, feet hip distance apart or wider. Gently and slowly tipping knees side to side.		
Active Release (Supine)	A way of coming into savasana position. First actively squeeze and then release all parts of the body.		
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with "Namaste" to each participant.		
Journaling	Ask participants to reflect on their practice.	Journals	

Week 3: Awareness: Awareness to Physical and Emotional Needs of Ourselves and Others

Goal: Bring awareness to needs. What others need and what we need (physically and emotionally).

Focus: On the pelvis and heads of femurs to help elicit that grounded feeling and open hips; connect to our core and promote awareness throughout the body.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Pose questions: How do you feel today? Can you feel what part of your body really needs yoga today? Can we be aware to what we need vs. want?	Journals	
Legs up the Wall (Supine)	Lying on back, with legs up the wall, focus on pelvic stability. Focus on extended exhalation breath (exhale just slightly longer than inhale).		
Legs up the Wall with Hip Release (Supine)	From Legs up the Wall, cross R ankle over L. Without moving or rocking in the pelvis, slide the R ankle down the L leg without hands.		
Reclining Hand to Big Toe (Supine)	Lying on back, focusing on pelvic stability, loop strap around foot and gently draw that leg towards the body for hamstring release. Then externally rotate the leg and abduct from the body only to a place where weight is still even into both side of the pelvis.	Strap	
Cat/Cow (Kneeling)	On hands and knees moving with breath; on inhale dropping back down and opening the chest (cow); on exhale arching back up to close the chest (cat).	Optional: knee support (blanket, foam pad or bolster under shins)	<ul style="list-style-type: none"> - Perform standing, hands on chair and moving through the spine. - Perform seated, hands on knees moving through the spine. - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).

Forward Hero to Tabletop (x5) (Kneeling)	Kneeling and sitting back on heels (full knee flexion), knees apart arms extended. Inhale while on heels, exhale to use arms/shoulder stability to pull to a tabletop (quadruped position) and repeat moving with breath 5 times.	Optional: Chair	- Use chair; kneeling with 90° knee flexion or less if needed and sliding chair away.
Tabletop with Limb(s) Extended to Crunches (Kneeling)	With hands and knees on the ground, extend R arm with L leg, crunch R arm with L leg taking spine into flexion and engaging abdominals – repeat 5 times (if possible) and then return to the ground. Extend L arm with R leg, crunch L arm with R leg taking spine into flexion and engaging abdominals – repeat 5 times (if possible) and return to the ground.		- If issues with strength or balance focus on one limb at a time.
Bound Angle (Seated)	Seated with bottoms of feet touching and knees lying out to the sides with spine in an erect neutral position.	Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Arm Circles (Seated)	From Bound Angle, take a strap into hands and arms overhead. Begin to draw small circles keeping movement purely in shoulder girdle.	Strap Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Electric Arms in “T” (Seated)	Seated position, arms in T just below shoulder height, take back to an easy stretch, then release deep tissue by drawing back wrists and fingers.	Optional: Chair, bolster	- Perform from chair if more comfortable. - Sit on bolster if knees are higher than hip height so spine can come into neutral.
Flowing Arm Twists (Seated)	Seated position, take arms one at a time into a flowing movement just above heart height.	Optional: Chair	- Perform from chair if more comfortable.
Arm flow (Partial Sun Salute) (Standing)	First part in a Sun Salute – from standing, inhale as you bring the arms around and up overhead, opening the chest/heart and filling with breath bring arms back to the body.		

Chair Pose (Standing)	From mountain pose, bending at the knees and slightly hinging at hip to come into “Chair” position.	Optional: wall	- Perform at wall for balance (sacrum only point of contact). - Perform seated if feeling fatigued and focus on opening up through chest and arms.
Ankle; Heel; Toe Walking (Standing)	Standing and walking on the heel, balls of the feet, (toes) and inside/outside edges of the feet, bringing awareness to the movement patterns of the feet.		
Triangle Pose, Half moon, Warrior II, Warrior I, Warrior III Flow into the Wall (Standing)	Triangle: Abduct legs and external rotate front leg then take the upper body into a hinged forward position with the spine staying in neutral position. Hinge back up to standing to complete the pose. Half moon: Bend into front leg and lift back leg up off the ground as the body hinges forward. Then straighten front leg. Torso is perpendicular to standing leg and parallel to back raised leg. Warrior II: Abduct legs apart , externally rotate front leg and then hinge into a high lunge position with arms extending over front and back legs. Warrior I: From standing at top of mat, step one leg back into a high lunge position. Move arms overhead. Warrior III: Standing on one leg, hinging forward at hips and reaching leg out behind and arms out in front. Alternate legs.	Wall, Optional: Chair	- Perform using a chair under the front thigh for support.
Buddha Walk (Standing) (Partner/Group Activity)	Standing in a line with all other participants, grabbing one another’s wrists or shoulders, slowly and mindfully move across the room, taking large steps (alternating R and L) into Warrior III. Bring awareness to moving in unison with breath and		

	meeting the needs of others with our own.		
Partner Twist in wide legged forward bend position (Seated) (Partner/Group Activity)	Seated, facing a partner with legs open wide, grab opposite elbow/wrists of partner and gently twist to open chest in opposite directions.	Optional: Bolsters	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on their practice.	Journals	

Week 4: Balance: Coming into Complete Balance

Goal: To create a sense of balance physically, mentally and emotionally.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Pose Question: What is balance to you?	Journals	
Reclined Bound Angle (Supine)	Lying on back with bottoms of feet touching and knees dropping out to the sides chest lifted and spine supported on a bolster. Instruct participants to balance their breath on the inhale with the breath on the exhale.	Bolster	
Circle of Friendship (Seated) (Partner/Group Activity)	Seated in a circle in Bound Angle, reach under to join hands with the participant beside, lean back and balance as a team supporting each other.		
Hand Drill (open/close) (Seated)	Seated, open and close hands mindfully with fingers spreading wide to open and closing tight into fists. Forearms stay engaged and held at shoulder height with wrist in flexion.	Quote to read: Your hand opens and closes, opens and closes. If it were always a fist, or always stretched open, you would be paralysed. Your deepest presence is in every small contracting and expanding, the two as beautifully balanced and coordinated as birds' wings. ~ Rumi Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Flowing Arm Twists (Seated)	Seated position, take arms one at a time into a flowing movement just above heart height.	Optional: Chair	- Perform from chair if more comfortable.
Elephant Ears (Seated)	Gentle massage of the outsides of the ears, believed to stimulate the energy meridians of the body	Optional: Bolster,	- Sit on bolster if knees are higher than hip height so spine can

			come into neutral.
Tabletop Knee Lifts (Kneeling)	On hands and knees with a neutral spine, draw navel gently up and towards spine, tuck toes and lift knees only an inch or two off of the floor, ensure breath continues.		- Place a bolster under shin to remove weight from the knee (if issues with weight bearing) and lift through shins.
Tabletop with Limb(s) Extended (Kneeling)	On hands and knees, alternating extending R arm with L leg and L arm with R leg.	Optional: knee support: blanket, foam pad or bolster under shins	- Start with one limb at a time (i.e., moving just the R arm and then adding the L leg). - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Mountain (eyes closed) (Standing)	Standing tall, planting feet into the ground, close eyes.		
Stork (Standing)	Balancing on one leg with hands crossed over chest. Eyes closed to challenge proprioception	Optional: Wall	- Perform at wall for balance (sacrum only point of contact).
Stork with Turns (Standing)	Balancing on one leg with hands crossed over chest, keeping eyes forward, slowly twist R to L. Alternate legs.	Optional: Bolster	- Use a bolster to allow foot to rest down lightly.
Chair Pose with Knee Hugs (Standing)	Chair pose (from mountain pose, bending at the knees and slightly hinging at hip to come into “Chair” position) but continuing the movement dynamically. As coming back to an upright standing position ‘hug’ around the leg drawing the knee into as much flexion as possible. Flowing from one side to the other with squat position in between.		

Tree into Eagle into Warrior III into Half Moon (Standing)	Tree: Standing on R leg with L leg pressing into ankle or thigh (alternate legs). Eagle: In chair pose, move weight to R leg, lift L leg and cross it over (tucking it behind calf if possible) Warrior III: Standing on R leg, leaning forward and reaching L leg out behind and arms out in front. Half Moon: From Warrior III, bend into R leg and rotate torso to open body up. Alternate legs.	Wall	- Perform at wall for balance (sacrum only point of contact). - Perform with a chair under the front thigh if there are issues with weight bearing.
Boat Pose (Seated)	From seated, engage core and draw arms and legs off the ground so the body makes a “V” shape.		
Forward Fold (Seated)	Seated on the floor with legs outstretched, exhale and bend forward, maintaining neutral spine.	Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization. Focus on balancing both sides of the body.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on practice.	Journal	

Week 5: Stability: Physically and Emotionally

Goal: Foster a sense of stability in participants. Physically through stability in muscles, joints and core; and emotionally by instilling a sense of safety and self-confidence.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Pose Questions: What makes you feel stable? Does it come from physical strength? Family love and support? Friends? Self-Esteem?		
Legs up the Wall (Supine)	Lying on back, with legs up the wall.		
Single Leg Abduction (Supine)	From legs up the wall, move away from wall and abduct leg away from body once raised keeping a bolster against that hip.	Bolster, Strap	
Toe Taps (5/side) (Supine)	Lay on back, keeping connection of low back to the floor, raise legs to a right angle (shins parallel with the floor). Alternate legs, slowly lower one at a time to tap down on the floor while other leg stays absolutely still.	Optional: Strap	Use: strap to help with low back connection, place it under the back and have participants actively push into it throughout the pose.
Hip Activation (Seated)	From seated, lean back and lift up hips, place a tennis ball under one side of the gluteus maximus and minimus, lift that same side leg off the ground and gently roll the tennis ball around working into deeper tissue for release and stimulating the muscle.	Tennis Ball	
Tabletop with Limb(s) Extended with Tennis Ball (Kneeling)	On hands and knees, alternating extending R arm with L leg and L arm with R leg. For extra fun/challenge, place the tennis ball on the lower back.	Optional: knee support: blanket, foam pad or bolster under shins	- Start with one limb at a time (i.e., moving just the R arm and then adding the L leg). - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Modified Cow Faced	Standing, place one arm overhead and bent at	Strap	

Arms (Standing)	elbow, other arm bends at elbow to cross around tailbone. Using a strap in both hands mimic the movement of drying your back with a towel in smooth fluid motion		
One Legged Hip Turns with Front and Back Toe Taps (Standing)	Standing with hands touching shoulders and elbow facing out. Head/eyes stay focused forwards throughout movement. Shift weight into L leg and tap R toe lightly in front and behind. Alternate legs and increase size of half circle when stable.		
Dynamic Warrior III (Standing)	Standing on one leg, leaning forward and reaching leg out behind and arms out in front. Move continuously, hinging forward and back to upright posture. Alternate legs.	Optional: Wall, Chair	- Perform beside wall for balance. - Start with very small movement range.
Balancing Core Series (Standing)	Standing upright in mountain, take strap around R foot and bring knee up in front. Breath. Take knee out to the side. Breath. Bring knee back in front. Breath. Extend leg as far as possible. Breath.	Strap Optional: Wall	- Perform at wall for balance (sacrum only point of contact).
Integrated Shoulder Flexibility/Stability (Standing)	Standing, arms at right angles at the side of body. Move arms in saw motion 3 time each (thumbs up, palms down, thumbs down). Focus on controlled movement.	Optional: Chair	- Perform from chair if more comfortable.
Integrated Shoulder Flexibility/Stability (Standing)	Standing, arms at R angles in front of body, hands in fists punching 3 times each (thumbs up, palms down, thumbs down). Focus on controlled movement.	Optional: Chair	- Perform from chair if more comfortable.
Integrated Shoulder Flexibility/Stability (Standing)	Standing, arms down, palms face thighs to start, raise elbows up to shoulder height, rotate arms so hands are facing the ceiling (cactus arms). Ensure forearms are wider than 90°.	Optional: Chair	- Perform from chair if more comfortable.

Wheel Barrel Walking (Partner/Group Activity)	With partners, have one participant in tabletop (plank position), the other reaches under and picks up shins/thighs. The “wheel barrel partner” engages core and slowly walks.		<ul style="list-style-type: none"> - Walk on forearms if strength limitations. - Hold position (no movement).
Crab Walking with Balloons (Partner/Group Activity)	Leaning back from seated, ensure arm has externally rotated, place weight into hands, and lift hips off of the ground. Goal: try to keep balloon in the air using legs, and walking/moving as a crab.	Balloons	<ul style="list-style-type: none"> - Lower hips to the ground for breaks.
Dolphin Plank (Prone)	Lying on stomach, raise body off of the ground in plank position (on forearms).	Optional: Bolster	<ul style="list-style-type: none"> - Knees up or down. - To challenge alternate lifting 1 arm or 1 leg off of the ground (3 limbed dolphin). - Use bolster under shins in cases of peripheral neuropathy.
Plank (Prone)	Lying on stomach, raise body off of the ground in a plank position (arms fully extended).	Optional: Bolster	<ul style="list-style-type: none"> - Knees up or down. - To challenge alternate lifting 1 arm or 1 leg off of the ground (3 limbed dolphin). - Use bolster under shins in cases of peripheral neuropathy.
Rope Pulls (Supine)	Lying on back with knees bent and feet planted on the ground, engage core and reach up (lifting shoulders off of the ground) alternating R and L hands reaching.		<ul style="list-style-type: none"> - Release head and shoulders to the floor.
Bridge into Single Leg Bridge (Supine)	Bridge: Lying on back with knees bent and feet planted, engage core and lift hips. Keep muscles contracted and hold for up to 10 seconds.		

	Single Leg Bridge: From bridge, keep gluteus maximus contracted and lift alternating legs.		
Paper Slides (Supine)	Lying on back with knees bent and feet planted, tilt pelvis posteriorly and connect low back to the floor. Lift alternating feet 1 cm off of the ground (enough for a piece of paper to slide under the feet).		
Pigeon (Supine)	On back, bend knees, cross R ankle over other leg just above knee. If available, clasp hands around L thigh and lift L foot off the floor for stretch in R side gluteus. Head and shoulders stay settled on floor	Optional: Strap	<ul style="list-style-type: none"> - Avoid pose if knee ROM limited. - Use strap to wrap around thigh.
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization.	Optional: Bolster	<ul style="list-style-type: none"> - Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on practice.	Journals	

Week 6: Strength: Strong Body, Mind, Breath and Focus

Goal: Teach participants that strength can be found in much more than just muscles.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Pose Questions: What makes you feel strong? When does your inner light shine? Does it come from being courageous? Feeling confident? Eating well? Being connected? Having a clear mind? Standing up for yourself?	Journals	
Reclined Bound Angle (Supine)	Lying back on a bolster with soles of feet touching and knees dropping out to the sides.	Optional: Large and small bolster	Place long bolster under spine and smaller bolster under heads.
Integrated Shoulder Flexibility (ISF) Pulls (Seated)	Seated with dominant hand in front of face, with palm facing out, bring other hand up to clasps. Pull hands apart and maintain tension throughout movement. Move arms 3x each (side to side, circle forward, circle backward, swim forward (draw circles in opposite directions with elbows), swim backward).	Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
ISF Pushes (Seated)	Seated with dominant hand in front of face, with palm facing out, bring other hand up to clasps. Push hands together and maintain tension and activation. Move arms 3x each (side to side, circle forward, circle backward, swim forward, swim backward)	Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Mountain (Standing)	Standing tall, planting feet into the ground.		
Reach for the Sun (Standing)	Standing tall, punch up (overhead and cross midline) and pull back with energetic arms.		
Revolved Side Angle on One Knee (Standing)	In a lunge position, with back knee down, extend spine forward, and then turn from the waist up, toward the bent front leg	Optional: Chair	- Perform using a chair under the front thigh for support.
Tree *Day 2: Close eyes in	Standing on one leg with opposite leg pressing into ankle lower leg or thigh (alternate legs).	Optional: Wall	- Perform at wall for balance (sacrum only)

tree (Standing)			point of contact).
Warrior I (Standing)	From standing at top of mat, step one leg back into a high lunge position. Move arms overhead.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support.
Warrior II (Standing)	Abduct legs apart, externally rotate front leg and then hinge into a high lunge position with arms extending over front and back legs.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support.
Extended Side Angle (Standing)	From Warrior II position, hinge to bring torso over front leg reaching top arm long overhead. Chest/belly stay facing side. Lower forearm presses into front thigh	Optional: Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support.
Dynamic Surfers Pose (Standing)	In warrior I position, keep lower body still, while upper body leans forward over thighs through hip hinge so spine stays in neutral (without resting on thighs).	Optional: Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support.
Dynamic Deltoids Seated or Standing (8-12/side) (Seated/Standing)	In seated/standing one arm comes into flexion, the other abduction lifting no higher than shoulder height .		
Buddha Walk (Standing) (Partner/Group Activity)	Standing in a line with all other participants, grabbing one another's shoulders, slowly and mindfully move across the room, taking large steps (alternating R and L) into Warrior III. Bring awareness to moving in unison with breath.		

Dolphin Plank (Prone)	Lying on stomach, raise body off of the ground in plank position (on forearms).	Optional: Bolster	- Knees up or down. - To challenge alternate lifting 1 arm or 1 leg off of the ground (3 limbed dolphin). - Use bolster under shins in cases of peripheral neuropathy.
Sphinx Pose (Prone)	Lying on belly, align elbows under shoulders. Press forearms into the mat while lengthening the upper body forward (neck long) and lower body back and into mat, lift shoulders and chest up and keep drawing breastbone forward	Optional: Wall	- Perform at wall pushing hands into the wall and slowly lengthening the upper body.
Rope Pulls (Supine)	Lying on back with knees bent and feet planted on the ground, engage core and reach up (lifting head and shoulders off of the ground) alternating R and L hands reaching straight up towards ceiling.		- Can release head and shoulders to the floor.
Supported Bridge into Single Leg Support Bridge (Supine)	Supported Bridge: Lying on back with knees bent and feet planted, engage core and lift hips and place support (bolster) under hips. Release into bolster. Single Leg Supported Bridge: From supported bridge, lift alternating legs.	Bolster	
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on practice.	Journals	

Week 7: Love: Yourself and Each Other

Goal: Try to demonstrate they can still feel abundance, joy and gratitude during challenging times.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Pose Questions: What makes your heart sing? What makes your heart smile? What makes you feel joy? What do you love? What makes you feel loved? What are you grateful for?	Journals	
Savasana II (Peace Breath) (Supine)	Reclining onto a vertical bolster so entire spine/head are supported. If comfortable, stretch legs out straight. Chest is supported and diaphragm free for breath work	Optional: Bolster	- Place bolster under head for support. - Bend knees and plant feet.
Reclined Angel Arms (Supine)	Lying on back, knees bent, feet planted. Arms on ground with elbows bent at 90° (cactus position). Glide arms along the floor until fingertips touch overhead.		- Glide arms ½ inch in the air (not on the ground).
Parvatasana (Seated)	In a seated position with an upright spine take arms perpendicular to the torso. Interlace fingers, flip palms forward and with humerus settled into the shoulder girdle, bring arms overhead without moving through the torso/ribs.	Optional: Strap	- Use a strap when shoulders tight.
Thymus Tap (Seated)	Seated, gently tap fists on sternum and rib area.		- Avoid of ports, surgery sites etc.
Flowing Arm Twists (Seated)	Seated position, take arms one at a time into a flowing movement just above heart height.	Optional: Chair	- Perform from chair if more comfortable.
Pectoral/Rhomboid Stretch (Seated)	Seated with an upright spine, take arms perpendicular to the body and clasp hands. Begin to draw navel in, rounding back while arms, like they are hugging a beach ball. Press arms gently away. Release and take arms behind the back (externally rotated) either clasping or holding a strap. Extend hands away from back.	Optional: Bolster, Strap	- Sit on bolster if knees are higher than hip height so spine can come into neutral. - Use strap instead of clasping for tight shoulders and/or

			restrictions from torso/lung surgeries.
Cat/Cow (Kneeling)	On hands and knees moving with breath; on inhale dropping back down and opening the chest (cow); on exhale arching back up to close the chest (cat).	Optional: knee support (blanket, foam pad or bolster under shins)	<ul style="list-style-type: none"> - Perform standing, hands on chair and moving through the spine. - Perform seated, hands on knees moving through the spine. - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Twisting Tabletop (Kneeling)	From all 4's, thread one arm under and across the body to (if possible) bring ear to the floor. Femurs stay vertical and pelvis square while torso moves into gentle twist to open chest/heart	Optional: Bolster	<ul style="list-style-type: none"> - Use a bolster if the shoulder/ear does not come down to the floor. - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Gate Pose (Kneeling)	From kneeling, extend one leg out, externally rotate femur. Extend upper body/arm over straight leg.	Optional: Mini Bolster, Chair	<ul style="list-style-type: none"> - Use the mini bolster to ground foot on (if it cannot flatten to the floor). - Use chair for those who cannot kneel or weight bear.
Crescent Moon into Electric Arms in "T" (Standing)	<p>Crescent Moon: Standing, reaching hands overhead and interlocking fingers, tilting gently to R and L side.</p> <p>In between sides standing Electric Arms in "T" (arms in T just below shoulder height, take back to an easy stretch, then release deep tissue by drawing</p>		

	back wrists and fingers).		
Arm Flow (Partial Sun Salute) with forward bend (Standing)	First part in a Sun Salute – from standing, inhale, bring the arms around and up overhead, opening the chest/heart and filling with breath. Exhale as you hinge at the hip and bend over the legs.	Optional: Chair	- Knees stay bent. - Bend to hands on a chair (keeping head at heart height to reduce dizziness).
Karate Chop (Standing)	Standing with shoulder at wall, keep should open and externally rotated. Place palm up on wall and press pinkie into wall gently activating arm. If possible, turn chest, not head away from the wall slightly.	Wall	
Warrior I with Arms (Standing)	As in previous weeks (From standing at top of mat, step one leg back into a high lunge position with arms overhead. Add arm flow. Inhale arms in front and overhead, exhale arms down to perpendicular to the body, and then out to sides then back to hips. Focus on extended exhalation.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support.
Warrior II into Reverse Warrior II (Standing)	From warrior II position (abduct legs apart – externally rotate front leg and then hinge into a high lunge position with arms extending over front and back legs), take arms extended from body to reach back arm down back leg, front up reaching up to ceiling.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support.
Dolphin Plank (Prone)	Lying on stomach, raise body off of the ground in plank position (on forearms).	Optional: Bolster	- Knees up or down. - To challenge alternate lifting 1 arm or 1 leg off of the ground (3 limbed dolphin). - Use bolster under shins in cases of peripheral neuropathy.
Sphinx Pose	Lying on belly, align elbows under shoulders.	Optional: Wall	- Perform at wall pushing

(Prone)	Press forearms into the mat while lengthening the upper body forward (neck long) and lower body back and into mat, lift shoulders and chest up and keep drawing breastbone forward.		hands into the wall and slowly lengthening the upper body.
Supported Bridge (Supine)	Lying on back with knees bent and feet planted, engage core and lift hips and place support (bolster) under hips. Release into support.	Bolster	
Happy Baby (Supine)	Lying on back, bring knees up to chest and raise soles of feet to face the ceiling. Grab onto outside of feet while knees release to the outsides of the ribs/armpit area (depending on mobility).	Optional: Strap	- Use a strap to wrap around feet if hands cannot reach.
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on practice.	Journals	

Week 8: Creativity: Self-Expression

Goal: Encourage participants to find confidence in self-expression, through voice, writing, storytelling or however they may be comfortable.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Pose Questions: How confident is your voice? Do you like to express yourself through speaking, singing, writing or story telling? Are you comfortable expressing yourself? Is what you say truthful?	Journals	
Modified Fish over Rolled Mat (Supine)	Lying on back, place rolled mat under back perpendicular to spine (at shoulder tip of shoulder blade height). Open up chest, heart and throat.	Rolled Mat, Optional: Bolster	- Bolster under head if necessary to open chest, heart and throat.
Legs up the Wall into Hip Lifts (Supine)	Legs up the Wall: Laying on back, with legs up the wall. Legs bent so feet plant on wall. Press into feet and lift hips into air. Lift and hold for a few breaths or move dynamically with breath. Focus on articulating the spine back down to the mat.	Wall	
Mandible Magic into Modified Lions Breath (Seated)	Mandible Magic: Seated, massage jaw muscles while moving lower jaw around. Lions Breath: Sitting, focus on breath, close eyes and deeply inhale, on exhale make a roaring noise and stick tongue out of mouth.	Optional: Bolster or Chair	- Sit on bolster if knees are higher than hip height so spine can come into neutral. - Perform from chair if more comfortable.
Day 1: Bhramari Breath Day 2: Om's (Seated)	Bhramari Breath: Inhale and on exhale allow for gentle buzzing sound at back of throat reducing stress response in the body. Om's: Inhale – on exhale, chant OM as a group	Optional: Bolster, Chair	- Sit on bolster if knees are higher than hip height so spine can come into neutral. - Perform from chair if more comfortable.
Hand Drill (open/close) (Seated)	Seated, open and close hands mindfully with fingers spreading wide to open and closing tight into fists. Forearms stay engaged and held at shoulder height	Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into

	with wrist in flexion.		neutral.
Wide Legged Forward Bend with Chair (Seated)	Seated on the floor with legs outstretched and wide, exhale and bend forward and bring forehead forward to chair ,	Chair	
Cat/Cow (Kneeling)	On hands and knees moving with breath; on inhale dropping back down and opening the chest (cow); on exhale arching back up to close the chest (cat).	Optional: knee support (blanket, foam pad or bolster under shins)	<ul style="list-style-type: none"> - Perform standing, hands on chair and moving through the spine. - Perform seated, hands on knees moving through the spine. - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Wide Legged Forward Bend into Chair (Standing)	Standing with legs straight and wide, bend forward, bring hands to the chair and release head to the floor.	Chair	
Warrior I (Cactus Arms) (Standing)	Warrior I as in previous weeks with arms bent and at right angles (like cactus) drawing breastbone forward to open throat/heart area.	Optional: Wall, Chair	<ul style="list-style-type: none"> - Perform at wall for balance. - Perform using a chair under the front thigh for support.
Warrior II into Reverse Warrior II (Standing)	Warrior II: as in previous weeks then moving into reverse warrior II with back arm sliding down back leg and front arm reaching up and back to open the chest/heart and throat area	Optional: Wall, Chair	<ul style="list-style-type: none"> - Perform at wall for balance. - Perform using a chair under the front thigh for support.
Upward Plank (Supine)	Seated on floor or chair, take arms beside hips, plant hands and straighten legs in front of body. Inhale and lift hips off ground opening front side of body as much	Chair	<ul style="list-style-type: none"> - Perform from seated on front edge of chair instead of floor.

	as possible		
Plank Rollovers (Dynamic)	Lying on stomach, raise body off of the ground in a plank position (arms fully extended); lift R leg off of the ground followed by the R arm and rotate over, placing R leg then arm down and chest open to the ceiling, lift L arm up and continue rotating over to starting position. Alternate directions.		
½ Boat Pose (Seated)	Seated bend knees slightly and lift off floor, maintaining a lift in the chest, body forms a V position but with knees bent for most or ankles crossed.	Strap	- Wrap a strap around feet and use to help lift feet off the floor.
Sphinx Pose (Prone)	Lying on belly, align elbows under shoulders. Press forearms into the mat while lengthening the upper body forward (neck long) and lower body back and into mat, lift shoulders and chest up and keep drawing breastbone forward.	Optional: Wall	- Perform at wall pushing hands into the wall and slowly lengthening the upper body.
Supported Bridge (Supine)	Lying on back with knees bent and feet planted, engage core and lift hips and place support (bolster) under hips. Release into support.	Bolster	
½ Revolved Belly (Supine)	Reclined on back, knees bent feet planted. Take knees over to R side first (may lower to floor). Opposite shoulder/arm-pit stay on the floor, no arch in back. Done both statically and dynamically with breath.	Bolster	
Happy Baby (Supine)	Lying on back, bring knees up to chest and raise feet to face the roof. Grab onto feet. Allow knees to separate wide apart, trying to release knees towards ribs or armpits – shins vertical.	Strap	- Use a strap to wrap around feet if hands cannot reach.
Savasana with R Hand Over Heart (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher guided relaxation with visualization.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		

Journaling	Ask participants to reflect on practice.	Journals	
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Week 9: Patience and Acceptance: Taking Time to be Patient and Appreciate Yourself

Goal: Create space for participants to give themselves permission for time to heal. Promote a place of acceptance to find happiness in this space. Explain that yoga will meet them where they are on any given day.

Focus: Yin style class – very slow pace, finding comfort and rest.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Quote: The key to being happy is accepting where you are in life, on any given day, and making the most of that place each and every day. Ask participants to reflect on this quote and prepare them for the slower paced class.	Journals	
Modified Fish over Rolled Mat (Supine)	Lying on back, place rolled mat under back perpendicular to spine (at shoulder height). Open up chest.	Rolled Mat Optional: Bolster	- May use bolster under head if necessary to open chest.
Supported Bridge into Bound Angle (no props) (Supine)	Supported Bridge: Supported Bridge: Lying on back with knees bent and feet planted, engage core and lift hips and place support (bolster) under hips. Release into support. Reclined Bound Angle: Lying on back with bottoms of feet touching and knees dropping out to the sides.		
Reclined Sleeping Pigeon (Supine)	As in week 5 (on back, bend knees – cross R ankle over other leg just above knee. If available, clasp hands around L thigh and lift L foot off the floor for stretch in R side gluteus. Head and shoulders stay settled on floor). Add in a traction component by pulling thigh in while pushing thigh away into hand. Alternate legs.	Optional: Strap	- Wrap strap around thigh.
Pigeon with a Twist (Supine)	As above, cross ankle over opposite thigh and then instead of lifting foot off the floor, simply roll the lower body over toward the non-crossed leg. Outer thigh will rest on the floor or on support in a position that allows opposite shoulder/armpit to stay on floor and natural curve only in low back.	Optional: Strap	- Wrap strap around thigh.
Bound Angle (No	Lying on back with bottoms of feet touching and knees		

Props) (Supine)	dropping out to the sides.		
Side Bend Variation of Wide Legged Forward Bend (Seated)	Seated on the floor with a bolster under hips, legs outstretched and wide. Exhale and extend to the side over straight leg. Allow arm to drape behind back on open side of the body.	Bolster	
Wide Legged Forward Bend with Vertical Bolster (Seated)	Seated on the floor with a bolster under hips, legs outstretched and wide. Exhale and bend forward, bring forehead forward to rest on a vertical bolster.	Bolster	
½ Happy Baby (Supine)	Lying on back, feet into wall, take one leg into happy baby and one leg stays pressing into wall.	Wall Optional: Strap	- May loop strap around foot in happy baby if necessary.
Hand to Big Toe (Supine)	Lying on back, focusing on pelvic stability, loop strap around foot and gently draw that leg towards the body for hamstring release. Then externally rotate the leg and abduct from the body only to a place where weight is still even into both side of the pelvis.	Optional: Strap	- Use strap to reach feet if necessary.
Savasana (Supine)	Lying on back, eyes closed, arms and legs wide. Teacher guided relaxation with visualization and quote. Quote: Patience is allowing time to run its course and allowing people, to work and grow at their own pace. Patience moves our minds away from frustrations, expectations or “should” and aligns us with related. When we are patient, our energy is available to make good things happen. We are kinder to ourselves and others.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on practice.	Journals	

Week 10: Body Appreciation

Goal: Encourage participants to embrace their bodies, even when they may feel like it's betrayed them or is not cooperating. Encourage the parts that need assistance and thank the parts that carry you through your day.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Pose Questions: Do you appreciate and embrace the strength, resilience and beauty in your body? Even when it is not exactly as you think it should be? Can you celebrate your body's individuality? In both body and mind?	Journals	
Breath Work (Seated)	In a comfortable seated position inhale positive attributes and exhale the negative opposite	Optional: Bolster, chair, wall	- Sit on bolster if knees are higher than hip height so spine can come into neutral. - Perform from chair if more comfortable. - Perform leaning into wall if more comfortable.
Pigeon into Happy Baby into Pigeon (Supine)	Reclined Sleeping Pigeon: On back, bend knees cross R ankle over other leg just above knee. If available, clasp hands around L thigh and lift L foot off the floor for stretch in R side gluteus. Head and shoulders stay settled on floor. Happy Baby: Lying on back, bring knees up to chest and raise feet to face the roof. Grab onto feet. Reclined Sleeping Pigeon: On back, bend knees cross R ankle over other leg just above knee. If available, clasp hands around L thigh and lift L foot off the floor for stretch in R side gluteus. Head and shoulders stay settled on floor.	Strap	- May use strap to wrap around thigh in sleep pigeon and to wrap around feet in happy baby.
Crescent Moon into Electric Arms in "T"	Crescent Moon: Standing, reaching hands overhead and interlocking fingers, tilting gently to R and L side. Electric Arms in "T": Standing arms in T just below		

(Standing)	shoulder height, take back to an easy stretch, then release deep tissue by drawing back wrists and fingers.		
Arm Flow (Partial Sun Salute) (Standing)	First part in a Sun Salute – from standing, inhale, bring the arms around and up overhead, opening the chest/heart and filling with breath. Exhale as you hinge at the hip and bend over the legs.	Optional: Chair	- Knees stay bent. - Bend to hands on a chair (keeping head at heart height to reduce dizziness).
Chair Pose (Standing)	From mountain pose, bending at the knees and slightly hinging at hip to come into “Chair” position.	Optional: wall	- Perform at wall for balance (sacrum only point of contact). - Perform seated if feeling fatigued and focus on opening up through chest and arms.
Warrior I (Standing)	From standing at top of mat, step one leg back into a high lunge position. Move arms overhead. Focus on appreciating the strength in our bodies.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support. - Entwine arms into Eagle position (day 2).
Warrior II (Standing)	Abduct legs apart, externally rotate front leg and then hinge into a high lunge position with arms extending over front and back legs. Focus on appreciating the strength in our bodies.	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support. - Entwine arms into Eagle position (day 2).
Tree (Standing)	Standing on one leg with opposite leg pressing into ankle or thigh (alternate legs).	Optional: Wall, Chair	- Perform at wall for balance (sacrum only point of contact). - Perform seated if there are issues with weight bearing. - Perform in a reclined position if there are issues with weight bearing.
Eagle	Seated, take eagle arms guiding participants to offer		

(Seated)	this pose as a gift of appreciation to their shoulders/arms		
Forward Fold (Seated)	Seated on the floor with legs outstretched, exhale and bend forward. Guiding kids to offer this pose as a gift of appreciation to their lower back and legs.	Optional: Bolster	- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Self Massage (Seated)	Seated on the floor, gently give a massage to a chosen part of the body. Participant may choose where to direct their massage that day based on how they are feeling. Creating awareness to what part of their body might need self love and care		- Sit on bolster if knees are higher than hip height so spine can come into neutral.
Twist (Supine)	Appreciation to the chest and torso. Lying on floor bend one leg and draw it across midline to other side onto floor or bolster – keep opposite shoulder/armpit on ground and minimal arch in low back. Gentle twist.		
Pigeon into Happy Baby into Pigeon (Supine)	Reclined Sleeping Pigeon: On back, bend knees cross R ankle over other leg just above knee. If available, clasp hands around L thigh and lift L foot off the floor for stretch in R side gluteus. Head and shoulders stay settled on floor. Happy Baby: Lying on back, bring knees up to chest and raise feet to face the roof. Grab onto feet. Reclined Sleeping Pigeon: On back, bend knees cross R ankle over other leg just above knee. If available, clasp hands around L thigh and lift L foot off the floor for stretch in R side gluteus. Head and shoulders stay settled on floor.	Strap	- May use strap to wrap around thigh in sleep pigeon and to wrap around feet in happy baby.
Savasana (Supine)	Lying on back, eyes closed, arms and legs wide. Teacher guided relaxation with visualization. Encouraging the ability to find gratitude and abundance during challenging times. Thanking yourself and body for showing up on the mat.	Optional: Bolster	- May place bolster under knees if comfortable.
Namaste	Close practice with “Namaste” to each participant.		

Journaling	Ask participants to reflect on their practice.	Journals	
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Week 11: Meditation in Motion

Goal: Bring awareness to being present when in motion or when life is happening around you.

Focus: Use breath to help create this awareness. Use breath as a tool to bring calm during more hectic times.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Ask participants to reflect on their week.	Journals	
Breath Work Meditation (Seated)	Inhale thru left nostril, exhale thru right and repeat.		
Twist with Arm Flow (Seated)	Seated, exhale into a twist from the waist up and inhaling to come back to centre. Feeling into the body for a sense of balance between the two sides. Arms flow.		
Cat/Cow (Kneeling)	On hands and knees moving with breath; on inhale dropping back down and opening the chest (cow); on exhale arching back up to close the chest (cat).	Optional: knee support (blanket, foam pad or bolster under shins)	<ul style="list-style-type: none"> - Perform standing, hands on chair and moving through the spine. - Perform seated, hands on knees moving through the spine. - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Tabletop to Child's Pose to Tabletop (Kneeling)	<p>Tabletop: On hands and knees, spine in neutral.</p> <p>Child's Pose: Inhale to take buttocks back to heels.</p> <p>Tabletop: Exhale back to tabletop and repeat movement dynamically with breath.</p>		
Tabletop with Limb(s) Extended to Crunches (Kneeling)	With hands and knees on the ground, extend R arm with L leg, crunch R arm with L leg and then return to the ground. Extend L arm with R leg, crunch L arm with R leg and		

	return to the ground.		
Forward Hero into Cat/Cow into Lunge R into Cat/Cow into Lunge L into Cat/Cow into Forward Hero (Kneeling)	Moving with breath from pose to pose (alternating legs in lunge). Forward Hero: Kneeling and seated back on heels (full knee flexion), knees apart arms extended. Cat/Cow: On hands and knees moving with breath; on inhale dropping chest down and opening chest; on exhale arching back up. Lunge: Kneeling lunge position (alternating R and L legs as cycle through). Cat/Cow: On hands and knees moving with breath; on inhale dropping chest down and opening chest; on exhale arching back up. Forward Hero: Kneeling and sitting back on heels (full knee flexion), knees apart arms extended.		
Dynamic Heel Raises (Standing)	Standing tall focus on drawing the heels straight up in the back. Balance weight through all 5 toes. Lower. Repeat 10-15 times		
Arm Flow (Partial Sun Salute) (Standing)	First part in a Sun Salute – from standing, inhale, bring the arms around and up overhead, opening the chest/heart and filling with breath. Exhale as you hinge at the hip and bend over the legs.	Optional: Chair	- Knees stay bent. - Bend to hands on a chair (keeping head at heart height to reduce dizziness).
Warrior I with Arm Flow (Standing)	From standing at top of mat, step one leg back into a high lunge position. Inhale as you raise arms and bend into front leg. Exhale as arms lower to chest, go out to sides and release to hips. Repeat bringing awareness to energy lines from heart to fingers	Optional: Wall, Chair	- Perform at wall for balance. - Perform using a chair under the front thigh for support.
Warrior III	Standing on one leg, hinging forward at hips	Optional: Wall,	- Perform at wall for

(Standing)	and reaching leg out behind and arms out in front. Alternate legs.	chair	balance. - Perform seated if there are issues with weight bearing.
Tree into Eagle into Warrior III (Standing)	Moving from pose to pose (alternating legs). Tree: Standing on one leg with opposite leg pressing into ankle or thigh (alternate legs). Eagle: Standing in chair lift one leg and cross it over planted leg. Warrior III: Standing on one leg, leaning forward and reaching leg out behind and arms out in front. Alternate legs.		- Perform at wall for balance. - Perform seated if there are issues with weight bearing.
Buddha Walk (Standing) (Partner/Group Activity)	Standing in a line with all other participants, grabbing one another's shoulders, slowly and mindfully move across the room, taking large steps (alternating R and L) into Warrior III. Bring awareness to moving in unison with breath.		
Dynamic Lunges (Standing)	Standing, step into lunge position. Lower knee down on inhale and straighten back on exhale. Repeat 5-10x/side.		
Forward Fold with Arm Sweep (Seated)	Seated on the floor with legs outstretched, inhale to lengthen upright and exhale and bend forward sweeping arms out in front over legs.		
Dynamic Windshield Wipers (Supine)	Lying on back with knees bent, gently and slowly tipping knees side to side. As moving legs to side inhale. When moving legs back to centre on exhale. Repeat several times.		
Savasana (Supine)	Lying on back, eyes closed, arms and legs slightly away from the body wide. Teacher	Optional: Bolster	- Place bolster under knees if there are issues

	guided relaxation with visualization.		fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on their practice.	Journals	

Week 12: Unity: Coming Together

Goal: Finding unity in ourselves and our group.

Focus: Staying connected to ‘core’ our center helps us to keep our bright light shining.

Pose/Activity	Description	Props/Tools	Modification(s)
Journaling	Quote: when we are connected to ourselves in a positive way, we are more easily able to connect with family, community and the world at large. This is yoga. Asked participants to reflect on the quote.	Journals	
Knees In and Feet Out (Supine)	Lying on back, knees up and feet planted. Drop knees together down centerline of body and bring feet out.		
½ Revolved Belly Twist (Supine)	Reclined bend knees take feet off floor and revolve the knees over to one side on inhale. On exhale bring knees back to center. Repeat several times to both sides of the body.		
90° Curl-Up (Supine)	Lying on back, with legs up and at right angles to the ground, create a hammock with hands behind head. Exhale and curl up slightly, inhale and lower down. Repeat.		
Cat/Cow + Lateral Flow (Kneeling)	On hands and knees moving with breath; on inhale dropping back down and opening the chest; on exhale arching back up to close the chest. After 3 cycles, inhale drop down, exhale push ribs out to the R, inhale arch up, exhale ribs out to the side. Continue 3x and then switch directions.	Optional: knee support (blanket, foam pad or bolster under shins)	
Tabletop Knee Lifts (Kneeling)	On hands and knees with a neutral spin, draw navel up and towards spine, tuck toes and lift knees only an inch or two off of the floor, ensure breath continues.	Optional: knee support (blanket, foam pad or bolster under shins)	- Start with one limb at a time (i.e., moving just the R arm and then adding the L leg). - Place a bolster under shin

			to remove weight from the knee (if issues with weight bearing).
Tabletop with Limb(s) Extended to Crunches (Kneeling)	From tabletop bring R elbow and knee together (crunching on the same side). Extend R and L leg and then do opposite.	Optional: knee support (blanket, foam pad or bolster under shins)	- Start with one limb at a time (i.e., moving just the R arm and then adding the L leg). - Place a bolster under shin to remove weight from the knee (if issues with weight bearing).
Resting Child's Pose (Kneeling)	Kneeling with buttocks on heels		
Buddha Walk (Standing) (Partner/Group Activity)	Standing in a line with all other participants, grabbing one another's shoulders, slowly and mindfully move across the room, taking large steps (alternating R and L) into Warrior III. Bring awareness to moving in unison with breath.		
Warrior III Crunches with Flow (Standing)	Standing on one leg, hinging forward at hips and reaching leg out behind and arms out in front, crunch arms in. Alternate legs.	Optional: Wall	- Perform against wall.
Plank into Side Plank (Prone)	Plank: Lying on stomach, push body off of the ground into a plank position (arms fully extended). Side Plank: Open up to one side weight supported onto bent leg shin (bottom leg) and straight leg (top leg) (into 3 limbed plank).	Optional: Bolster	- May use bolster under shins in cases of peripheral neuropathy. - To challenge may raise straight leg up off the ground for a breath or two
Dolphin Plank	Lying on stomach, raise body off of the ground in	Optional: Bolster	- Knees up or down.

(Prone)	plank position (on forearms).		- To challenge alternate lifting 1 arm or 1 leg off of the ground (3 limbed dolphin). - Use bolster under shins in cases of peripheral neuropathy.
Dolphin Plank (hip touches) (Prone)	Lying on stomach, raise body off of the ground in plank posing (on forearms). Gently roll one hip in direction of ground (may touch for a few) then return to centre and pause before moving to other side rock hips side to side so they touch the ground.		
Boat Pose (Seated)	Seated, engage core and draw arms and legs off the ground so the body makes a “V” shape.	Optional: Strap	- Use strap to find ½ boat and try opening all the way, if can keep chest open.
Rope Pulls (Supine)	Lying on back with knees bent and feet planted on the ground, engage core and reach up (lifting shoulders off of the ground) alternating R and L hands reaching.		- Can release head and shoulders to the floor.
Supported Bridge (Supine)	Lying on back with knees bent and feet planted, engage core and lift hips and place support (bolster) under hips. Release into support.	Bolster	
Windshield Wipers (Supine)	Lying on back with knees bent, gently and slowly tipping knees side to side.		
Savasana	Lying on back, eyes closed, arms and legs wide. Relaxation with positive affirmations throughout.	Optional: Bolster	- Place bolster under knees if there are issues fully extending. - Place small bolster under head for comfort.
Namaste	Close practice with “Namaste” to each participant.		
Journaling	Ask participants to reflect on practice and last 12-	Journals	

	weeks.		
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APPENDIX J: PEDSQL GENERAL MODULE

ID#	_____
Date:	_____

PedsQLTM

Pediatric Quality of Life Inventory

Version 4.0

YOUNG CHILD REPORT (ages 5-7)

Instructions for interviewer:

I am going to ask you some questions about things that might be a problem for some children. I want to know how much of a problem any of these things might be for you.

Show the child the template and point to the responses as you read.

If it is not at all a problem for you, point to the smiling face

If it is sometimes a problem for you, point to the middle face

If it is a problem for you a lot, point to the frowning face

I will read each question. Point to the pictures to show me how much of a problem it is for you. Let's try a practice one first.

	Not at all	Sometimes	A lot
Is it hard for you to snap your fingers			

Ask the child to demonstrate snapping his or her fingers to determine whether or not the question was answered correctly. Repeat the question if the child demonstrates a response that is different from his or her action.

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01/00
PedsQL-4.0-Core -- US/English
PedsQL-4.0-Core-YC_eng-USof.doc

Think about how you have been doing for the last few weeks. Please listen carefully to each sentence and tell me how much of a problem this is for you.

After reading the item, gesture to the template. If the child hesitates or does not seem to understand how to answer, read the response options while pointing at the faces.

PHYSICAL FUNCTIONING (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Is it hard for you to walk	0	2	4
2. Is it hard for you to run	0	2	4
3. Is it hard for you to play sports or exercise	0	2	4
4. Is it hard for you to pick up big things	0	2	4
5. Is it hard for you to take a bath or shower	0	2	4
6. Is it hard for you to do chores (<i>like pick up your toys</i>)	0	2	4
7. Do you have hurts or aches (<i>Where? _____</i>)	0	2	4
8. Do you ever feel too tired to play	0	2	4

Remember, tell me how much of a problem this has been for you for the last few weeks.

EMOTIONAL FUNCTIONING (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Do you feel scared	0	2	4
2. Do you feel sad	0	2	4
3. Do you feel mad	0	2	4
4. Do you have trouble sleeping	0	2	4
5. Do you worry about what will happen to you	0	2	4

SOCIAL FUNCTIONING (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Is it hard for you to get along with other kids	0	2	4
2. Do other kids say they do not want to play with you	0	2	4
3. Do other kids tease you	0	2	4
4. Can other kids do things that you cannot do	0	2	4
5. Is it hard for you to keep up when you play with other kids	0	2	4

SCHOOL FUNCTIONING (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Is it hard for you to pay attention in school	0	2	4
2. Do you forget things	0	2	4
3. Is it hard to keep up with schoolwork	0	2	4
4. Do you miss school because of not feeling good	0	2	4
5. Do you miss school because you have to go to the doctor's or hospital	0	2	4

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PedsQLTM
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PARENT REPORT for YOUNG CHILDREN (ages 5-7)

DIRECTIONS

On the following page is a list of things that might be a problem for **your child**. Please tell us **how much of a problem** each one has been for **your child** during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has your child had with ...

PHYSICAL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Walking more than one block	0	1	2	3	4
2. Running	0	1	2	3	4
3. Participating in sports activity or exercise	0	1	2	3	4
4. Lifting something heavy	0	1	2	3	4
5. Taking a bath or shower by him or herself	0	1	2	3	4
6. Doing chores, like picking up his or her toys	0	1	2	3	4
7. Having hurts or aches	0	1	2	3	4
8. Low energy level	0	1	2	3	4

EMOTIONAL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Feeling afraid or scared	0	1	2	3	4
2. Feeling sad or blue	0	1	2	3	4
3. Feeling angry	0	1	2	3	4
4. Trouble sleeping	0	1	2	3	4
5. Worrying about what will happen to him or her	0	1	2	3	4

SOCIAL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Getting along with other children	0	1	2	3	4
2. Other kids not wanting to be his or her friend	0	1	2	3	4
3. Getting teased by other children	0	1	2	3	4
4. Not able to do things that other children his or her age can do	0	1	2	3	4
5. Keeping up when playing with other children	0	1	2	3	4

SCHOOL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Paying attention in class	0	1	2	3	4
2. Forgetting things	0	1	2	3	4
3. Keeping up with school activities	0	1	2	3	4
4. Missing school because of not feeling well	0	1	2	3	4
5. Missing school to go to the doctor or hospital	0	1	2	3	4

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CHILD REPORT (ages 8-12)

DIRECTIONS

On the following page is a list of things that might be a problem for you. Please tell us **how much of a problem** each one has been for you during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has this been for you ...

ABOUT MY HEALTH AND ACTIVITIES (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. It is hard for me to walk more than one block	0	1	2	3	4
2. It is hard for me to run	0	1	2	3	4
3. It is hard for me to do sports activity or exercise	0	1	2	3	4
4. It is hard for me to lift something heavy	0	1	2	3	4
5. It is hard for me to take a bath or shower by myself	0	1	2	3	4
6. It is hard for me to do chores around the house	0	1	2	3	4
7. I hurt or ache	0	1	2	3	4
8. I have low energy	0	1	2	3	4

ABOUT MY FEELINGS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I feel afraid or scared	0	1	2	3	4
2. I feel sad or blue	0	1	2	3	4
3. I feel angry	0	1	2	3	4
4. I have trouble sleeping	0	1	2	3	4
5. I worry about what will happen to me	0	1	2	3	4

HOW I GET ALONG WITH OTHERS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I have trouble getting along with other kids	0	1	2	3	4
2. Other kids do not want to be my friend	0	1	2	3	4
3. Other kids tease me	0	1	2	3	4
4. I cannot do things that other kids my age can do	0	1	2	3	4
5. It is hard to keep up when I play with other kids	0	1	2	3	4

ABOUT SCHOOL (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. It is hard to pay attention in class	0	1	2	3	4
2. I forget things	0	1	2	3	4
3. I have trouble keeping up with my schoolwork	0	1	2	3	4
4. I miss school because of not feeling well	0	1	2	3	4
5. I miss school to go to the doctor or hospital	0	1	2	3	4

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PedsQLTM
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PARENT REPORT for CHILDREN (ages 8-12)

DIRECTIONS

On the following page is a list of things that might be a problem for **your child**. Please tell us **how much of a problem** each one has been for **your child** during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has your child had with ...

PHYSICAL FUNCTIONING (problems with...)	Never	Almost	Some-	Often	Almos
1. Running...					
2. Climbing things...					
3. Getting dressed...					
4. Getting up and down...					
5. Getting up and down...					
6. Getting up and down...					
7. Getting up and down...					
8. Getting up and down...					
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197. Getting up and down...					
198. Getting up and down...					
199. Getting up and down...					
200. Getting up and down...					

EMOTIONAL FUNCTIONING (problems with...)	Never	Almost Never	Some-times	Often	Almos Always
1. Feeling afraid or scared	0	1	2	3	4
2. Feeling sad or blue	0	1	2	3	4
3. Feeling angry	0	1	2	3	4
4. Trouble sleeping	0	1	2	3	4
5. Worrying about what will happen to him or her	0	1	2	3	4

SOCIAL FUNCTIONING (problems with...)	Never	Almost Never	Some-times	Often	Almos Always
1. Getting along with other children	0	1	2	3	4
2. Other children wanting to be his or her friend	0	1	2	3	4
3. Getting teased by other children	0	1	2	3	4
4. Other kids do things the other children like to do	0	1	2	3	4
5. Getting up with other children	0	1	2	3	4

SCHOOL FUNCTIONING (problems with...)	Never	Almost Never	Some-times	Often	Almos Always
1. Paying attention in class	0	1	2	3	4
2. Doing things at school	0	1	2	3	4
3. Getting up with school work	0	1	2	3	4
4. Missing school because of not feeling well	0	1	2	3	4
5. Missing school because of other reasons	0	1	2	3	4

PedsQL 2.0 - Health-Related Quality of Life Questionnaire for Children and Adolescents
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 PedsQL 2.0 - Health-Related Quality of Life Questionnaire for Children and Adolescents

ID# _____

Date: _____

TM
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Pediatric Quality of Life
Inventory

Version 4.0

TEEN REPORT (ages 13-18)

DIRECTIONS

On the following page is a list of things that might be a problem for you. Please tell us **how much of a problem** each one has been for you during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has this been for you ...

ABOUT MY HEALTH AND ACTIVITIES (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. It is hard for me to walk more than one block	0	1	2	3	4
2. It is hard for me to run	0	1	2	3	4
3. It is hard for me to do sports activity or exercise	0	1	2	3	4
4. It is hard for me to lift something heavy	0	1	2	3	4
5. It is hard for me to take a bath or shower by myself	0	1	2	3	4
6. It is hard for me to do chores around the house	0	1	2	3	4
7. I hurt or ache	0	1	2	3	4
8. I have low energy	0	1	2	3	4

ABOUT MY FEELINGS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I feel afraid or scared	0	1	2	3	4
2. I feel sad or blue	0	1	2	3	4
3. I feel angry	0	1	2	3	4
4. I have trouble sleeping	0	1	2	3	4
5. I worry about what will happen to me	0	1	2	3	4

HOW I GET ALONG WITH OTHERS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I have trouble getting along with other teens	0	1	2	3	4
2. Other teens do not want to be my friend	0	1	2	3	4
3. Other teens tease me	0	1	2	3	4
4. I cannot do things that other teens my age can do	0	1	2	3	4
5. It is hard to keep up with my peers	0	1	2	3	4

ABOUT SCHOOL (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. It is hard to pay attention in class	0	1	2	3	4
2. I forget things	0	1	2	3	4
3. I have trouble keeping up with my schoolwork	0	1	2	3	4
4. I miss school because of not feeling well	0	1	2	3	4
5. I miss school to go to the doctor or hospital	0	1	2	3	4

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PedsQLTM
**Pediatric Quality of Life
Inventory**

Version 4.0

PARENT REPORT for TEENS (ages 13-18)

DIRECTIONS

On the following page is a list of things that might be a problem for **your teen**. Please tell us **how much of a problem** each one has been for **your teen** during the **past ONE month** by circling:

- 0** if it is **never** a problem
- 1** if it is **almost never** a problem
- 2** if it is **sometimes** a problem
- 3** if it is **often** a problem
- 4** if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has your teen had with ...

PHYSICAL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Walking more than one block	0	1	2	3	4
2. Running	0	1	2	3	4
3. Participating in sports activity or exercise	0	1	2	3	4
4. Lifting something heavy	0	1	2	3	4
5. Taking a bath or shower by him or herself	0	1	2	3	4
6. Doing chores around the house	0	1	2	3	4
7. Having hurts or aches	0	1	2	3	4
8. Low energy level	0	1	2	3	4

EMOTIONAL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Feeling afraid or scared	0	1	2	3	4
2. Feeling sad or blue	0	1	2	3	4
3. Feeling angry	0	1	2	3	4
4. Trouble sleeping	0	1	2	3	4
5. Worrying about what will happen to him or her	0	1	2	3	4

SOCIAL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Getting along with other teens	0	1	2	3	4
2. Other teens not wanting to be his or her friend	0	1	2	3	4
3. Getting teased by other teens	0	1	2	3	4
4. Not able to do things that other teens his or her age can do	0	1	2	3	4
5. Keeping up with other teens	0	1	2	3	4

SCHOOL FUNCTIONING (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Paying attention in class	0	1	2	3	4
2. Forgetting things	0	1	2	3	4
3. Keeping up with schoolwork	0	1	2	3	4
4. Missing school because of not feeling well	0	1	2	3	4
5. Missing school to go to the doctor or hospital	0	1	2	3	4

APPENDIX K: PEDSQL CANCER MODULE

ID#

Date: _____

PedsQLTM Cancer Module

Version 3.0

YOUNG CHILD REPORT (ages 5-7)

Instructions for interviewer:

I am going to ask you some questions about things that might be a problem for some children. I want to know how much of a problem any of these things might be for you.

Show the child the template and point to the responses as you read.

If it is not at all a problem for you, point to the smiling face

If it is sometimes a problem for you, point to the middle face

If it is a problem for you a lot, point to the frowning face

I will read each question. Point to the pictures to show me how much of a problem it is for you. Let's try a practice one first.

	Not at all	Sometimes	A lot
Is it hard for you to snap your fingers			

Ask the child to demonstrate snapping his or her fingers to determine whether or not the question was answered correctly. Repeat the question if the child demonstrates a response that is different from his or her action.

Think about how you have been doing for the past one month. Please listen carefully to each sentence and tell me how much of a problem this is for you.

After reading the item, gesture to the template. If the child hesitates or does not seem to understand how to answer, read the response options while pointing at the faces.

PAIN AND HURT (<i>problems with...</i>)	Not at all	Sometimes	A lot
1. Do you ache or hurt in your bones and/or muscles	0	2	4
2. Do you hurt a lot	0	2	4

NAUSEA (<i>problems with...</i>)	Not at all	Sometimes	A lot
1. Does your medicine make you sick to your stomach	0	2	4
2. Does food taste bad to you	0	2	4
3. Do you get sick to your stomach when you think about your medicine	0	2	4
4. Do you feel too sick to your stomach to eat	0	2	4
5. Do some foods and smells make you sick to your stomach	0	2	4

PROCEDURAL ANXIETY (<i>problems with...</i>)	Not at all	Sometimes	A lot
1. Do needle sticks (i.e. shots, blood tests, IV's) hurt you	0	2	4
2. Do you get scared when you have to have blood tests	0	2	4
3. Do you get scared about having needle sticks (i.e. shots, blood tests, IV's)	0	2	4

TREATMENT ANXIETY (<i>problems with...</i>)	Not at all	Sometimes	A lot
1. Do you get scared when you are waiting to see the doctor	0	2	4
2. Do you get scared when you have to go to the doctor	0	2	4
3. Do you get scared when you have to go to the hospital	0	2	4

WORRY (<i>problems with...</i>)	Not at all	Sometimes	A lot
1. Do you worry about how medicines make you feel	0	2	4
2. Do you worry about whether or not your medicine is working	0	2	4
3. Do you worry that your cancer illness will come back	0	2	4

COGNITIVE PROBLEMS (<i>problems with...</i>)	Not At all	Sometimes	A lot
1. Do you know what to do when something bothers you	0	2	4
2. Is it hard for you to work with numbers or do math	0	2	4
3. Is it hard for you to pay attention to things	0	2	4
4. Is it hard for you to remember what is read to you	0	2	4

Think about how you have been doing for the past one month. Please listen carefully to each sentence and tell me how much of a problem this is for you.

PERCEIVED PHYSICAL APPEARANCE (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Do you feel you are not good looking	0	2	4
2. Does it bother you when other people see your scars	0	2	4
3. Are you embarrassed when other people see your body	0	2	4

COMMUNICATION (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Is it hard for you to tell the doctors and nurses how you feel	0	2	4
2. Is it hard for you to ask the doctors and nurses questions	0	2	4
3. Is it hard for you to tell other people that you are sick	0	2	4

ID# _____
Date: _____

PedsQLTM Cancer Module

Version 3.0

PARENT REPORT for YOUNG CHILDREN (ages 5-7)

DIRECTIONS

Children with cancer sometimes have special problems. On the following page is a list of things that might be a problem for your child. Please tell us **how much of a problem** each one has been for your child during the past one month by circling:

- 0 if it is never a problem
- 1 if it is almost never a problem
- 2 if it is sometimes a problem
- 3 if it is often a problem
- 4 if it is almost always a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past one month, how much of a problem has your child had with ...

PAIN AND HURT (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Aches in joints and/or muscles	0	1	2	3	4
2. Having a lot of pain	0	1	2	3	4

NAUSEA (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Becoming nauseated during medical treatments	0	1	2	3	4
2. Food not tasting very good to him/her	0	1	2	3	4
3. Becoming nauseated while thinking about medical treatments	0	1	2	3	4
4. Feeling too nauseous to eat	0	1	2	3	4
5. Some foods and smells making him/her nauseous	0	1	2	3	4

PROCEDURAL ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Needle sticks (i.e. injections, blood tests, IV's) causing him/her pain	0	1	2	3	4
2. Getting anxious about having blood drawn	0	1	2	3	4
3. Getting anxious about having needle sticks (i.e. injections, blood tests, IV's)	0	1	2	3	4

TREATMENT ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Getting anxious when waiting to see the doctor	0	1	2	3	4
2. Getting anxious about going to the doctor	0	1	2	3	4
3. Getting anxious about going to the hospital	0	1	2	3	4

WORRY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Worrying about side effects from medical treatments	0	1	2	3	4
2. Worrying about whether or not his/her medical treatments are working	0	1	2	3	4
3. Worrying that the cancer will reoccur or relapse	0	1	2	3	4

COGNITIVE PROBLEMS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Difficulty figuring out what to do when something bothers him/her	0	1	2	3	4
2. Difficulty working with numbers or doing math	0	1	2	3	4
3. Difficulty paying attention to things	0	1	2	3	4
4. Difficulty remembering what is read to him/her	0	1	2	3	4

In the past one month, how much of a problem has your child had with ...

PERCEIVED PHYSICAL APPEARANCE (problems with...)	Never	Almost Never	Some- times	Often	Almost Always
1. Feeling that he/she is not good looking	0	1	2	3	4
2. Not liking other people to see his/her scars	0	1	2	3	4
3. Being embarrassed about others seeing his/her body	0	1	2	3	4

COMMUNICATION (problems with...)	Never	Almost Never	Some- times	Often	Almost Always
1. Difficulty telling the doctors and nurses how he/she feels	0	1	2	3	4
2. Difficulty asking the doctors or nurses questions	0	1	2	3	4
3. Difficulty explaining his/her illness to other people	0	1	2	3	4

ID# _____
Date: _____

PedsQLTM Cancer Module

Version 3.0

CHILD REPORT (ages 8-12)

DIRECTIONS

Children with cancer sometimes have special problems. Please tell us **how much of a problem** each one has been for you during the **past one month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past one month, how much of a problem has this been for you ...

PAIN AND HURT (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I ache or hurt in my joints and/or muscles	0	1	2	3	4
2. I hurt a lot	0	1	2	3	4

NAUSEA (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I become sick to my stomach when I have medical treatments	0	1	2	3	4
2. Food does not taste very good to me	0	1	2	3	4
3. I become sick to my stomach when I think about medical treatments	0	1	2	3	4
4. I feel too sick to my stomach to eat	0	1	2	3	4
5. Some foods and smells make me sick to my stomach	0	1	2	3	4

PROCEDURAL ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Needle sticks (i.e. injections, blood tests, IV's) hurt	0	1	2	3	4
2. I get scared when I have to have blood tests	0	1	2	3	4
3. I get scared about having needle sticks (i.e. injections, blood tests, IV's)	0	1	2	3	4

TREATMENT ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I get scared when I am waiting to see the doctor	0	1	2	3	4
2. I get scared when I have to go to the doctor	0	1	2	3	4
3. I get scared when I have to go to the hospital	0	1	2	3	4

WORRY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I worry about side effects from medical treatments	0	1	2	3	4
2. I worry about whether or not my medical treatments are working	0	1	2	3	4
3. I worry that my cancer will come back or relapse	0	1	2	3	4

COGNITIVE PROBLEMS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. It is hard for me to figure out what to do when something bothers me	0	1	2	3	4
2. I have trouble solving math problems	0	1	2	3	4
3. I have trouble writing school papers or reports	0	1	2	3	4
4. It is hard for me to pay attention to things	0	1	2	3	4
5. It is hard for me to remember what I read	0	1	2	3	4

In the past one month, how much of a problem has this been for you ...

Think about how you have been doing for the past one month. Please listen carefully to each sentence and tell me how much of a problem this is for you.

PERCEIVED PHYSICAL APPEARANCE (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Do you feel you are not good looking	0	2	4
2. Does it bother you when other people see your scars	0	2	4
3. Are you embarrassed when other people see your body	0	2	4

COMMUNICATION (<i>problems with...</i>)	Not at all	Some-times	A lot
1. Is it hard for you to tell the doctors and nurses how you feel	0	2	4
2. Is it hard for you to ask the doctors and nurses questions	0	2	4
3. Is it hard for you to tell other people that you are sick	0	2	4

ID# _____
Date: _____

PedsQLTM Cancer Module

Version 3.0

PARENT REPORT for CHILDREN (ages 8-12)

DIRECTIONS

Children with cancer sometimes have special problems. On the following page is a list of things that might be a problem for **your child**. Please tell us **how much of a problem** each one has been for **your child** during the **past one month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past one month, how much of a problem has your child had with ...

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PAIN AND HURT (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Aches in joints and/or muscles	0	1	2	3	4
2. Having a lot of pain	0	1	2	3	4

NAUSEA (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Becoming nauseated during medical treatments	0	1	2	3	4
2. Food not tasting very good to him/her	0	1	2	3	4
3. Becoming nauseated while thinking about medical treatments	0	1	2	3	4
4. Feeling too nauseous to eat	0	1	2	3	4
5. Some foods and smells making him/her nauseous	0	1	2	3	4

PROCEDURAL ANXIETY (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Needle sticks (i.e. injections, blood tests, IV's) causing him/her pain	0	1	2	3	4
2. Getting anxious about having blood drawn	0	1	2	3	4
3. Getting anxious about having needle sticks (i.e. injections, blood tests, IV's)	0	1	2	3	4

TREATMENT ANXIETY (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Getting anxious when waiting to see the doctor	0	1	2	3	4
2. Getting anxious about going to the doctor	0	1	2	3	4
3. Getting anxious about going to the hospital	0	1	2	3	4

WORRY (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Worrying about side effects from medical treatments	0	1	2	3	4
2. Worrying about whether or not his/her medical treatments are working	0	1	2	3	4
3. Worrying that the cancer will reoccur or relapse	0	1	2	3	4

COGNITIVE PROBLEMS (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Difficulty figuring out what to do when something bothers him/her	0	1	2	3	4
2. Trouble solving math problems	0	1	2	3	4
3. Trouble writing school papers or reports	0	1	2	3	4
4. Difficulty paying attention to things	0	1	2	3	4
5. Difficulty remembering what he/she reads	0	1	2	3	4

In the past one month, how much of a problem has your child had with ...

PERCEIVED PHYSICAL APPEARANCE <i>(problems with...)</i>	Never	Almost Never	Some- times	Often	Almost Always
1. Feeling that he/she is not good looking	0	1	2	3	4
2. Not liking other people to see his/her scars	0	1	2	3	4
3. Being embarrassed about others seeing his/her body	0	1	2	3	4

COMMUNICATION <i>(problems with...)</i>	Never	Almost Never	Some- times	Often	Almost Always
1. Difficulty telling the doctors and nurses how he/she feels	0	1	2	3	4
2. Difficulty asking the doctors or nurses questions	0	1	2	3	4
3. Difficulty explaining his/her illness to other people	0	1	2	3	4

ID# _____
Date: _____

PedsQLTM Cancer Module

Version 3.0

TEEN REPORT (ages 13-18)

DIRECTIONS

Teens with cancer sometimes have special problems. Please tell us **how much of a problem** each one has been for you during the **past one month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past one month, how much of a problem has this been for you ...

PAIN AND HURT (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I ache or hurt in my joints and/or muscles	0	1	2	3	4
2. I hurt a lot	0	1	2	3	4

NAUSEA (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I become sick to my stomach when I have medical treatments	0	1	2	3	4
2. Food does not taste very good to me	0	1	2	3	4
3. I become sick to my stomach when I think about medical treatments	0	1	2	3	4
4. I feel too sick to my stomach to eat	0	1	2	3	4
5. Some foods and smells make me sick to my stomach	0	1	2	3	4

PROCEDURAL ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Needle sticks (i.e. injections, blood tests, IV's) hurt	0	1	2	3	4
2. I get scared when I have to have blood tests	0	1	2	3	4
3. I get scared about having needle sticks (i.e. injections, blood tests, IV's)	0	1	2	3	4

TREATMENT ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I get scared when I am waiting to see the doctor	0	1	2	3	4
2. I get scared when I have to go to the doctor	0	1	2	3	4
3. I get scared when I have to go to the hospital	0	1	2	3	4

WORRY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I worry about side effects from medical treatments	0	1	2	3	4
2. I worry about whether or not my medical treatments are working	0	1	2	3	4
3. I worry that my cancer will come back or relapse	0	1	2	3	4

COGNITIVE PROBLEMS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. It is hard for me to figure out what to do when something bothers me	0	1	2	3	4
2. I have trouble solving math problems	0	1	2	3	4
3. I have trouble writing school papers or reports	0	1	2	3	4
4. It is hard for me to pay attention to things	0	1	2	3	4
5. It is hard for me to remember what I read	0	1	2	3	4

In the past one month, how much of a problem has this been for you ...

PERCEIVED PHYSICAL APPEARANCE <i>(problems with...)</i>	Never	Almost Never	Some- times	Often	Almost Always
1. I feel I am not good looking	0	1	2	3	4
2. I don't like other people to see my scars	0	1	2	3	4
3. I am embarrassed when others see my body	0	1	2	3	4

COMMUNICATION <i>(problems with...)</i>	Never	Almost Never	Some- times	Often	Almost Always
1. It is hard for me to tell the doctors and nurses how I feel	0	1	2	3	4
2. It is hard for me to ask the doctors and nurses questions	0	1	2	3	4
3. It is hard for me to explain my illness to other people	0	1	2	3	4

ID# _____
Date: _____

PedsQLTM Cancer Module

Version 3.0

PARENT REPORT for TEENS (ages 13-18)

DIRECTIONS

Teens with cancer sometimes have special problems. On the following page is a list of things that might be a problem for **your teen**. Please tell us **how much of a problem** each one has been for **your teen** during the **past one month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past month, how much of a problem has your teen had with ...

PedsQL 3.0 - Parent (13-18) Cancer
05/00

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PAIN AND HURT (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Aches in joints and/or muscles	0	1	2	3	4
2. Having a lot of pain	0	1	2	3	4

NAUSEA (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Becoming nauseated during medical treatments	0	1	2	3	4
2. Food not tasting very good to him/her	0	1	2	3	4
3. Becoming nauseated while thinking about medical treatments	0	1	2	3	4
4. Feeling too nauseous to eat	0	1	2	3	4
5. Some foods and smells making him/her nauseous	0	1	2	3	4

PROCEDURAL ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Needle sticks (i.e. injections, blood tests, IV's) causing him/her pain	0	1	2	3	4
2. Getting anxious about having blood drawn	0	1	2	3	4
3. Getting anxious about having needle sticks (i.e. injections, blood tests, IV's)	0	1	2	3	4

TREATMENT ANXIETY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Getting anxious when waiting to see the doctor	0	1	2	3	4
2. Getting anxious about going to the doctor	0	1	2	3	4
3. Getting anxious about going to the hospital	0	1	2	3	4

WORRY (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Worrying about side effects from medical treatments	0	1	2	3	4
2. Worrying about whether or not his/her medical treatments are working	0	1	2	3	4
3. Worrying that the cancer will reoccur or relapse	0	1	2	3	4

COGNITIVE PROBLEMS (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Difficulty figuring out what to do when something bothers him/her	0	1	2	3	4
2. Trouble solving math problems	0	1	2	3	4
3. Trouble writing school papers or reports	0	1	2	3	4
4. Difficulty paying attention to things	0	1	2	3	4
5. Difficulty remembering what he/she reads	0	1	2	3	4

In the past one month, how much of a problem has your teen had with ...

PERCEIVED PHYSICAL APPEARANCE <i>(problems with...)</i>	Never	Almost Never	Some- times	Often	Almost Always
1. Feeling that he/she is not good looking	0	1	2	3	4
2. Not liking other people to see his/her scars	0	1	2	3	4
3. Being embarrassed about others seeing his/her body	0	1	2	3	4

COMMUNICATION <i>(problems with...)</i>	Never	Almost Never	Some- times	Often	Almost Always
1. Difficulty telling the doctors and nurses how he/she feels	0	1	2	3	4
2. Difficulty asking the doctors or nurses questions	0	1	2	3	4
3. Difficulty explaining his/her illness to other people	0	1	2	3	4

APPENDIX L: PEDSQL MULTIDIENSIONAL FATIGUE SCALE

ID#	_____
Date:	_____

PedsQLTM Multidimensional Fatigue Scale

Standard Version

YOUNG CHILD REPORT (ages 5-7)

Instructions for interviewer:

I am going to ask you some questions about things that might be a problem for some children. I want to know how much of a problem any of these things might be for you.

Show the child the template and point to the responses as you read.

If it is not at all a problem for you, point to the smiling face

If it is sometimes a problem for you, point to the middle face

If it is a problem for you a lot, point to the frowning face

I will read each question. Point to the pictures to show me how much of a problem it is for you. Let's try a practice one first.

	Not at all	Sometimes	A lot
Is it hard for you to snap your fingers			

Ask the child to demonstrate snapping his or her fingers to determine whether or not the question was answered correctly. Repeat the question if the child demonstrates a response that is different from his or her action.

Think about how you have been doing for the past few weeks. Please listen carefully to each sentence and tell me how much of a problem this is for you.

After reading the item, gesture to the template. If the child hesitates or does not seem to understand how to answer, read the response options while pointing at the faces.

General Fatigue (PROBLEMS WITH...)	NOT AT ALL	SOME-TIMES	A LOT
1. Do you feel tired	0	2	4
2. Do you feel physically weak (not strong)	0	2	4
3. Do you feel too tired to do things that you like to do	0	2	4
4. Do you feel too tired to spend time with your friends	0	2	4
5. Do you have trouble finishing things	0	2	4
6. Do you have trouble starting things	0	2	4

Remember, tell me how much of a problem this has been for you for the last few weeks.

Sleep/Rest Fatigue (PROBLEMS WITH...)	NOT AT ALL	SOME-TIMES	A LOT
1. Do you sleep a lot	0	2	4
2. Is it hard for you to sleep through the night	0	2	4
3. Do you feel tired when you wake up in the morning	0	2	4
4. Do you rest a lot	0	2	4
5. Do you take a lot of naps	0	2	4
6. Do you spend a lot of time in bed	0	2	4

Cognitive Fatigue (PROBLEMS WITH...)	NOT AT ALL	SOME-TIMES	A LOT
1. Is it hard for you to keep your attention on things	0	2	4
2. Is it hard for you to remember what people tell you	0	2	4
3. Is it hard for you to remember what you just heard	0	2	4
4. Is it hard for you to think quickly	0	2	4
5. Do you have trouble remembering what you were just thinking	0	2	4
6. Do you have trouble remembering more than one thing at a time	0	2	4

ID# _____

Date: _____

PedsQLTM

Multidimensional Fatigue Scale

Standard Version

PARENT REPORT for YOUNG CHILDREN (ages 5-7)

DIRECTIONS

On the following page is a list of things that might be a problem for **your child**. Please tell us **how much of a problem** each one has been for **your child** during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has this been for your child ...

GENERAL FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some- times	Often	Almost Always
1. Feeling tired	0	1	2	3	4
2. Feeling physically weak (not strong)	0	1	2	3	4
3. Feeling too tired to do things that he/she likes to do	0	1	2	3	4
4. Feeling too tired to spend time with his/her friends	0	1	2	3	4
5. Trouble finishing things	0	1	2	3	4
6. Trouble starting things	0	1	2	3	4

SLEEP/REST FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some- times	Often	Almost Always
1. Sleeping a lot	0	1	2	3	4
2. Difficulty sleeping through the night	0	1	2	3	4
3. Feeling tired when he/she wakes up in the morning	0	1	2	3	4
4. Resting a lot	0	1	2	3	4
5. Taking a lot of naps	0	1	2	3	4
6. Spending a lot of time in bed	0	1	2	3	4

COGNITIVE FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some- times	Often	Almost Always
1. Difficulty keeping his/her attention on things	0	1	2	3	4
2. Difficulty remembering what people tell him/her	0	1	2	3	4
3. Difficulty remembering what he/she just heard	0	1	2	3	4
4. Difficulty thinking quickly	0	1	2	3	4
5. Trouble remembering what he/she was just thinking	0	1	2	3	4
6. Trouble remembering more than one thing at a time	0	1	2	3	4

ID# _____
Date: _____

PedsQLTM Multidimensional Fatigue Scale

Standard Version

CHILD REPORT (ages 8-12)

DIRECTIONS

On the following page is a list of things that might be a problem for you. Please tell us **how much of a problem** each one has been for you during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has this been for you ...

GENERAL FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some- times	Often	Almost Always
1. I feel tired	0	1	2	3	4
2. I feel physically weak (not strong)	0	1	2	3	4
3. I feel too tired to do things that I like to do	0	1	2	3	4
4. I feel too tired to spend time with my friends	0	1	2	3	4
5. I have trouble finishing things	0	1	2	3	4
6. I have trouble starting things	0	1	2	3	4

SLEEP/REST FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some- times	Often	Almost Always
1. I sleep a lot	0	1	2	3	4
2. It is hard for me to sleep through the night	0	1	2	3	4
3. I feel tired when I wake up in the morning	0	1	2	3	4
4. I rest a lot	0	1	2	3	4
5. I take a lot of naps	0	1	2	3	4
6. I spend a lot of time in bed	0	1	2	3	4

COGNITIVE FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some- times	Often	Almost Always
1. It is hard for me to keep my attention on things	0	1	2	3	4
2. It is hard for me to remember what people tell me	0	1	2	3	4
3. It is hard for me to remember what I just heard	0	1	2	3	4
4. It is hard for me to think quickly	0	1	2	3	4
5. I have trouble remembering what I was just thinking	0	1	2	3	4
6. I have trouble remembering more than one thing at a time	0	1	2	3	4

ID# _____
Date: _____

PedsQLTM Multidimensional Fatigue Scale

Standard Version

PARENT REPORT for CHILDREN (ages 8-12)

DIRECTIONS

On the following page is a list of things that might be a problem for **your child**. Please tell us **how much of a problem** each one has been for **your child** during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has this been for your child ...

GENERAL FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Feeling tired	0	1	2	3	4
2. Feeling physically weak (not strong)	0	1	2	3	4
3. Feeling too tired to do things that he/she likes to do	0	1	2	3	4
4. Feeling too tired to spend time with his/her friends	0	1	2	3	4
5. Trouble finishing things	0	1	2	3	4
6. Trouble starting things	0	1	2	3	4

SLEEP/REST FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Sleeping a lot	0	1	2	3	4
2. Difficulty sleeping through the night	0	1	2	3	4
3. Feeling tired when he/she wakes up in the morning	0	1	2	3	4
4. Resting a lot	0	1	2	3	4
5. Taking a lot of naps	0	1	2	3	4
6. Spending a lot of time in bed	0	1	2	3	4

COGNITIVE FATIGUE (<i>problems with...</i>)	Never	Almost Never	Some-times	Often	Almost Always
1. Difficulty keeping his/her attention on things	0	1	2	3	4
2. Difficulty remembering what people tell him/her	0	1	2	3	4
3. Difficulty remembering what he/she just heard	0	1	2	3	4
4. Difficulty thinking quickly	0	1	2	3	4
5. Trouble remembering what he/she was just thinking	0	1	2	3	4
6. Trouble remembering more than one thing at a time	0	1	2	3	4

ID# _____
Date: _____

PedsQLTM Multidimensional Fatigue Scale

Standard Version

TEEN REPORT (ages 13-18)

DIRECTIONS

On the following page is a list of things that might be a problem for you. Please tell us **how much of a problem** each one has been for you during the **past ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has this been for you ...

GENERAL FATIGUE (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I feel tired	0	1	2	3	4
2. I feel physically weak (not strong)	0	1	2	3	4
3. I feel too tired to do things that I like to do	0	1	2	3	4
4. I feel too tired to spend time with my friends	0	1	2	3	4
5. I have trouble finishing things	0	1	2	3	4
6. I have trouble starting things	0	1	2	3	4

SLEEP/REST FATIGUE (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. I sleep a lot	0	1	2	3	4
2. It is hard for me to sleep through the night	0	1	2	3	4
3. I feel tired when I wake up in the morning	0	1	2	3	4
4. I rest a lot	0	1	2	3	4
5. I take a lot of naps	0	1	2	3	4
6. I spend a lot of time in bed	0	1	2	3	4

COGNITIVE FATIGUE (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. It is hard for me to keep my attention on things	0	1	2	3	4
2. It is hard for me to remember what people tell me	0	1	2	3	4
3. It is hard for me to remember what I just heard	0	1	2	3	4
4. It is hard for me to think quickly	0	1	2	3	4
5. I have trouble remembering what I was just thinking	0	1	2	3	4
6. I have trouble remembering more than one thing at a time	0	1	2	3	4

ID# _____
Date: _____

PedsQLTM Multidimensional Fatigue Scale

Standard Version

PARENT REPORT for TEENS (ages 13-18)

DIRECTIONS

On the following page is a list of things that might be a problem for your child. Please tell us **how much of a problem** each one has been for your child during the past **ONE month** by circling:

- 0 if it is **never** a problem
- 1 if it is **almost never** a problem
- 2 if it is **sometimes** a problem
- 3 if it is **often** a problem
- 4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

In the past ONE month, how much of a problem has this been for your child ...

GENERAL FATIGUE (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Feeling tired	0	1	2	3	4
2. Feeling physically weak (not strong)	0	1	2	3	4
3. Feeling too tired to do things that he/she likes to do	0	1	2	3	4
4. Feeling too tired to spend time with his/her friends	0	1	2	3	4
5. Trouble finishing things	0	1	2	3	4
6. Trouble starting things	0	1	2	3	4

SLEEP/REST FATIGUE (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Sleeping a lot	0	1	2	3	4
2. Difficulty sleeping through the night	0	1	2	3	4
3. Feeling tired when he/she wakes up in the morning	0	1	2	3	4
4. Resting a lot	0	1	2	3	4
5. Taking a lot of naps	0	1	2	3	4
6. Spending a lot of time in bed	0	1	2	3	4

COGNITIVE FATIGUE (<i>problems with...</i>)	Never	Almost Never	Sometimes	Often	Almost Always
1. Difficulty keeping his/her attention on things	0	1	2	3	4
2. Difficulty remembering what people tell him/her	0	1	2	3	4
3. Difficulty remembering what he/she just heard	0	1	2	3	4
4. Difficulty thinking quickly	0	1	2	3	4
5. Trouble remembering what he/she was just thinking	0	1	2	3	4
6. Trouble remembering more than one thing at a time	0	1	2	3	4

APPENDIX M: GODIN LEISURE SCORE INDEX

A. During a normal week, how many hours a day do you watch television or plan video/computer games:

- Never
- 1 hour or less
- 1 to 3 hours
- 4 to 5 hours
- 6 or more hours

B. The following questions ask you to recall your levels of physical activity over the last week. Physical activity is any body movement that increases your energy expenditure above resting levels and includes any physical recreation, exercise and sporting activities.

During a typical 7-day period, how many times on average do you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number).

- Strenuous Exercise (heart beats rapidly, sweating)

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance biking)

_____ times/week
_____ minutes/session

- Moderate Exercise (not exhausting, light perspiration)

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing, leisure skating)

_____ times/week
_____ minutes/session

- Mild Exercise (minimal effort, no perspiration)

(e.g., yoga, archery, fishing, bowling, horseshows, golf, pool, easy walking)

_____ times/week
_____ minutes/session

APPENDIX N: THEORY OF PLANNED BEHAVIOUR QUESTIONNAIRE

When making ratings on the following scales, please remember the following:

- Be sure to answer all of the items – please DO NOT skip any.
- Do not circle more than one number on a single question.
- Physical activity is any body movement that increases your energy expenditure above resting levels and includes any physical recreation, exercise and sporting activities.
- Regular physical activity is defined as a minimum of 60 to 90 minutes of activity each day.

Example:

Since my cancer diagnosis, I think being physically active would be...

1.

Useless 1	2	3	4	5	6	Useful 7
Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely

If you think that since your cancer diagnosis, being physically activity would be extremely useless, then you would circle 1.

Useless 1	2	3	4	5	6	Useful 7
Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely

If you think that since your cancer diagnosis, being physically activity would be slightly useless then you would circle 5.

Useless 1	2	3	4	5	6	Useful 7
Extremely	Quite	Slightly	Neither	Slightly	Quite	Extremely

If you think that since your cancer diagnosis, being physically activity would be extremely useful, then you would circle 7.

Attitude: The following questions ask about your attitude toward physical activity. Please circle the number that most accurately reflects your attitude.

Since my cancer diagnosis, I think being physically active would be...

1.

Useless 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Useful 7 Extremely
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2.

Harmful 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Beneficial 7 Extremely
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3.

Wise 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Foolish 7 Extremely
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4.

Bad Idea 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Good Idea 7 Extremely
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5.

Unenjoyable 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Enjoyable 7 Extremely
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6.

Pleasant 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Unpleasant 7 Extremely
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7.

Negative 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Positive 7 Extremely
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8.

Healthy 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Unhealthy 7 Extremely
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9.

Worthwhile 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Not Worthwhile 7 Extremely
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10.

Interesting 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Uninteresting 7 Extremely
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11.

Fun 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Chore 7 Extremely
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Since my cancer diagnosis, I think being physically active would be...

12.

Dull 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Stimulating 7 Extremely
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13.

Obligation 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Treat 7 Extremely
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14.

Convenient 1 Extremely	2 Quite	3 Slightly	4 Neither	5 Slightly	6 Quite	Inconvenient 7 Extremely
------------------------------	------------	---------------	--------------	---------------	------------	--------------------------------

Subjective Norm: The following questions ask about the support you have for being physically active. Please circle the number that most accurately reflects your feelings of support.

1. Since my diagnosis, people who are important to me *think* that I should be physical active.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
---------------------------	---	---	---------------------------------------	---	---	------------------------

2. Since my diagnosis, people who are important to me *approve* of me being physically active.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
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3. Since my diagnosis, people who are important to me support me being physical active.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
---------------------------	---	---	---------------------------------------	---	---	------------------------

Perceived Behavioural Control: The following questions ask about the control you have over being physically active on a regular basis. Please circle the number that most accurately reflects your feelings of control.

1. Since your cancer diagnosis, do you believe that you have the ability to be physically active on a regular basis?

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
---------------------------	---	---	---------------------------------------	---	---	------------------------

2. Since your cancer diagnosis, how confident are you that you are capable of being physically active on a regular basis?

1 Not Confident at all	2	3	4 Neither	5	6	7 Extremely Confident
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3. Since your cancer diagnosis, do you feel that you are capable of being active on a regular basis?

1 Not at all Capable	2	3	4 Neither	5	6	7 Very Capable
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4. Since your cancer diagnosis, how certain are you that you can be physically active on a regular basis?

1 Not at all Certain	2	3	4 Neither	5	6	7 Very Certain
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5. Since your cancer diagnosis, how much control do you have over being physically active on a regular basis?

1 Very Little Control	2	3	4 Neither	5	6	7 Complete Control
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6. Since your cancer diagnosis, if you wanted to, you could easily be physically active on a regular basis.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
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7. Since your cancer diagnosis, being physically active on a regular basis is entirely up to you.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
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8. Being physically active on a regular basis is....

1 Impossible	2	3	4 Neither	5	6	7 Possible
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Intention: The following questions ask about your intentions to be physically active on a regular basis. Please circle the number that most accurately reflects your intentions.

1. Since my cancer diagnosis, it is my intention (goal) to be physically active on a regular basis.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
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2. Since my cancer diagnosis, I plan to be active on a regular basis.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
---------------------------	---	---	---------------------------------------	---	---	------------------------

3. Since my cancer diagnosis, I am trying to be physically active on a regular basis.

1 Strongly Disagree	2	3	4 Neither Disagree nor Agree	5	6	7 Strongly Agree
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