

Bellarmino University

ScholarWorks@Bellarmino

---

Undergraduate Theses

Undergraduate Works

---

4-2022

## An Analysis of the Psychological and Physical Effects of a Physical Activity Program During In-Patient Pediatric Cancer Treatment

Zoë Winters

Bellarmino University, [zwinters@bellarmine.edu](mailto:zwinters@bellarmine.edu)

Follow this and additional works at: [https://scholarworks.bellarmino.edu/ugrad\\_theses](https://scholarworks.bellarmino.edu/ugrad_theses)



Part of the [Oncology Commons](#)

---

### Recommended Citation

Winters, Zoë, "An Analysis of the Psychological and Physical Effects of a Physical Activity Program During In-Patient Pediatric Cancer Treatment" (2022). *Undergraduate Theses*. 80.

[https://scholarworks.bellarmino.edu/ugrad\\_theses/80](https://scholarworks.bellarmino.edu/ugrad_theses/80)

This Honors Thesis is brought to you for free and open access by the Undergraduate Works at ScholarWorks@Bellarmino. It has been accepted for inclusion in Undergraduate Theses by an authorized administrator of ScholarWorks@Bellarmino. For more information, please contact [jstemmer@bellarmine.edu](mailto:jstemmer@bellarmine.edu), [kpeers@bellarmine.edu](mailto:kpeers@bellarmine.edu).

PERCEPTIONS OF A PHYSICAL ACTIVITY PROGRAM IN PEDIATRIC ONCOLOGY

An Analysis of the Psychological and Physical Effects of a Physical Activity Program During In-Patient Pediatric Cancer Treatment

Spring 2021

Zoë Winters, Dr. Beth Ennis, Dr. Catelin Infante Kass

TABLE OF CONTENTS

I.	Abstract	Page 3
II.	Literature Review	Page 4
	A. Background on Cancer	Page 4
	B. What are Physical Activity, Physical Fitness, and Exercise	Page 8
	C. Importance of Physical Activity	Page 9
	D. Physical Activity in Relation to Cancer	Page 12
III.	Methodology	Page 18
IV.	Results	Page 21
V.	Discussion	Page 23
	A. Limitations	Page 25
	B. Areas of Future Study	Page 26
VI.	References	Page 27
VII.	Appendix A.	Page 32
	A. Appendix A1. Outreach Script for Professionals	Page 32
	B. Appendix A2. Outreach Script for Parents	Page 33
	C. Appendix A3. Informed Consent Form	Page 34
VIII.	Appendix B.	Page 36
	A. Appendix B1. Professional's Perceptions on the Implementation of a Physical Activity Program Open-Ended Questions and Script	Page 36
	B. Appendix B2. Parents's Perceptions on the Implementation of a Physical Activity Program Open-Ended Questions and Script	Page 37

ABSTRACT

There is limited published research regarding the use of physical activity in cancer treatment programs, and even fewer in pediatric treatment plans; however, there is a common consensus that following the conclusion of cancer treatment an individual's physical fitness has been majorly impacted. The inactivity that commonly coexists with cancer treatment often results in extended periods of time in rehabilitation programs and decreased independence. Along with the physical detriments caused by inactivity, increased dependence on others often brings about feelings of helplessness that can further cause emotional detriments. It has however been demonstrated in previous research that adding physical activity programs into cancer treatment plans, especially those emphasizing maintenance of preexisting fitness levels can decrease the detriments seen in inactive patients. In interviews with physical therapists working in a pediatric stem cell transplant ward, the importance of including a physical activity treatment program was emphasized due to its ability to assist in the maintenance of previous levels of physical fitness. Despite the scarcity of research, there are trends to promote the implementation of physical activity into oncological treatment plans. Further research is needed to clarify which types of activity plans are the most conducive to bringing health related benefits into the various treatment plans for each population group and cancer type. Future Research can also delve into whether physical activity programs have an effect on the emotional and mental state of pediatric oncology patients.

## LITERATURE REVIEW

Approximately one in every 285 children in the United States are diagnosed with cancer before the age of twenty (American Academy of Pediatrics, 2021). Many of these children spend a lot of time in the hospital receiving treatment, and this in-hospital care can limit the amount of physical activity performed by the child on a daily basis for a variety of reasons; from concerns about safety to the availability of resources. Through inactivity, patients potentially lose not only the health benefits of an active lifestyle, but the emotional benefits as well. This information exposes two questions: what are the perceived benefits of a physical activity program implemented into the long-term inpatient treatment, and would parents, professionals and parents perceive such a program as beneficial?

Before any understanding can be gained in regards to whether a physical activity program would benefit patient health both physically and psychologically, one must first understand the various types of cancer, the effects of cancer on patients, and current treatment plans. Additionally, it is important to understand the definitions of physical fitness, physical activity, and exercise. Another aspect to consider is the physical and psychological effects of physical activity on children with and without a cancer diagnosis.

### **Background on Cancer**

Cancer starts when cells in the body begin to grow out of control; this can occur nearly anywhere in the body and spread to other areas (American Cancer Society, 2021). Although a patient could be diagnosed with one type of cancer, it can present itself in an area outside of the diagnosis zone. For example, if a child is diagnosed initially with bone cancer in their right leg, it could spread to their lungs. The variability of cancer often causes complications when designing

a treatment plan. Regardless of the type of cancer or treatment plan, such as chemotherapy, radiation, and stem cell transplant, rehabilitation is required, often for extended lengths of time—sometimes years—after the initial diagnosis. Further, repeated rounds of cancer treatment weakens the body and decreases the likelihood of a person (and even more so a child) to return to pre-diagnosis activities and physical fitness levels due to loss of endurance and overall fitness from extensive sedentary periods and muscle weakening.

The most common cancers diagnosed in children are leukemia, brain and spinal cord tumors, neuroblastoma, Wilms tumor, lymphoma (including both Hodgkin and non-Hodgkin), rhabdomyosarcoma, retinoblastoma, and bone cancer (including osteosarcoma and Ewing sarcoma) (American Cancer Society, 2021). Leukemia is an important example to consider specifically because many leukemia treatment programs involve long stays at the hospital, and leukemia treatment does not often result in any need for major surgeries and the following orthopedic or musculoskeletal rehabilitation. The focus of this study is on the perceived benefits of a physical activity routine during long stays in the hospital as opposed to rehabilitation programs after treatment has concluded.

When a child is first diagnosed with cancer (especially in the case of Leukemia), they undergo three stages of treatment; induction, consolidation, and maintenance. During the induction phase patients are often required to stay in the hospital for about a month due to the intensity of the treatment (American Cancer Society, 2019). It is during the induction phase that the greatest change in a child's physical activity and their physical fitness levels can be seen. Introducing physical activity during this stage has the potential to be the most beneficial due to the importance of maintaining physical activity early in the treatment plan; however it may be difficult to keep the patient active while they undergo arguably the most difficult stage of

treatment due to the high levels of intensity. During the consolidation stage, chemotherapy lasts several months and the patient may be able to move out of the hospital (American Cancer Society, 2019). Outpatient rehabilitation therapy generally starts during the consolidation phase as the patient transitions out of the hospital. It would be the goal of the physical activity program to release the patient at as close to their pre-existing level of physical fitness as possible. During the maintenance phase the patient begins to return to their home life and only comes in every now and then for treatment (American Cancer Society, 2019). Every stage of treatment has different implications when it comes to maintaining a physical activity program. Some stages, such as induction, do not often include physical activity while others, such as maintenance, already include rehabilitation programs.

Under the guidelines of most treatment plans, the patient is assigned a care team upon diagnosis. The care team is composed of doctors, nurses, nurse practitioners, physician assistants, and other professionals fulfilling a myriad of roles and overseeing regular patient care. (St. Jude Children's Research Hospital, 2018). The interviews in this study were directed towards three main professionals, the first of which is the pediatric oncologist. Pediatric oncologists coordinate and direct the patients' cancer treatment, working closely with all members of the care team (St. Jude Children's Research Hospital, 2018). As the oncologist is working closely with the patient and tracking progress, their perspectives on treatment plans and physical activity programs are important. They should be able to notice differences in the physical presentation of the patient after physical activity.

Treatment also includes ensuring the child's psychological well-being. A child life specialist is a professional who has training in child development, they use play, art, and other activities to help children cope with cancer and prepare them for treatments and procedures using

age-appropriate methods (St. Jude Children's Research Hospital, 2018). The inclusion of this professional can potentially provide ease and comfort to the child to assist them in gaining a better understanding of the procedures they are undergoing and processing the changes happening in their life. Interviewing professionals from this branch would provide insight into how physical activity can bring about a mental and emotional change for the child and if the program is positively impacting the child in this manner. The child life specialist best understands the psychological effects of treatment and hospital life on the patient. By including their knowledge of physical activity plans, it can be determined whether the activities are assisting with stress relief and helping the child cope with their situation or if the activities are instead producing the opposite effect.

The third group of professionals this study focused on are rehabilitation specialists. These specialists work to help the patient maintain as much movement and physical function as possible in tasks of daily living, hearing, speech, communication, and functioning in school and work (St. Jude Children's Research Hospital, 2018). Due to the fact that a child is spending so much time in the hospital, they may not be able to be as engaged in important aspects of life as a child who does not have cancer. While rehabilitation professionals work closely with these children, it is important to distinguish that this research is focusing primarily on physical activity during in-patient treatment instead of the rehabilitation process after the cessation of treatment. That being said, the opinions of rehabilitation professionals are important as they decide when a patient can return to normal activities after their stay in the hospital and have a better sense of what the child's limitations are during their stay.

This study endeavors to understand the recommended levels of activity during the hospital stay that help the child maintain appropriate levels of functional movement both during

and after treatment. It is important to note that physical therapists do not only focus on rehabilitation after treatment is complete. A few therapists work to increase the child's mobility and improve their ability to perform self-care activities while the patient is still undergoing treatment (Children's Hospital of Orange County, 2020). Therefore, it is critical to understand therapists' perceptions of how important and effective activity programs are during the inpatient stay.

Families play a large role in emotional support for children fighting cancer. They are involved with much of their treatment, being there for whatever is needed. They also see the changes in their children as treatment continues, they are more attuned to their child's fluctuations in mood and are more conscious of what the child's previous levels of physical fitness are. For that reason, parents are vital to understanding how, and to what extent, physical activity and oncological treatment programs affect the patients.

### **What are Physical Activity, Physical Fitness, and Exercise?**

Physical Activity is commonly described as any movement produced by the body resulting in energy usage or expenditure. It is commonly categorized as occurring while sleeping, working, or during leisure time (Caspersen et al., 1985). Leisure-time physical activity is further divided into sports, conditioning, and household activities. Exercise is structured, repetitive and planned physical activity with the objective to improve or maintain a level of physical fitness (Caspersen et al., 1985). When one thinks of exercise they should consider a sporting event such as football, baseball, or tennis. It can also include recreational activities such as running, dance classes, or conditioning and work out classes. Physical fitness can be defined as having "the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample

energy to enjoy leisure-time pursuits and to meet unforeseen emergencies" (President's Council on Physical Fitness and Sports, 1971). However due to the difficulty to objectively measure "fatigue" and "alertness", physical fitness is often broken down into health-related and skill related components. The health-related components are more applicable to healthy living of the general public than the skill-related athletic components of physical fitness. The health-related components of physical fitness are cardiorespiratory endurance, muscular endurance, muscular strength, body composition, and flexibility (Caspersen et al., 1985). Of the five health related components of physical fitness, cardiorespiratory endurance, muscular endurance, and muscular strength are considered to be the most beneficial to the individual and have the greatest success in producing physical activity related health benefits. This study will focus on physical activity as a whole due to its versatility and convenience. It is not required that a person engage in a planned sporting or conditioning event to obtain health benefits, oftentimes getting up and walking for 30 minutes a day five times a week is enough to produce health benefits associated with physical activity. Additionally, while undergoing cancer treatment, asking an individual to take a short walk can feel like asking them to climb a mountain. It is for this reason the focus of promoting physical activity should be on maintaining pre-existing physical fitness levels and not improving physical fitness while also undergoing treatment.

### **Importance of Physical Activity**

Establishing healthy lifestyle behaviors, such as regular physical activity participation, at a young age is extremely important as behaviors learned during the early years of life tend to be carried forward into adulthood (Truelove et al., 2018). Since adequate amounts of physical activity provide multiple health benefits and will improve or maintain physical fitness, it should

be an integral component of children's lives (Downs, 2005). In the lens of this study, for children that spend extended periods of time in the hospital, there may be an absence of the establishment of those healthy habits.

Researchers have shown that children as young as 2 years of age can attain positive health effects from engaging in daily physical activity (Truelove et al., 2018). However, there are not clear cut guidelines for this age group as the physical abilities of children change so much between the age of two and three. For preschool-aged children (ages three to five years) without any disease conditions, it is recommended that they are physically active throughout the day (U.S. Department for Health and Human Services, 2020), participating in activities like running, dancing, and climbing (American Academy of Pediatrics, 2021). For children aged six through seventeen, it is recommended that they participate in sixty or more minutes of moderate-to-vigorous intensity exercise each day. This includes aerobic activities such as running or jumping three days a week and muscle building activities such as climbing or push-ups three days a week (U.S. Department for Health and Human Services, 2020). For children, these activities can often be met by playing sports but, especially in recent years, increasing numbers of children and adolescents are not reaching physical activity recommendations. There are several reasons for the lack of adherence to these guidelines, including lack of athleticism, poor physical condition, low self esteem, concern over physical appearance, dislike for highly structured—and often overly competitive—adult organized activities, conflicting and busy schedules, and increasing usage of technology-based entertainment (Wójcicki & McAuley, 2014).

Physical activity provides specific health benefits, including weight management, blood pressure control, and improved musculoskeletal and cardiopulmonary function (Downs, 2005). Simply decreasing the amount of sedentary time in a person's life can promote health benefits.

Aerobic activities of moderate to vigorous intensity appear to be the most effective way to attain a majority of these physical benefits, with the exception of improved bone health, which typically requires high-impact, weight-bearing activities (Wójcicki & McAuley, 2014).

Additionally, maintaining healthy levels of physical activity has the ability to decrease the risk of developing chronic diseases (Christian et al., 2021).

Beyond just the physical benefits, physical activity in children, especially the preschool age, has been shown to be important for social emotional development—a child’s experience, expression, and management of emotions (Christian et al., 2021). If a child is spending extended periods of time in the hospital, they are missing out on forming the ability to easily interact with other children and form meaningful connections with peers. Play for children is more than just a break from reality, it teaches children the importance of sharing, fairness, and other valuable life lessons. A growing body of evidence also supports the positive psychological effects of physical activity (Platschek et al., 2017). Regular physical activity has been shown to improve energy levels, concentration, mental performance and mood. It is also attributed with reduced tension, anxiety, depression and hostility (Sothorn et al.,1999). One study demonstrated that “after incidental activity (such as climbing stairs), adolescents felt better and more energized” (Koch et al., 2020). Research conveys that physical activity improves mental health by reducing anxiety, depression, and negative mood and by improving self-esteem and cognitive function.

When it comes to arguing for physical activity in a disease state, there is growing evidence that physical activity can help battle illness. By decreasing sedentary behaviors and, thus, increasing daily physical activity, individuals may experience many stress-reducing benefits, which may enhance the immune system (Sothorn et al.,1999). However, the guidelines for recommended levels of physical activity for children were written with the healthy child or

adolescent in mind and there are not many specifications for children with a diagnosis. When it comes to encouraging children with cancer to be physically active, the recommended guidelines must be changed and adjusted to meet each individual's condition and needs. It is also important to consider that young patients often adopt a sedentary lifestyle, either from limitations created by their disease itself or fear of potential risks (perceived or real) of exercise (Rowland, 2016). Although it is important to keep these children active, it is also important to recognize their fears and limitations and mood, keeping all aspects of their diagnosis in mind. The most important aspect of selecting a mode for children and adolescents is to find an activity that is enjoyable, with the duration and frequency dependent on the chosen mode (Downs, 2005). For example, if a patient loves playing soccer but hates running on the treadmill, then a reasonable solution would be to replace running on the treadmill with soccer playing so the patient can enjoy the prescribed movement. Similarly, going for a walk around the hospital could provide some physical activity for the patient without too much added stress.

### **Physical Activity in Relation to Cancer**

Due to the positive impact of physical activity on emotional state, energy levels, and overall health, as determined by previous studies, it is important to investigate the impact of a physical activity program as a component of the inpatient treatment plan of pediatric cancer patients. Furthermore, impaired physical fitness and its consequences, such as reduced cardiopulmonary function, decreased muscle strength, and fatigue, have been reported during childhood cancer treatment (Platschek et al., 2017). Additionally, a meta-analysis of several studies indicates that patients experience a decrease of physical activity during treatment, and this physical inactivity persists even after treatment has ended (Winter et al., 2009). This

continuation of inactivity would suggest that implementing an activity program during treatment could have a positive impact in this area. Although there is research promoting physical activity in the treatment plans for several types of cancer across various populations, there is a scarcity of research within the adolescent and pediatric populations.

Studies have found it necessary to encourage patients to engage in physical activity during and after treatment for cancer in order to prevent negative health and mood effects. Various studies have shown that “reduced physical activity is highly probable in patients during and after treatment” (Winter et al., 2009). In prior studies that focused on acute lymphoblastic leukemia (ALL), eleven investigations found that most patients did not meet activity recommendations. While the cause for most reported reductions in physical activity is treatment-induced, there are numerous factors that influence the level of physical activity in survivors (Winter et al., 2009). These studies did not review only pediatric patients but any and all types of patients that had received a diagnosis of acute lymphoblastic leukemia. They also focused primarily on physical activity post treatment instead of during the patient’s stay in the hospital.

Children with Acute Lymphoblastic Leukemia are at increased risk for low bone mineral density (White et al., 2005). It has been shown in past research that exercise in children increases bone marrow density. Thus it makes sense to assume that increasing physical activity in pediatric cancer treatment will result in increased bone marrow density (White et al., 2005). This article encourages clinical researchers to work with exercise professionals to enhance patient adherence and compliance.

In a trial consisting of breast cancer survivors, a multicomponent physical activity program (BEAT) showed significant effects on decreasing fatigue, depression, and anxiety (Rogers et al., 2017). The intervention utilized here (BEAT) included 12 exercise sessions led by

an exercise specialist spanning the first 6 weeks and led to an unsupervised home-based program during the last 6 weeks. Although the exercise sessions were unsupervised towards the conclusion of the intervention, face-to-face update counseling sessions were still held with the exercise specialist every 2 weeks in order to maintain accountability and support (Rogers et al., 2017). This study is significant because it demonstrates that for cancer survivors, physical activity can do serious good in increasing the mood and mental wellbeing of patients. It allows the researchers to hypothesize that introducing a similar intervention in pediatrics or during treatment rather than following treatment, would similarly result in positive benefits. However, further research is necessary to implement such a program into common practice.

In a program designed to restore and improve the physical well-being of women living with breast cancer as they undergo chemotherapy or radiation treatments, a 12 week exercise intervention resulted in participant reported satisfaction, decrease in fatigue levels, a higher quality of life and physical fitness (Leach et al., 2014). The benefits that came out of the intervention during treatment is what makes this article relevant to the current course of research. It is an example as to how physical activity during chemotherapy leads to better quality of life. More research is necessary to apply this information to other types of treatment but as there were no adverse effects of physical activity during treatment it is a study that backs up the desires of the current research.

A common treatment for various types of leukemias is hematopoietic stem cell transplantation (HSCT). Recent meta-analytic evidence indicates that physical activity attenuates the functional decline of children and adolescents with cancer in general but particularly in HSCT recipients (Morales et al., 2020). Specifically, and most importantly in regards to this study, a moderate-intensity supervised exercise intervention performed during inpatient

hospitalization appears to be safe for children and adolescents undergoing HSCT (Morales et al., 2020). If a physical activity program is safe during stem cell treatment, and has benefits of decreased stress and improved mood, then it leads to questions as to whether this type of combined program would be beneficial for more pediatric patients.

There is increasing evidence that regular physical activity can improve the overall health, functional capacity, and quality of life both for children with cancer and older survivors of cancer (San Juan et al., 2010). This study effectively indicates that physical activity programs in the treatment plans for pediatric cancer are necessary.

An emphasis is placed on the need not only for an exercise program but specifically one that is sustainable enough to continue providing long term benefits after that conclusion on cancer treatment. During one five year study, 32 pediatric patients and 14 siblings, all between the ages of three and eighteen, for six to eighteen months participated in an exercise program consisting of endurance, strength, coordination exercises, as well as relaxation and cooperative games and were offered once a week for 45-60 minutes (Daeggelmann et al., 2018). There were no serious negative effects of the exercises and the majority of participants remained physically active following the completion of the program, however, it is mentioned that “reintegration into non-cancer-specific PA must be improved” (Daeggelmann et al., 2018). It might also be more effective to decrease the length of the session and instead hold multiple sessions throughout the week.

Another study at the Yale Pediatric Hematology-Oncology Clinic asked patients and parents to complete a 10 minute survey discussing barriers, preferences, and beliefs surrounding physical activity in childhood cancer. This study found that the most common barriers to physical activity were fatigue, shortness of breath, lack of motivation, and lack of time (Ross et

al., 2018). This study provides a stepping point of how to plan future programs so that these barriers can be overcome or avoided all together. Including physical therapy into a patient's daily routine can take some work but could also prove very effective. The study also asked patients what types of physical activity they preferred. The majority of patients endorsed walking over biking and prefer biking over jogging, dancing, or basketball (Ross et al., 2018). They were ranking these activities on a survey which leads to the question if an open ended question where participants could write in their own activities would result in a different conclusion. It is important to make sure that patients are participating in activities that they enjoy as this will result in them sticking to their program for longer.

A four-week inpatient rehabilitation program consisting of land based and aquatic exercises, as well as hippo-therapy, showed immediate and sustainable effects on psychosocial well being and the potential of physical activity to be related to general recovery (Müller et al., 2016). In comparison to the previous study that took place during treatment, this program took place seventeen months after cessation of acute medical treatment. However, it also demonstrated that for individuals aged four to eighteen years with leukemia, lymphoma, brain tumor, or sarcoma, physical activity provided considerably more positive benefits than negative consequences, promoting the concept that exercise provides relief from cancer symptoms. This article also mentions the scarcity of research promoting physical activity during the acute stages of treatment and it is for this reason they instead focused on rehabilitation following the cessation of treatment (Müller et al., 2016).

Patient participation in treatment plans is encouraged by finding “a child’s strengths and emphasizing them so that they can achieve all that they dream” (Anderson, 2018). In other words, the activities should be adaptable to each patient. Professionals should engage in

children's "playful and ambivalent" behavior in order to better understand how to interact in shared therapy (Bjorbaekmo et al., 2018). By involving the patient in the creation of the program, they are more likely to adhere to it. Another study discussed the positive effect of a computer-based exercise intervention on mood in a population of inpatient and outpatient pediatric patients with cancer (Platschek et al., 2017). If children are used to playing video or computer games at home, introducing a physical activity program that is based on a computer program could also increase adherence.

Another article claims the introduction of a physical activity program should not be done at the beginning of treatment due to the fact that the child and family need time to adjust to the diagnoses before being able to respond to physical activity interventions (Cox et al., 2017). The emotional state of the patient is important to consider when introducing a physical activity program because although increased physical activity generally boosts patient mood, it can potentially increase stress. Although it is commonly believed that the sooner treatment or intervention begins the better the outcome, this may not always be the case. In some instances, it may be more beneficial to ease the patient into the physical activity treatment. Finding the perfect time to start encouraging physical activity is easier said than done. Start too late and the child may already be feeling the effects of inactivity, start too soon and there may be low adherence as the child grows weaker. Despite these reservations, it is believed that by starting physical activity programs earlier, the child will become used to getting up and being active every day and this will reduce inactivity.

In an alternative argument, a study at another children's hospital argues that physical activity should be initiated in the initial shade of treatment even though this is often considered the most intensive stage. The physical activity should be performed not only in the patients'

room expanding their surroundings to include the corridors of the department or a nearby gym.

This article also argues that adding a sports room to the oncology wing of a hospital could result in greater adherence to a physical activity program (Revon-Rivière et al., 2021).

Another point of concern is the lack of standard procedures regarding exercise programs. As there is not set practice, every program is slightly different which makes comparing results and outcomes more difficult. Further, information regarding effective approaches to taking evidence and putting it into practice is limited (Cormie et al., 2017). There are more programs attempting to reach the general population in regards to effective education of the benefits of physical activity programs in cancer treatment. One such program in the “Life Now Exercise” which provided evidence-based exercise medicine to participants. Full benefits and drawbacks of this program have not yet been analyzed but the practice has been set in motion and they fully explore the potential benefits of a generalized information program (Cormie et al., 2017).

The general consensus in past literature concludes that physical therapy is safe in oncology patients and it provides therapeutic interventions that may mitigate loss of function and disability. The importance in any fitness or physical activity program lies in assessing each patient individually in medically supervised settings and adjusting the program in accordance with any observations (Maltser et al., 2017).

## METHODOLOGY

The most effective way to assess the potential benefits of including a physical activity program in oncological treatments is to conduct an experimental study using patients as participants and asking them to complete various amounts of physical activity throughout the treatment period while measuring specific outcomes pertaining to endurance, strength, and

emotional/mental state. However, access to oncology patients is understandably limited. As the surging COVID-19 pandemic spread across the world, immunocompromised individuals were protected, exposure to external forces was limited, and precautions were taken as to not put the patients at further risk. Further, as the researcher does not have experience creating physical activity plans, creating a program and asking participants to follow it would lead to questions regarding the credibility of the proposed program. Therefore, this study focused on current opinions of the benefits and drawbacks of a physical activity program in the treatment plan of pediatric cancer. At the outset of the study doctors, nurses, and physical therapists were contacted with invitations to be interviewed regarding their opinions surrounding the inclusion of a physical activity program in pediatric oncology treatment plans. Parents were also contacted through support groups in order to determine the lived experience of someone directly involved with the child. The list of hospitals contacted comprised the top five pediatric oncological hospitals in the United States and five other randomly chosen hospitals from an alphabetical list of hospitals across the United States with pediatric oncology departments. Multiple hospitals with varying degrees of oncological programs were contacted as not every hospital has a physical activity program included and perceptions of hospitals from multiple sides of the spectrum was desired. It was important to interview care providers from different type of hospitals as some hospitals are specifically children's cancer hospitals (or children's hospitals with specific cancer programs) while other hospitals are not primary children's cancer facilities. Despite contacting multiple individuals from each hospital, no response was received. It was then decided to reach out to individuals belonging to professional organizations under the branches of oncology and physical therapy. Through the entire process over fifty individuals were contacted and two interviews were conducted. In the interviews, open ended questions

regarding the individual's perceptions of the inclusion of physical activity programs in pediatric oncological treatment plans were asked. These questions and a complete transcript of the outreach scripts and informed consent forms for the professionals and families can be found in Appendix A through Appendix B.

For the purpose of this study, children are defined as anyone who is under the age of eighteen, at which point they are no longer legally dependent on their parents or guardian. It should also be noted that for this study the term parent is used to describe any person with guardianship over the child, not just the biological parents.

All potential participants were contacted either via email and phone call and asked to sign and return the consent form (Appendix A3) if they were interested in participating. Once consent was obtained and the interview scheduled, the researcher engaged via Zoom. The interview was recorded for later transcription and throughout the interview notes were taken. These interviews consisted of a series of open-ended questions which can be found in Appendix B1 and B2, as there are different questions for healthcare professionals and for parents. Once the interviews were transcribed, they were read by two people (the researcher and the advisor) independently to determine if consistent themes exist. The two separate reviews were compared for consistency and consolidation. Consistent themes were further analyzed for their relevance to the implementation of physical activity programs during inpatient cancer hospitalizations. Because only one interview was conducted, it was compared to previous research and used as a first person testimony of the benefits of physical activity programs when used in pediatric oncological treatment programs.

When it comes to comparing the interview to the existing research it is important to find similar themes between the results of the research and the interview. By identifying these themes

a conclusion can be drawn as to whether there is generally a positive call for implementing research into more areas of oncological treatment.

## RESULTS

It has been theorized that physical activity would result in positive outcomes for the patient, as long as the physical activity is done in moderation, if the therapist is seeing signs of fatigue or pain, they should stop until the patient is recovered. This study explored the experiences and opinions of health care professionals regarding the impact of physical activity programs implemented during inpatient cancer treatment for children. This study also delved into past research surrounding this topic and compared results in order to reach a common consensus regarding the effects of a physical therapy program.

In interviews with physical therapists working in children's hospitals, the effectiveness of physical activity in cancer treatment programs became evident. The idea that every patient is different and as such treatment should be adjusted is a common theme across previous studies as well as this one. This is important because regardless of whether the individual is in a disease state or not, the amount of physical activity needed and how this should be fulfilled varies for each individual.

A key point emphasized in the first interview that was not seen as much in previous research is that maintenance of physical fitness levels should be an important aspect of treatment. In the interview the physical therapist emphasized that there should be no more allowing patients to lay in bed but rather encouraging them to get up, even if it's just to move to the chair and then back to bed. The therapist also mentioned that patients that were able to maintain previous levels of strength and endurance had better oncology outcomes. There was an emphasis placed in the

interview that at 100 days post stem cell transplant, patients that had maintained 75% to 100% of their previous levels of physical fitness, as indicated by their outcome measures, were better able to return to normal life following treatment. The second interviewee also emphasized the idea that children that are exposed to physical activity and rehabilitation during treatment experienced fewer deficits after their stay in the hospital has ended. Similarly, there was maintenance of endurance and cardiorespiratory health.

It was also mentioned in both interviews that when patients are returning home in similar physical fitness levels, then there is less of a gap between the end of their treatment and their return to pre-diagnosis activity. Additionally, it was pointed out in the first interview that being able to walk out of the hospital after treatment had a positive psychological effect compared to students that left the hospital in a wheelchair or in their parents arms. The second interview agreed with this as it emphasized the importance of maintaining what the patients have. This means they are not focused as much on making new gains but rather on not losing the fitness levels at admittance.

A concern discussed by past literature is whether physical activity is safe during treatment. When posed this question, the first interviewee explained that before the program starts there is extensive review of the patient's medical history and if at any point the patient or patient's family expressed that they no longer wanted to engage in the physical activity, then the program was stopped and re-evaluated in terms of that particular patient. Many concerns can be eliminated through re-education. It was explained that for such a program to be successful, the patient, families, and sometimes even medical staff need to understand that it is ok and safe for the patient to be moving around. The second interview emphasized that one way to ensure safety is by being another eye. The therapists are part of the medical teams and as such they are able to

see the patient through another perspective. They may be able to notice physical changes that the primary oncology doctors did not notice. It can be argued then that having physical activity as part of the patient treatment plan improves patient care.

The second interview further emphasized the usefulness of physical activity in cancer treatment. It was explained that throughout the oncology treatment program, baseline measures and evaluations were taken to trace changes over the course of treatment. Where this interview differs from the previous one is that they have a gym on site that they can take patients too if they are feeling up to more intensive exercise. Previous research also mentioned that having a gym on the treatment floor would be effective in maintaining compliance levels with the physical activity program.

Neither interviews expressed any major concerns given by families or professionals. The only noted challenge was the reluctance of parents to allow exercise during their children's stay in the hospital. However, the first interview further explained that by working with the families, this issue could be easily resolved.

## DISCUSSION

The majority of research surrounding the effects of physical activity on survivors of other types of cancer and the research surrounding physical activity levels in pediatric cancer patients in combination with interviews with pediatric oncology physical therapists promote the inclusion of a physical activity program—especially one that focuses on maintenance of previous levels of physical fitness rather than increasing physical fitness. However, in order to effectively establish the habit of maintaining physical fitness levels in pediatric cancer patients, there must be a culture change on the oncology floor.

It is, of course, important to consider that every patient and case is different and as such, what works for one patient might not work for another. Previous research and recent interviews demonstrate the benefits of physical activity programs across various types of cancer, emphasizing that they should be implemented on a case by case basis. Another important aspect to consider is that there is a pre-existing understanding that when a person is sick they should lay in bed and rest; this needs to be reframed, since while rest is good, so is physical activity. Encouraging patients and families to change this culture and instead become more active during their stay in the hospital could change outcomes.

Physical activity and rehabilitation programs in acute care facilities are also potentially limited by the funding allowing for staff or locations necessary for a program. The second interview mentioned taking patients to the gym for physical activity, however, not all facilities have a gym that can be used for these purposes, so the patients are limited to activities that can be performed in their room.

There was, both in previous research and the additional interviews, a lack of focus on the mood of the patient whilst undergoing physical activity at the same time as cancer treatment. In the first interview the therapist stated that since they did not work with the patients prior to admission they are not aware of the mood of the child prior to the start of the program. However, in comparison to when the program started, the patients they are working with now do seem to be happier. This is not an objectively measured value but rather a reflective perspective on the mood of the patients.

When looking into past research there is a comparison between cancer survivors that are seeing a decrease in fatigue and depression levels while engaging in physical activity. However,

not many of the research articles involving pediatrics have delved into fatigue and depression and very few of the articles looked into emotional well being of patients.

Further, although there is a general consensus that physical activity is in fact good for patients undergoing cancer treatment, there is not a complete agreement as to what approach and method this exercise should be implemented. Implementation strategies vary across each research article and the therapist interviewed also stated that it is hard to know how much physical activity and in what mode the physical activity should take place. Although it would be beneficial to have a standard of practice, it should be understood that every individual is different and any standard of practice should be adapted for every person.

### **Limitations**

An aspect to consider when generalizing the interview responses is that the population size is limited in both size and area of expertise. From the over fifty individuals contacted, two participants were interviewed. Professionals' names were easy to find because they are not protected under confidentiality and contact information can often be found on hospital websites. In several instances, the researcher was able to contact the hospital and get an email sent out to the entire oncology or physical therapy department. However, parents were harder to reach. The main strategy was to reach out to support groups, tell them the purpose of the study and ask them to share our contact information with families. This way it was up to the patient and parent to share their identity with us, however, no parents or patients reached out. When it became evident that there were going to be fewer than expected responses, the focus of the research shifted to focus more on past literature across a wide range of cancers rather than focusing only on pediatric cancers, specifically pediatric leukemia which was the original intention of the study.

The additional literature review allowed for identifying the proponents and the limitations to physical activity during treatment.

### **Areas of Future Study**

Exploring the experiences and opinions of those closest to pediatric cancer patients was intended to provide insight into the benefits and challenges of utilizing physical activity programs in oncology treatment. It is recommended that future studies delve deeper into the emotional and psychological benefits of physical activity in relation to pediatric cancer treatments. Further, because interviews with more individuals was not possible, future research can look more into perceptions of such physical activity programs as was the original intention of this study.

As affirmed by the majority of studies reviewed in this paper, exercise in pediatric oncology provides psychosocial, functional, and physical benefits (Wurz et al., 2019). This consensus in the literature means that delving even deeper into this area of study could result in children returning to prior activities at faster rates. It should be considered that although the results of the interviews are important it is two interviews with a focus on a very specific population group. However, many significant statements were made that can be reflected in previous research as well. This study as a whole has emphasized the point that just because you are sick doesn't mean you should only lay in bed. Physical activity is beneficial to improve physical, mental, and emotional state in healthy individuals as well as in patients currently undergoing treatment for cancer.

REFERENCES

- American Academy of Pediatrics. (2021). Preschool activity. Retrieved March 23, 2021, from <https://www.healthychildren.org/English/healthy-living/growing-healthy/Pages/preschool-activity.aspx>
- American Cancer Society. (2021). Cancer in children. Retrieved February 04, 2021, from <https://www.cancer.org/cancer/cancer-in-children.html>
- American Cancer Society. (2019, February 12). What is childhood leukemia? Retrieved February 14, 2021, from <https://www.cancer.org/cancer/leukemia-in-children/about/what-is-childhood-leukemia.html>
- Anderson, J. L. (2018). Enhancing Pediatric Participation. *Rehab Management: The Interdisciplinary Journal of Rehabilitation*, 31(3), 18-23. Retrieved February 22, 2021, from <https://libproxy.bellarmine.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=129248026&site=ehost-live&scope=site>
- Bjorbaekmo, W., Stendal Robinson, H., & Engebretsen, E. (2018). Which knowledge? An examination of the knowledge at play in physiotherapy with children. *Physiotherapy Theory & Practice*, 34(10), 773–782. <https://doi.org/10.1080/09593985.2018.1423654>
- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical Activity, Exercise, and Physical Fitness: Definitions and Distinctions for Health-Related Research. *Public Health Reports* (1974-), 100(2), 126–131. <http://www.jstor.org/stable/20056429>
- Children’s Hospital of Orange County. (2020, November 03). Physical therapy during cancer treatment. Retrieved February 22, 2021, from <https://www.choc.org/programs-services/rehabilitation/physical-therapy-cancer-treatment>

- Christian, H. E., Lester, L., Al Marzooqi, M. K., Trost, S. G., & Papageorgiou, A. (2021). The Association Between Preschooler Physical Activity Duration and Intensity and Social Emotional Development: Findings From the PLAYCE Study. *Journal of Physical Activity & Health*, 18(7), 844–850.
- Cormie, P., Lamb, S., Newton, R. U., Valentine, L., McKiernan, S., Spry, N., Joseph, D., Taaffe, D. R., Doran, C. M., & Galvão, D. A. (2017). Implementing exercise in cancer care: study protocol to evaluate a community-based exercise program for people with cancer. *BMC Cancer*, 17, 1–10. <https://doi.org/10.1186/s12885-017-3092-0>
- Cox, C. L., Zhu, L., Kaste, S. C., Srivastava, K., Barnes, L., Nathan, P. C., . . . Ness, K. K. (2018). Modifying bone mineral density, physical function, and quality of life in children with acute lymphoblastic leukemia. *Pediatric Blood & Cancer*, 65(4). <https://doi.org/10.1002/pbc.26929>
- Downs AM. (2005). Pediatric physical activity and fitness. *Cardiopulmonary Physical Therapy Journal (American Physical Therapy Association, Cardiopulmonary Section)*, 16(2), 12–20. <https://doi.org/10.1097/01823246-200516020-00003>
- Daeggelmann, J., Prokop, A., Loesse, V., Otten, S., Maas, V., Bloch, W., & Oschwald, V., (2021). Implementing Sustainable Physical Activity Opportunities in Pediatric Oncology - Five-Year Experience of a Group-Based Exercise Program. / Implementierung eines dauerhaften gruppenbasierten Bewegungsangebotes für krebskranke Kinder und Jugendliche - Erfahrungen aus 5 Jahren. *German Journal of Sports Medicine / Deutsche Zeitschrift Fur Sportmedizin*, 72(5), 223–229.
- Koch, E. D., Tost, H., Braun, U., Gan, G., Giurgiu, M., Reinhard, I., Zipf, A., Meyer-Lindenberg, A., Ebner-Priemer, U. W., & Reichert, M. (2020). Relationships between

incidental physical activity, exercise, and sports with subsequent mood in adolescents.

Scandinavian Journal of Medicine & Science in Sports, 30(11), 2234–2250.

<https://doi.org/10.1111/sms.13774>

Leach, H. J., Danyluk, J. M., & Culos-Reed, S. N. (2014). Design and implementation of a community-based exercise program for breast cancer patients. *Current Oncology*, 21(5), 267–271. <https://doi.org/10.3747/co.21.2079>

Maltser, S., Cristian, A., Silver, J.K., Morris, G.S., Stout, N.L. A Focused Review of Safety Considerations in Cancer Rehabilitation

Morales, J. S., González Vicent, M., Valenzuela, P. L., Castillo-García, A., Santana-Sosa, E., Lassaletta, A., . . . Lucia, A. (2020). Tailored Exercise during Hematopoietic Stem Cell Transplantation Hospitalization in Children with Cancer: A Prospective Cohort Study. *Cancers*, 12(10). <https://doi.org/10.3390/cancers12103020>

Müller, C., Krauth, K. A., Gerß, J., & Rosenbaum, D. (2016). Physical activity and health-related quality of life in pediatric cancer patients following a 4-week inpatient rehabilitation program. *Supportive Care in Cancer : Official Journal of the Multinational Association of Supportive Care in Cancer*, 24(9), 3793–3802. <https://doi.org/10.1007/s00520-016-3198-y>

Platschek, A., Kehe, L., Abeln, V., Berthold, F., Simon, T., & Strüder, H. (2017). Computer-based exercise program: Effects of a 12-week intervention on mood and fatigue in pediatric patients with cancer. *Clinical Journal of Oncology Nursing*, 21(6), 280-286. <https://doi.org/10.1188/17.cjon.e280-e286>

President's Council on Physical Fitness and Sports: Physical Fitness Research Digest. Series 1, No. 1. Washington, DC, 1971.

- Revon-Rivière, G., Saultier, P., Andrianarivony, R., Vallet, C., & André, N. (2021). A sport room within the paediatric oncology ward. *Ecancermedicalscience*, 15(1162–1202), 1–3.  
<https://doi.org/10.3332/ecancer.2021.ed108>
- Rogers, L. Q., Courneya, K. S., Anton, P. M., Verhulst, S., Vicari, S. K., Robbs, R. S., & McAuley, E. (2017). Effects of a multicomponent physical activity behavior change intervention on fatigue, anxiety, and depressive symptomatology in breast cancer survivors: randomized trial. *Psycho-Oncology*, 26(11), 1901–1906.  
<https://doi.org/10.1002/pon.4254>
- Ross, W., Le, A., Zheng, D., Mitchell, H.-R., Rotatori, J., Li, F., Fahey, J., Ness, K., & Kadan-Lottick, N. (2018). Physical activity barriers, preferences, and beliefs in childhood cancer patients. *Supportive Care in Cancer*, 26(7), 2177–2184.
- Rowland, T. (2016). Pediatric Exercise Science: A Brief Overview. *Pediatric Exercise Science*, 28(2), 167–170.
- San Juan, A. F., Wolin, K., & Lucía, A. (2010). Physical Activity and Pediatric Cancer Survivorship [Abstract]. *Physical Activity and Cancer*, 186, 319-347.  
[doi:https://doi.org/10.1007/978-3-642-04231-7\\_14](https://doi.org/10.1007/978-3-642-04231-7_14)
- Sothorn, M. S., Loftin, M., Suskind, R. M., Udall, J. N., & Blecker, U. (1999). The health benefits of physical activity in children and adolescents: implications for chronic disease prevention. *European Journal of Pediatrics*, 158(4), 271–274.
- St. Jude Children’s Research Hospital. (2018). Physical therapy in childhood cancer. Retrieved February 04, 2021, from <https://together.stjude.org/en-us/care-support/rehabilitation/physical-therapy.html>

Truelove, S., Johnson, A. M., Vanderloo, L. M., Driediger, M., Burke, S. M., Irwin, J. D.,

Timmons, B. W., Gaston, A., & Tucker, P. (2018). Preschoolers' health-related quality of life following the implementation of a childcare physical activity intervention. *Applied Physiology, Nutrition, and Metabolism*, 43(5), 453–459.

U.S. Department for Health and Human Services. (2020, October 07). How much physical activity do children need? Retrieved February 14, 2021, from <https://www.cdc.gov/physicalactivity/basics/children/index.htm>

White, J., Flohr, J., Winter, S., Vener, J., Feinauer, L., & Ransdell, L. (2005). Potential benefits of physical activity for children with acute lymphoblastic leukaemia. *Developmental Neurorehabilitation*, 8(1), 53–58.

Winter, C., Müller, C., Hoffmann, C., Boos, J., & Rosenbaum, D. (2009). Physical activity and childhood cancer. *Pediatric Blood & Cancer*, 54(4), 501-510.  
doi:<https://doi.org/10.1002/pbc.22271>

Wójcicki, T. R., & McAuley, E. (2014). ii. Physical Activity: Measurement and Behavioral Patterns in Children and Youth. *Monographs of the Society for Research in Child Development*, 79(4), 7–24. <https://doi.org/10.1111/mono.12128>

Wurz, A., Lategan, C., Hamari, L., Wilson, K., & Culos-Reed, S. N. (2019). Exercise helps kids with cancer: Exercise guidelines, research, and practice in pediatric oncology. *WellSpring*, 30(4), 1–4.

Appendix A1: Outreach Script for Professionals

Hello \_\_\_\_\_,

My name is Zoë Winters. I am an Undergraduate Exercise Science Pre-Physical Therapy Major at Bellarmine University. I am currently working on a research project exploring the perceived physical and psychological effects of a physical activity program on pediatric cancer treatment. As a member of the oncology department at \_\_\_\_\_ I was wondering if you would be willing to have a 30-45 minute interview with me regarding this topic. If you are interested please return the included consent form to me.

I look forward to hearing from you soon,

Zoë Winters

Bellarmino University Class of 2023

B.A. in Exercise Science: Health and Wellness, Pre-Physical Therapy

Peer Tutor, Student Ambassador, Hall Host, Tour Guide

Appendix A2: Outreach Script for Parents

Hello \_\_\_\_\_,

My name is Zoë Winters. I am an Undergraduate Exercise Science Pre-Physical Therapy Major at Bellarmine University. I am currently working on a research project exploring the perceived physical and psychological effects of a physical activity program on pediatric cancer treatment.

As a parent/guardian of a child at \_\_\_\_\_ I was wondering if you would be willing to have a 30-45 minute interview with me regarding this topic. If you are interested please return the included consent form to me.

I look forward to hearing from you soon,

Zoë Winters

Bellarmino University Class of 2023

B.A. in Exercise Science: Health and Wellness, Pre-Physical Therapy

Peer Tutor, Student Ambassador, Hall Host, Tour Guide

Appendix A3: Informed Consent Form

Informed Consent Form

Please read this consent document carefully before you decide to participate in this study. The researcher will answer any questions before you sign this form.

**Study Title:** A Qualitative Study of Perceived Physical and Psychological Effects of a Physical Activity Program on Pediatric Cancer Treatment.

**Purpose of the Study:** To gain a better understanding on the perceived effects of a physical activity program on the physical and psychological well being of a pediatric cancer patient.

**Procedures:** By agreeing to participate you are agreeing to have a 30-45 minute recorded interview regarding your perception of physical activity programs for treatment in pediatric cancer. These interviews will be transcribed for analysis.

**Potential Risks of Participation:** There are no more risks involved than those of everyday life.

**Potential Benefits of Participation:** There are no potential benefits to those participating in the interviews. However, the information gathered could benefit others in the future.

**Compensation:** There will be no compensation.

**Confidentially:** Your identity will be kept confidential to the extent provided by law. Any recorded information will not contain any personally identifying information. The information connecting your name to this study will not be shared and will be destroyed after the conclusion of the study. Your name nor your hospital's name will be used in any report.

**Voluntary Participation:** Your participation in this study is completely voluntary. There is no penalty for not participating. You may also refuse to answer any of the questions we ask you.

**Right to Withdraw from the Study:** You have the right to withdraw from the study at any time without consequence.

**Whom to contact if you have questions about the study:**

Dr. Beth Ennis

Email: eennis@bellarmine.edu Phone: (502) 272-8434

If you have any questions about your rights as a research subject, you may call the Institutional Review Board (IRB) office at 502-272-8032. You will be given the opportunity to discuss any questions about your rights as a research subject, in confidence, with a member of the committee. This is an independent committee composed of members of the University community and lay members of the community not connected with this institution. The IRB has reviewed this study.

**Agreement:**

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Participant: \_\_\_\_\_ Date: \_\_\_\_\_

Principal Investigator: \_\_\_\_\_ Date: \_\_\_\_\_

Appendix B1. Professional's Perceptions on the Implementation of a Physical Activity Program  
Open-Ended Questions and Script

Thank you for agreeing to talk to me today, I would like to ask you some questions regarding physical activity programs utilized in pediatric cancer treatment.

I also wanted to remind you that we are recording this conversation so that I can re-listen and take more notes later. However, participant interviews will be identified only by occupation or title, not by name or hospital.

1. Can you describe to me the typical treatment plan for your pediatric patients with leukemia while they are in the hospital?
2. Does your hospital have a physical activity program as part of your treatment plan? If so, why did your hospital implement a physical activity program as part of their protocol?
3. What does your physical activity program for your patients while undergoing treatment look like? Probe if needed with:
  - a. How much activity is involved?
  - b. How long does the program continue for?
4. What have you noticed with your patients who participate in any kind of physical activity program while in the hospital? Probe if needed with:
  - a. Have you noticed any difference in cardiorespiratory endurance?
  - b. Have you noticed any difference in mood or emotional state for patients following the initiation of a physical activity program?
  - c. What do these changes look like for your patients?
5. Are there any concerns or comments that you would like to add?

Thank you for agreeing to talk with me and for providing me with all this information.

Appendix B2: Parent's Perceptions on the Implementation of a Physical Activity Program Open-Ended Questions and Script

Thank you for agreeing to talk to me today, I would like to ask you some questions regarding physical activity programs utilized in pediatric cancer treatment.

I also wanted to remind you that we are recording this conversation so that I can re-listen and take more notes later. However, participant interviews will be identified only by occupation or title, not by name or hospital.

1. Can you describe to me the typical day for your child while they are in the hospital for treatment?
2. Have any of your child's doctors or nurses discussed the importance of physical activity for your child while they are undergoing treatment? If so, what did they share with you?
3. Did your hospital implement a physical activity program as part of the treatment protocol?
4. What does the physical activity program for your child while undergoing treatment look like? Probe if needed with:
  - a. How much activity is involved?
  - b. How long does the program continue for?
5. What have you noticed with your child while participating in this physical activity program while in the hospital? Probe if needed with:
  - a. Have you noticed any difference in energy levels?
  - b. Have you noticed any difference in the mood or emotional state of your child following the initiation of a physical activity program?

PERCEPTIONS OF A PHYSICAL ACTIVITY PROGRAM IN PEDIATRIC ONCOLOGY

- c. What do these changes look like for your child in comparison to their energy levels or mood prior to their diagnosis?
6. Are there any concerns or comments that you would like to add?

Thank you for agreeing to talk with me and for providing me with all this information.