



Physical activity for children undergoing acute cancer treatment: A qualitative study of parental perspectives

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Abstract

Background: Little is known about how to facilitate participation in physical activity among children receiving acute cancer treatment.

Objective: To understand the parental perspectives on physical activity for children during acute cancer treatment and explore strategies to overcome physical inactivity.

Methods: A qualitative study was completed. Data were collected via semistructured interviews with parents of children (aged 4-18 years) who were in their first nine months of cancer treatment. Data were analyzed thematically.

Results: Twenty parents were interviewed. A childhood cancer diagnosis and subsequent treatment were described as setting in motion a spiral of physical inactivity. Parents identified movement restrictions as a result of commencing treatment and the hospital environment as factors initiating this decline. Parents described the subsequent impact of movement restrictions on their child over time including loss of independence, isolation, and low motivation. These three consequences further contributed to an inability and unwillingness to be physically active. Parents responded in a variety of ways to their child's inactivity, and many were motivated to overcome the barriers to physical activity yet exhibited a reduced capacity to do so. Suggested intervention strategies highlighted the need for comprehensive support from the organization providing treatment.

Conclusions: Reasons for reduced physical activity in children receiving acute treatment for cancer are complex and multifactorial. Inactivity cannot be addressed by children and parents alone but requires support from the oncology team through changes to the environment, services, and policies to promote physical activity. These findings may be used to inform targeted, effective, and feasible physical activity interventions.

KEYWORDS

cancer, child, exercise, parents, pediatric, physical activity, qualitative

1 | INTRODUCTION

Children with cancer have reduced physical activity levels during treatment compared with their peers.¹⁻³ Children can also experience a range of adverse treatment effects that compromise their physical function.^{2,4-7} These adverse effects, in addition to reduced levels of

physical activity, have implications for their development and their health and well-being. If not addressed, functional deficits can worsen over time. Increasing levels of physical activity during acute cancer treatment may help to minimize or prevent adverse effects for children in the short term and long term.⁸

There is growing evidence to support the feasibility and effectiveness of physical activity interventions in the acute treatment setting.⁹⁻¹¹ Despite this, high dropout rates and poor compliance are commonly reported as limiting factors.^{10,12-15} To implement effective

Abbreviations: ANUM, associate nurse unit manager; NS, Nora Shields; SG, Sarah Grimshaw; y/o, year old.

physical activity interventions, we need a deeper understanding of how to engage children in physical activity in the acute cancer treatment setting. Previous studies have investigated barriers and motivators to physical activity from the child's perspective.^{16,17} In these studies, children discussed the influence parents have on their physical activity participation, highlighting the importance of understanding parents' perspectives.¹⁸

Parents could be key players in promoting increased activity levels in children with cancer. Qualitative studies in childhood cardiac and obesity populations have found parental values and attitudes to physical activity predict a child's physical activity behavior.^{19,20} In the cancer setting, mothers of children with cancer have a strong protective role and are integral in ensuring adherence to medical treatment to maximize their child's well-being.²¹ It is unclear what beliefs, values, and knowledge parents of children with cancer have of physical activity and how this may dictate their child's behavior during and beyond treatment. There is also a lack of understanding about how parents respond to their child's inactivity, and the barriers and motivators toward physical activity from their perspective. Qualitative methods preface the description and understanding of people's experiences, emotions, and behaviors and is an effective means of addressing this current gap.²² Understanding the parental experience, and the roles they play, could help to identify educational needs and new motivators toward physical activity for children with cancer. Consistent with implementation research methods, this qualitative inquiry is an important step toward designing feasible physical activity interventions in the cancer treatment setting.²³

Our primary aim was to understand parental perspectives on physical activity for children during acute cancer treatment. The secondary aim was to explore parental perceptions of what strategies may be helpful in encouraging children to be more physically active.

2 | METHODS

2.1 | Design

This qualitative study was designed from a constructivist perspective, which aims to build new understanding of the constructions participants (and researchers) have in regard to the research questions. This framework acknowledges participant opinions and experiences are varied and complex, and that multiple "knowledges" exist. Data were analyzed inductively, with meaning generated from data collected.²⁴

2.2 | Population

Ethics approval was obtained prior to study commencement. Participants were recruited from a large tertiary pediatric hospital in Melbourne, Australia, between 1 August 2017 and 31 January 2018. Written informed consent was obtained from all participants. A purposive sampling strategy was used.²² Eligibility criteria are presented in Table 1. Sampling aimed to maximize diversity across child characteristics including age, diagnosis, functional ability, time since diagnosis, treatment modality, time spent as an in-patient, and

place of residence. Parents were not contacted within the first month of diagnosis as this is a time of high stress for families. Participation was limited to parents of children diagnosed with cancer within the previous nine months, to capture the experiences of those receiving acute treatment. Hospital staff, independent to the research team and trained regarding the details of the study, helped identify eligible parents and approached potential participants.

2.3 | Data collection

Semistructured interviews were conducted using an interview guide with open-ended questions and prompts (Supporting Information File S1). The lead investigator (SG) completed all interviews. Physical activity was defined as "any bodily movement produced by skeletal muscles that requires energy expenditure."²⁵ Interview prompts were altered during the study in response to emergent themes. Interview timing was sensitive to existing hospital appointments and parents were interviewed face-to-face, by telephone or videoconference. The length of the interview was not time limited to allow for sufficient engagement with participants and thorough discussion of themes. Interviews were recorded with consent and transcribed verbatim.

2.4 | Data analysis

Thematic analysis was conducted inductively, as described by Braun²⁶ and Boyatzis.²⁷ The first phase of data analysis was familiarization. Once transcribed, interview transcripts were read through in their entirety to identify emerging patterns. The second phase involved systematic data coding, with codes being data-driven. Computer software (NVivo, Melbourne) was used to assist in data coding. The third phase was thematic development, where coded data were collated into themes. Relationships between themes were considered. The fourth phase involved reviewing, refining, and naming themes. Analysis was ongoing throughout the study; recruitment ceased once saturation was achieved.

Data were coded independently by two researchers (SG and NS). Triangulation of data coding between researchers was undertaken not only to gain deeper insights but also to compare and contrast the subjective views of the researchers.²⁸ In line with a constructivist, inductive perspective, it was expected that researchers would formulate their own interpretations of the data.²⁹ Resultant themes were compared and contrasted, and any inconsistencies or deviant cases were discussed and reported. Disagreement between the researchers was settled by consensus.³⁰ Participants were invited to participate in member checking. Participants were sent a document containing a summary of the resultant major themes and given the opportunity to respond with additional comments if they felt that their views were not adequately reflected. Field notes were kept for reflexive analysis purposes.

2.5 | Rigor

As a physiotherapist working on the cancer ward at a tertiary hospital, the potential for the lead investigator's prior experience

TABLE 1 Eligibility criteria

Inclusion	Exclusion
<ul style="list-style-type: none"> ● Parent or primary carer of a child: <ul style="list-style-type: none"> - Aged 4-18 years - Diagnosed with cancer or premalignant condition requiring HCT in previous nine months - Diagnosed with relapsed disease within previous nine months - Receiving cancer treatment at RCH ● Able to undertake interview in English 	<ul style="list-style-type: none"> ● Not child's primary carer ● Mother, father, or primary carer of a child: <ul style="list-style-type: none"> - Aged > 18 years or < 4 years - Diagnosed with cancer or premalignant condition requiring HCT > 9 months ago - Did not receive cancer treatment at RCH ● Required an interpreter for interview

HCT, hematopoietic cell transplantation; RCH, Royal Children's Hospital.

and preconceived opinions to influence the results of this study is acknowledged.^{24,31} Effort was made to minimize bias through techniques to ensure rigor. Credibility was strengthened through using purposive sampling, member checking, peer examination, reflexive analysis, data triangulation, and transparent presentation of findings.^{22,32,33} Transferability was addressed through clear reporting of the participants, methods, and research processes.³³ To ensure dependability, transparent descriptions of aims, data gathering, analysis, and interpretation were provided.²² An audit trail increased confirmability, assuring readers the resultant findings and interpretations were derived from data and not from opinions and biases of the investigators.²²

3 | RESULTS

Parents of 30 children were approached to participate. Five parents declined, four were lost to follow-up, and in one case the child turned 19 years prior to finalizing recruitment, leaving 20 participants who participated in the study (see Table 2). Interview length was between 16 and 52 minutes (median, 37 minutes). All parents of a child with a diagnosis of a central nervous system tumor approached declined to participate. Recruitment stopped once data were deemed saturated, determined via the use of a coding workbook and data saturation table once no further themes or codes were identified.^{34,35} A further two interviews were carried out beyond this point to confirm saturation. One parent replied as part of the member-checking process, the additional information did not provide any further insights.

The parents' experiences described: (1) factors that contribute to a child's physical inactivity during acute cancer treatment, (2) their responses to physical inactivity, and (3) their perspectives on overcoming physical inactivity.

3.1 | Factors that contribute to physical inactivity

Based on the emergent themes, a model was developed that describes a "spiral of physical inactivity" initiated from when a child is first diagnosed with cancer (Figure 1). Factors that contribute to this spiral

TABLE 2 Characteristics of participants and children

Characteristics	N (%)	Mean ± SD
Parent information		
Relationship to child		
Mother	16 (80)	
Father	4 (20)	
Place of residence ^a		
Local	12 (60)	
Rural	8 (40)	
Child information		
Age (years)		10.1 ± 4.6
Gender		
Female	9 (45)	
Male	11 (55)	
Diagnosis		
Leukemia	11 (55)	
Lymphoma	5 (25)	
MDS	1 (5)	
Osteosarcoma	3 (15)	
Time since diagnosis ^b		
1-3 m	4 (20)	
4-6 m	10 (50)	
7-9 m	6 (30)	
Relapsed disease	1 (5)	
Undergoing HCT	3 (15)	

HCT, hematopoietic cell transplantation; m, months; MDS, Myelodysplastic syndrome.

^aRural defined as living > 100 km from hospital.

^b1-3 m, 4-6 m, or 7-9 m months after diagnosis.

are represented by the outer and inner circles of the model. The outer circle represents movement restrictions imposed on children as a result of commencing cancer treatment and the hospital environment. The inner circle represents the impact of this restricted movement on a child over time in terms of loss of independence, isolation, and low motivation. An acute medical complication and long-term hospital admission were described as accelerating this spiral.

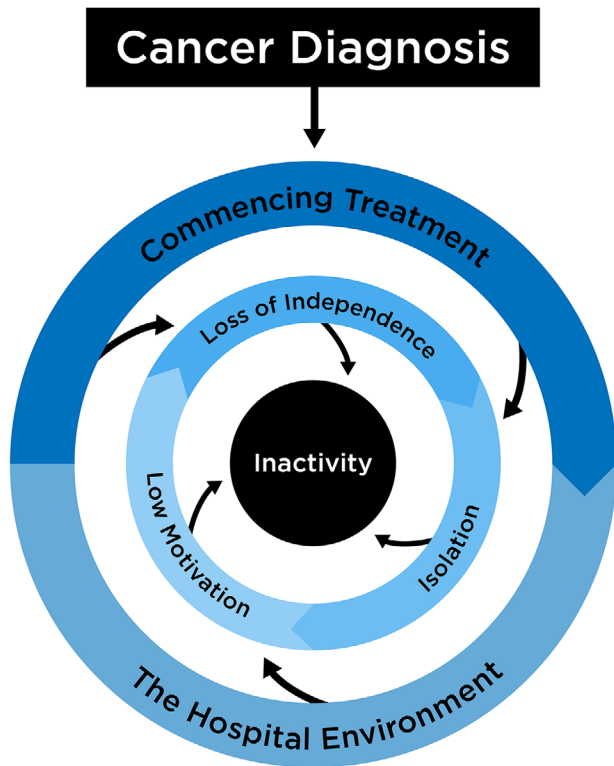


FIGURE 1 A spiral of physical inactivity

"...he's lost muscle mass and lost his fitness, lost the weight, everything...he gets really tired, his fitness, his energy level, his food intake, it's all changed." (Participant 14, father of 9 y/o male with leukemia)

"...we get nervous about the line... it's got to be controllable, you can't just go and play like a child." (Participant 26, mother of 5 (y/o) male with leukemia)

3.1.1 | Movement restrictions

Movement restrictions associated with commencing treatment and the hospital environment were thought to instigate a sudden and rapid decline in a child's ability to be physically active.

Commencing cancer treatment

Parents described the impact of commencing treatment as devastating for their child. Treatment-related adverse effects such as muscle wasting, weight loss, fatigue, nausea, and pain were seen to impede their child's ability to move and participate. Parents described externally imposed restrictions to their child's movement, such as the presence of intravenous lines. Commencing treatment was described as a major disruption to family life, often necessitating relocation from home, a high number of medical appointments, frequent and prolonged hospital admissions. Parents reported these precluded children from participating in physical activities normally part of their daily routine.

"When she's on the ward, no, zero activity, what do you do apart from... walk your drip to the hub. They do nothing, they can't, and there's nothing really they can do." (Participant 12, father of 10 y/o female with leukemia)

"Something to work towards... some of them lose the will to live, in terms of not having anything to work towards in here." (Participant 26, mother of 5 y/o male with leukemia)

"Oncologists are so focused on the medical side that they tend to not always talk about the physical side..." (Participant 6, mother of 6 y/o female with leukemia)

"The physio would pop in every now and then and see how it was going and you know write out a list of exercises for him and, as much as I tried, he didn't do those very often..." (Participant 3, mother of 15 y/o male with osteosarcoma)

The hospital environment

According to parents, receiving treatment in a hospital environment (both the in-patient and outpatient settings) further reduced their child's ability to move. Parents considered the hospital inadequately resourced to promote physical activity, in terms of access to activities of daily living, equipment; enticing, age-appropriate facilities, open spaces; and availability of specialized staff. Residing in small spaces and restricted access to outdoor fresh air were of particular concern, especially while admitted to the ward.

Parents perceived the priority of the oncology team was medical management, rather than a holistic approach encompassing their child's physical condition. Parents expressed disappointment that physical activity was not a core part of their child's treatment. They described receiving "generic" and "inconsistent" advice and that specialized services (such as physiotherapy) was reactive, inadequate, or unsuccessful in encouraging physical activity.

Rules and policies enforced over the course of treatment by the oncology team to promote safety were also perceived as restricting movement. Parents said they understood the reasons for these rules but were frustrated by the inflexible, inconsistent way they were applied by staff. Examples included having to avoid crowded places and reside close to the hospital and prolonged in-patient stays. Restrictive rules specific to the ward environment included having to remain on the ward while connected to an intravenous pole, isolation due to infection risk, and not being allowed to disconnect from their line.

3.1.2 | Consequences of restricted movement for children over time

The combination of restricted movement, and the protracted nature of cancer treatment, was perceived as contributing to a progressive decline in their child's physical and mental well-being, resulting in lost independence, isolation, and low motivation. Parents described these

"Every time she goes outside, the benefit she's gets from going outside far outweighs the fighting for it, but you will have to fight. You will have to go to the doctors, and then you will have to fight with the ANUM (Associate nurse unit manager) who will then go 'no, our policy is that you cannot go outside.'" (Participant 1, mother of 8 y/o female with leukemia)

"We can't take her to outside activities, so we are stuck in the city where it is built up...it is also limiting to what you can do and where you can go and what activities she can do." (Participant 12, father of 10 y/o female with leukemia)

"He really identified himself as a skateboarder and now he feels like he's got nothing." (Participant 3, father of 15 y/o male with osteosarcoma)

"And mentally he also just kind of refused...he was just so angry, ... when he's in hospital, even though the best thing for him is to walk, no, he won't." (Participant 21, mother of 9 y/o male with lymphoma)

"...he says he hates what he sees in the mirror and he just won't let anyone, apart from family see him." (Participant 30, mother of 17 y/o male with lymphoma)

"There was no way we would, she couldn't get out. And that played a lot of her psyche as well, she felt very, like a prisoner I guess in her own home. And she didn't want to go out either." (Participant 7, mother of 15 y/o female with leukemia)

"It mentally torments her. And takes away her want to do anything, so she is not wanting to do anything, and she doesn't want to walk anywhere or go anywhere. She just wants not to move." (Participant 1, mother of 8 y/o female with leukemia)

"...his whole world is sport and being outside and that's not his role anymore. So, it's turned into more of a sedentary life with a screen in front of him." (Participant 21, mother of 9 y/o male with lymphoma)

negative consequences as interacting with each other to perpetuate inactivity over time.

Loss of independence

Parents described their children feeling a loss of control over their environment and bodies, including their ability to move, daily routines, and the freedom to pursue interests. Parents used language such as "loss of dignity," "loss of identity," "fear," and "anger" to describe their child's responses to this lack of control and autonomy and talked about how their children grieved these changes. Some children were described as actively refusing physical activity to regain control.

Isolation

Parents described how their child experienced social and physical isolation due to long-term restricted access to open spaces and social environments over the course of acute treatment. In addition, reclusive behavior was described, especially in adolescents. In the parents' opinion, reclusive behavior developed due to lost confidence, unstimulating environments, and mental health decline. Embarrassment and fear associated with lost ability and changes to physical appearance meant many children and adolescents limited their interactions with the external environment and their peers.

Low motivation

Parents talked about the increasing difficulty they experienced in engaging their child in physical activity and their child's growing preference for sedentary activities. Children were perceived to experience a lack of joy with physical activity due to declining ability and reduced access to activities and sporting pursuits that inspired movement,

"...we have to try and get him to take meds, we have to get him to bath, we have to get him to eat, ...and all of those take a lot of energy from us to try and self-motivate him and enthusiastically get him to participate without him getting upset." (Participant 26, mother of 5 y/o male with leukemia)

"...so I don't know how we could make it better because the further you go along and the more treatment you have, the more you can't do." (Participant 29, mother of 12 y/o male with leukemia)

fun, and interest. Some children, particularly those who identified strongly as being athletic, chose not to take part in physical activity, because they could no longer participate in the sports they love to their previous level of ability.

3.2 | Parental response to physical inactivity

Parents responded in different ways to their child's decreasing physical activity. Many parents said they tried to take the initiative to promote physical activity and advocated strongly with staff to facilitate it. This was driven by their experience and knowledge about the benefits of physical activity. Despite this, parents felt their ability to effectively promote physical activity was limited. These parents felt activity promotion was solely their responsibility and that they lacked knowledge of how to safely and effectively encourage it in the cancer setting. This was especially true in cases where implementing physical activity was challenging. Parents expressed a sense of hopelessness in their ability to overcome inactivity and how, inevitably, they lost motivation over time due to competing demands and responsibilities.

"...you're in so much shock and the child is so young and they're so distressed and there's just so much mental stuff going on that I don't think we thought about it unless, you know, the doctors or someone would say something about physical activity." (Participant 6, mother of 6 y/o female with leukemia)

"I think we all make the mistake of just hanging out waiting for the time that he's better and he can do it all again. I think we're oblivious to the fact of how long it's going to take..." (Participant 21, mother of 9 y/o male with lymphoma)

"I didn't want him to move from the bed at the beginning... I didn't want him down because I'd seen him kind of dying and I was like just keep him there until he gets better." (Participant 8, mother of 4 y/o male with leukemia)

"Just keep asking to see the physio because I think it's really important that kids actually get that, get that expert help and then that will help them to feel more in control, instead of having all that control taken off them." (Participant 4, mother of 16 y/o female with osteosarcoma)

Other parents did not think to encourage physical activity, despite having positive values toward it. Parents reported feeling so stressed and overwhelmed by the cancer diagnosis that it impeded their ability to attend to anything other than the survival of their child. They also described underestimating the cumulative impact of treatment overtime.

Some parents believed the benefits of physical activity did not translate to the cancer treatment setting. In these cases, parents did not encourage activity or actively discouraged through fear of increasing fatigue, infection risk, or weight loss (see Figure 1).

3.3 | Parental perspectives on overcoming physical inactivity

Parental perspectives were that many of the barriers to physical activity were out of their control and that they, and their child, needed additional support. Suggested interventions targeted their child's unique experience and focused on maximizing independence, overcoming isolation and inspiring motivation toward physical activity. There were parents who called for changes to policy and culture within the treatment environment, changes that considered physical activity a vital part of their child's health. More responsive, proactive, and consistent therapy services and symptom management was proposed as part of this recommendation.

"If he could've gone downstairs and been allowed to go to the Parkville café and have his breakfast he would've been down there like a shot." (Participant 10, mother of 17 y/o male with osteosarcoma)

"Whereas if you had a game console that you move around, and you do like your wii fit and that sort of thing, or something, or even just little challenges for them. Can you do this many steps, or collect, we've been doing it as collect this amount of ponies for the day." (Participant 1, mother of 8 y/o female with leukemia)

"If someone comes up with the suggestions, actually suggested to parents, you know, on the spot yoga routine or anything like, any ideas...some parents might not be aware that that is important. ...that it is an option." (Participant 17, mother of 4 y/o male with leukemia)

Other parents focused on improvements to the ward environment that included freely accessible toys, activities, technology and equipment that promoted fun and active play; better access to large and socially interactive spaces; a greater focus on participation in incidental activities as part of daily living and routine; and policy changes that allowed their child to routinely get off the ward and outside for fresh air. Facilitated line-free time was seen as key to achieving this. Hospital policies and programs that supported children to spend more time at home, away from the hospital environment, was another recommendation.

Parents saw themselves as an underutilized resource. They sought more detailed and repeated education about the importance of physical activity and how to promote it. They also recommended the provision of regular supervised sessions that promoted physical activity with their child and better access to peer support.

4 | DISCUSSION

This study adds novel insight into how to design more effective physical activity interventions for children undergoing acute cancer treatment. Parents described a spiral of physical inactivity that follows a diagnosis of childhood cancer, highlighting the interplay between a child's ability to keep physically active, adverse treatment effects, hospital environments, and compromised physical and mental health. Parents suggested strategies to increase participation in physical activity, emphasizing a need for additional services, support, and engagement at an organizational level. Based on these findings, physical activity interventions need to target multiple levels of change across the physical environment, the family, and the child, thereby indicating the need for theory-informed complex intervention design.³⁶ The social-ecological model assumes the necessity of multiple levels of influence in order to bring about behavior change, including

intrapersonal, interpersonal, and organizational factors, and can be used a framework to apply these results.³⁷

Interventions at an intrapersonal level address characteristics of the individual, including their knowledge, attitudes, skills, and intentions, in the context of behavior change.³⁸ In order to better engage a child or adolescent with cancer in physical activity, behavior change literature leads us to consider the relevance of theories such as the transtheoretical model, self-determination theory, and theory of planned behavior.³⁹ These models emphasize the importance of people's beliefs, motivation, and self-efficacy in bringing about positive changes. Drawing from these theories, physical activity interventions could involve education, barrier identification, goal setting, self-monitoring techniques, focus on fun and enjoyment, and ongoing support and encouragement.⁴⁰ This approach considers the child's unique barriers to physical activity and acknowledges the importance of psychological factors in mediating participation in physical activity.^{39,41} Examples can be found across both healthy and chronic disease populations,⁴²⁻⁴⁴ such as the use of activity monitors for motivation and self-monitoring in breast cancer populations.⁴⁵

Interpersonal interventions focus on targeting social support systems that surround the individual,³⁸ and in this setting could focus on the family and peer groups. Parents within this study described feeling overwhelmed in trying to keep up with the many demands placed on them, a common experience in the cancer treatment setting.⁴⁶ Assessing parental knowledge, motivation, and perceived barriers to physical activity, for example through survey questions derived from the theory of planned behavior,⁴⁷ could inform the provision of targeted education and supportive care, and enable parents to be more effective advocates of physical activity. Models of care that emphasize the parental role in physical activity promotion could provide guidance in achieving this. In populations of children with cystic fibrosis, interventions provide consistent messaging regarding the disease-specific benefits of physical activity, and individualized education around how to safely facilitate it.⁴⁴ In line with recommendations made within this study, a potential role for supervised and individualized physical activity sessions is evident. In contrast to interventions driven by therapeutic intent, sessions that focus on fun, child-led physical activity within the family routine, could help to build parent and child confidence and motivation. Sessions may also work toward minimizing the disengagement with sport and activity commonly seen in this population.⁴⁸

Organizational factors are addressed via interventions targeting health settings, in this case the hospital or cancer treatment center.³⁸ Organizational culture, priorities, and values have a strong influence on physical activity opportunities in other settings.^{38,49} Despite the strong focus on medical management and safety that exist in cancer treatment settings, this focus does not necessarily have to be at the expense of physical activity. Aligning the treating institution's values toward physical activity could inform the development of policy and clinical practice guidelines that emphasize its importance and ensure its safety. A review of policies and practices pertaining to room isolation to align with available literature^{50,51} is an example of a hospital initiative that could facilitate greater participation in physical activity. The development of treatment in the home programs may also be

valuable as a means to reducing time spent in the hospital environment. Changes in workplace culture require motivation, leadership, strategy, resources, and time^{52,53} and necessitate a collective shift in beliefs, values, behaviors, and routines of treating staff.⁵⁴ Many of the changes proposed in this study rely upon funding for professional services and equipment, in addition to a change in mindset in the provision of care. Parents in this study called for a shift in perspective to ensure a holistic approach to their child's care. Positive changes emphasizing the importance of physical activity are seen in the adult cancer treatment setting. Rehabilitation using the stepped model of care in adult treatment settings is one example of a changing mindset toward prevention and maximizing well-being.⁵⁵

Early literature on physical activity interventions for children during acute cancer treatment focused on exercise prescription strategies that address physical impairments.^{9,56} More recently, promising examples of complex intervention design have emerged in the acute pediatric cancer setting, but more work needs to be done to ensure the strategies used are theoretically informed, feasible, and address factors beyond the child and family unit.^{18,43,57} Based on our results, barriers to physical activity are specific to the individual and can include factors that extend beyond the child. Children and parents also show a limited capacity to overcome these barriers without considerable support and guidance. Moving forward, it is important that physical activity interventions broaden their focus to address environmental and organizational barriers and employ techniques that acknowledge the individual experience of inactivity for each child over the entire course of acute treatment.

The strength of this study lies in the focus on the parental experience, specifically during acute cancer treatment, providing new perspectives. The theoretical framework of this study is transparent, consistent with the aims and informed the method used. Attaining saturation of data was another factor that strengthened the validity of results. There were potential limitations. The interviewer was a physiotherapist who worked on the cancer ward; this could have potentially biased results due to preexisting perceptions and opinions regarding the phenomenon under study. Strategies such as member checking and reflexive reporting were imperative to ensure researcher permeability. Efforts were made to recruit parents of children across a wide range of diagnosis groups, yet there were patient populations that remained unrepresented, such as children with brain tumor or other solid tumors, so we are uncertain if the emerged themes can be generalized to these groups. Diversity was achieved in other important participant characteristics, and a decision was made regarding data saturation due to the absence of additional themes in the latter stages of recruitment. Future research could explore organizational differences across multiple centers, the experiences of staff within the cancer treatment setting, and potential cultural influences. Engagement across the final aspects of the social-ecological model, those pertaining to the community and governing policy makers, could be another area of focus.

Improving participation in physical activity and reducing the sedentary nature of the hospital environment hold many potential benefits for children with cancer. This study builds on our understanding of the impact of inactivity and the challenges associated with keeping

children physically active during acute treatment. Inactivity cannot be addressed by children and parents alone but requires a coordinated and multifaceted approach. The oncology team need to support children to be physically active through their environment and their policies and support must be consistent and ongoing. Results from this study may be used to inform the development of future physical activity interventions that are targeted, effective, and feasible.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy and ethical restrictions.

CONFLICTS OF INTEREST

There are no conflicts of interest to declare in the production of this paper.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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