How power tilt is used in daily life to manage sitting pressure: Perspectives of adults who use power tilt and therapists who prescribe this technology

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Health and Rehabilitation Sciences
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HOW POWER TILT IS USED IN DAILY LIFE TO MANAGE SITTING PRESSURE: PERSPECTIVES OF ADULTS WHO USE POWER TILT AND THERAPISTS WHO PRESCRIBE THIS TECHNOLOGY

(Thesis format: Monograph)

by

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Graduate Program in Health and Rehabilitation Science
(Occupational Science)

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Abstract

Recent research studies have identified that use of large amplitudes of power tilt as a pressure management strategy used by adults who use wheelchairs and are at risk of developing pressure ulcers, was low. While the reason for low use was not identified, a lack of fit between using large amplitudes of tilt and daily life function was speculated as a main reason across studies. Using a post-positivist grounded theory approach, this study explored how power tilt was used in daily life particularly for managing sitting pressures, from the perspectives of five people experienced with using power tilt and six therapists who prescribe power tilt. Data were collected from two in-depth semi-structured interviews and a journal that tracked the context of tilt occurrences throughout each of three days. Theoretical saturation was reached at five and six participants respectively. Data were analyzed in separate groups and then combined using a constant comparative approach. The analysis resulted in the generation of a substantive theory from which the process of using power tilt in the context of daily life can be understood. The abstract, cognitive nature of the process specific to using power tilt for pressure management differed from the tacit and tangible nature of the process for all other daily life uses of power tilt. Contextual elements were identified which affected the use of large amplitudes of tilt such as fear of tipping over, social image and lack of functionality. The critical influence of knowledge related to using tilt for pressure management is highlighted including potential implications for clinical practice. The theory scheme offers a preliminary avenue for examining the transactive relationships of person, environment, technology and occupation that comprise daily life, influencing how power tilt is used. The substantive theory and its associated concepts contribute to the wheelchair technology field, addressing the identified knowledge gap specific to advancing the understanding of how power tilts, and potentially other wheelchair technologies, are integrated in daily life occupations. The substantive theory is preliminary, requiring further research however; potential is demonstrated to also inform the understanding of the person-environment-occupation relationship in the discipline of occupational science.

Key words: Power tilt wheelchair, grounded theory, occupational science, occupational therapy, pressure management
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Chapter 1

1 INTRODUCTION TO THE STUDY

This doctoral dissertation is the culmination of an inductive research study exploring how power tilt was used in daily life, particularly for the purpose of managing pressures at the sitting surface, from the perspectives of people who use power tilt and therapists who prescribe this assistive technology. This manuscript is written in monograph format with each phase of the study reflected as a separate chapter.

The starting point of any research study is identifying the topic area of interest (DePoy & Gitlin, 2005; Polatajko, 2004; Steward, 2006). To identify this research topic and locate it in context, brief overviews of the relationships between mobility and health, power tilt and mobility as well as power tilt and pressure ulcer management are presented in the first section of this introductory chapter. The researcher’s interest in this topic area is clinically based, having worked with many clients for whom pressure ulcers have limited their ability to be mobile and negatively influenced their health. Power tilt provides the means for changing body position thereby facilitating the pressure ulcer management strategy of weight shifting and reducing the impact of this significant complication of limited physical movement.

To frame this study in the topic area, the research question is presented in its final format. The methodology chapter describes how the research question was developed based on the chosen methodological approach.

While this research topic has been studied using the qualitative methodology of post-positivist grounded theory, it needs to be acknowledged that this work is situated in the discipline of occupational science. As an occupational therapist working in the area of wheelchairs and seating for many years, as well as a new researcher, my approach is from an occupational science perspective. This perspective shapes my perceptions and thoughts related to how and why people engage in different daily life occupations. I do not view this as a bias as that would suggest that I am singularly minded, or perhaps prejudiced (http://www.merriam-webster.com/dictionary/bias). Acknowledging this
perspective recognizes that it is part of this study, expanding on the possible contributions of different perspectives towards understanding human behaviours, in particular for this study, that of how power tilt is used in daily life. Therefore, occupational science has guided the interpretation of the literature in Chapter 2, and informed the study methods and analyses presented in Chapters 4 and 5 respectively. While not specific to power tilt use, the occupational science perspective provided insight into the construct of daily life in this research problem. The purpose of presenting this perspective at this point in the dissertation is for transparency as well as to provide the reader with a foundational understanding to carry through the remaining paper.

This chapter concludes with a plan for the remaining chapters. The contents of each chapter will be briefly described to provide an outline as well as to orient the reader to the organization of the full paper.

1.1 Relating Power Tilt to Mobility and to Pressure Ulcer Management

The ability to participate in daily life activities as well as the ability to be mobile have been identified as positive contributors to health (Auger et al., 2008; Chaves et al., 2004; Cook & Miller Polgar, 2008; Garber, Bunzel & Monga, 2002; Mollenkopf et al., 1997; Pentland, Harvey & Walker, 1998; Sonenblum, Sprigle, Harris & Maurer, 2008; World Health Organization, 2001). Participants in several studies identified the loss of independence in the ability to be mobile as the most profound loss experienced, which resulted in the greatest restriction to participation following a traumatic health change such as stroke or spinal cord injury (Barker, Reid & Cott, 2004; Di Marco, Russell & Masters, 2003).

Mobility has been defined as both moving place to place and changing body positions (World Health Organization, 2001). When limitations in mobility occur due to physical disability, people’s ability to participate in most aspects of daily life is critically affected (Chaves et al., 2004). Mobility assistive technologies augment or provide an alternate means to move, thereby minimizing mobility limitations and enabling continued participation in daily life activities (Cook & Miller Polgar, 2008). As the most frequently
used mobility assistive technology, a wheelchair offers the potential to reduce the negative influence of compromised mobility (Carlson & Myklebust, 2002; Chaves et al., 2004; Di Marco et al., 2003; Fogelberg, Aitkins, Imperatore Blanche, Carlson & Clark, 2009; Samuelsson & Wressle, 2007). For those people whose ability to change body positions is also challenged, the addition of positioning technology to the wheelchair base further enables their mobility and continued participation. Power tilt, as one such positioning technology, offers the ability to independently change body positions to address daily life issues such as discomfort or pain, the effects of fatigue, or sudden changes in blood pressure, all of which influence the ability to function while in the wheelchair (Dicianno et al., 2009).

For people who use wheelchairs, mobility can be restricted or altered by the occurrence of a pressure ulcer especially on the sitting surface, which then affects their health and ability to participate in activities. A pressure ulcer is generally defined as any lesion caused by unrelieved pressure, which results in damage to underlying tissue (Consortium for Spinal Cord Medicine Clinical Practice Guidelines [PVA], 2000; Registered Nurses’ Association of Ontario [RNAO], 2007). The European and National Pressure Ulcer Advisory Panel is an international panel of experts who have developed an internationally recognized definition of a pressure ulcer.

A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these is yet to be elucidated (National Pressure Ulcer Advisory Panel [NPUAP], 2009a, 2009b)

Pressure ulcers are a significant and costly health disruption. For example Allen and Houghton (2004) found that the cost to treat a pressure ulcer in the community was approximately $9,000 per month in a 12 week treatment program. Pressure ulcers also result in increased frequency and duration of hospital stays as well as increased morbidity and mortality rates (Bolton et al., 2008; Duncan, 2007). In a study of people with spinal cord injury, Krause, Carter, Pickelsimer and Wilson (2009) estimated “...that for every
additional ulcer that required surgery, the risk for mortality increased by 10%...” (p. 1488). In a study of pressure ulcer prevalence, Woodbury and Houghton (2004) estimated that one in four people in the Canadian healthcare system had a pressure ulcer. Pressure ulcers influence every aspect of a person’s life including personal care routines, changes in use of time and activity choices as well as affecting family and social systems (Bolton et al., 2008; Duncan, 2007; Rappl, 2004; Woodbury & Houghton, 2004).

Pressure on the sitting surface is the most prevalent cause of pressure ulcer development, particularly for people who require wheelchairs for mobility (Bolton et al., 2008; Drummond, Breed & Narenchania, 1985). In sitting, pressure ulcers typically occur over bony prominences of the ischial tuberosities and coccyx, as pressure is higher in these locations (Duncan, 2007; PVA, 2000; RNAO, 2007). The benefits of changing body position to shift body weight to redistribute buttock pressure and increase blood reperfusion at the sitting surface are demonstrated in the literature and are supported in clinical best practice guideline recommendations (Georgia Institute of Technology, 2010; NPUAP, 2009; PVA; RNAO, 2005 and 2007; Sonenblum, Sprigle & Maurer, 2009; Sprigle, Maurer & Sonenblum 2010).

People who are physically unable to independently shift their own body weight can affect sitting pressure through the use of dynamic positioning technology such as a tilt-in-space seating system (Dicianno et al., 2009; Georgia Institute of Technology, 2010; Sprigle et al., 2010). In using the dynamic tilt technology, the tilt system’s seat to back angle is maintained, thereby maintaining the person’s hip angle, while the system rotates on an anterior-posterior plane from an upright position where the seat is parallel to the floor (0 degrees of tilt) through a full range of amplitudes to a fully tilted position where the seat moves towards being perpendicular to the floor but never reaches perpendicular. As the system tilts, the person’s weight is shifted from the sitting surface to the back surface thereby redistributing pressure from high risk bony prominences of the buttocks to the back surface (Ding et al., 2008; Georgia Institute of Technology, 2010; Lacoste, Weiss-Lambrous, Allard & Dansereau, 2003; NPUAP, 2009; PVA, 2000; RNAO, 2005 and 2007; Sonenblum et al., 2009; Sprigle, et al., 2010). These systems are termed dynamic as the angle of tilt is changeable. A static tilted position is obtained by configuring the
wheelchair frame in a fixed degree of tilt. Dynamic tilt systems are available as manual or electrically-powered options, typically with the respective manual or power wheelchairs but not exclusively. Throughout the remaining paper, the term tilt or power tilt refers to power dynamic tilt-in-space.

The benefit of using large amplitudes of tilt to affect the risk of pressure ulcer development on the sitting surface is demonstrated clinically through tools such as pressure mapping and is supported in the research literature (Giesbrecht, Ethans & Staley, 2011; Sprigle & Sonenblum, 2011). Prescribing power tilt wheelchairs for the purpose of pressure management is a common clinical practice among therapists as is suggested by the plethora of related educational opportunities. However, common clinical issues voiced at clinical and conference venues are related to inconsistencies between recommended and actual use of power tilt by clients for managing their sitting pressures. Furthermore, the relationship between prescribing power tilt and the occurrence or re-occurrence of pressure ulcers was identified as being not well understood. Clients also report frustration regarding the poor fit between using large amplitudes of tilt and daily life activities. Given the personal and financial costs of pressure ulcers and the cost of power tilt technology in addition to the wheelchair costs, a further examination of how power tilt is used in daily life, particularly for the purpose of managing pressures at the sitting surface, was warranted.

1.2 The Research Question

The above noted clinical concerns related to power tilt use, particularly large amplitude tilt for managing sitting pressures, indicated the need for greater depth in understanding how power tilt was used in daily life beyond the measurements of frequency, amplitude and duration already used in previous power tilt studies. This need led to the choice of an inductive approach to this study (Carpenter & Suto, 2008; Polatajko, 2004; Strauss & Corbin, 1990). Corbin and Strauss (2008) recommend the question be broad enough to allow exploration but keep the focus on the primary problem. Confirmed by the constructs from the wheelchair use literature as described in Chapter 2, the decision was made for the primary focus of this study to be on the perspectives of adults who use power tilt and therapists who prescribe power tilt. The goal in choosing this focus was to
gain insight and understanding into how power tilt was used in the context of daily life, particularly for the purpose of managing sitting pressure, including the problems that arose, responses to those problems and how those responses inhibited or changed the use of power tilt during the course of daily life. As a result the following research question and research objectives were developed:

Research question: From the perspectives of adults who use power tilt and therapists who prescribe power tilt, how is power tilt used within the context of daily life particularly for managing sitting pressures?

Research objectives:

1. From the perspectives of people who use power tilt and therapists who prescribe tilt:
   1. Understand how and why power tilt for pressure management is or is not used within the daily lives of adults who use power tilt wheelchairs particularly for managing sitting pressures.
   2. Gain insight into how context of daily life influences how power tilt is used particularly for managing sitting pressure.

2. To determine if the knowledge gained from this study can inform clinical practice, adults who use power tilt as well as research related to power tilt use and pressure management.

1.3 An Occupational Science Perspective

The primary interest in this study was how power tilt is used in the context of daily life. To this end, an occupational science perspective was integrated to provide insight into the central construct of daily life. The critical importance of the relationship between what and how people are involved in their daily lives and health and well-being has been acknowledged in the health care field (Auger et al., 2008; Chaves et al., 2004; Garber et al., 2002; Mollenkopf et al., 1997; Pentland et al., 1998; Sonenblum et al., 2008). One of the most recognized demonstrations of this relationship is the World Health Organization’s development of the International Classification of Functioning, Disability
and Health (ICF) (2001). The ICF structures the classification of health and health related states into two parts; Functioning and Disability as Part 1 and, Contextual Factors as Part 2. Within Part 1, Activities and Participation are identified as one of the two primary components that are influenced by a health condition; the other is Body Functions and Structures (World Health Organization, 2001). The ICF espouses that what and how people are involved in their daily life affects their health and well-being. This relationship is also a foundational relationship in occupational science. The ability to participate in occupation that has value and meaning to the individual has a direct and positive influence on health and well-being (Miller Polgar & Landry, 2004; Polatajko et al., 2007a; Wilcock, 2006).

The approach in occupational science is person-centred, considering the relationships between all aspects of the person and her environment within the context of her own daily life occupations, with the meaning and value the person attributes to engaging in those occupations being central (Christiansen & Townsend, 2004; Polatjko et al., 2007a; Wilcock, 2006). This person-centred focus is one of the primary criticisms of the ICF in that there is lack of specificity in the articulation of the person component of the model particularly related to activities and participation (Whiteneck & Dijkers, 2009). While there are limitations in the ICF, it does position the need to examine the constructs of daily life as paramount. For these reasons this researcher chose to use an occupational science perspective to examine the construct of daily life within this study.

The occupational therapy literature offers several models of occupational performance and/or engagement that describe the dynamic interaction between the attributes of each of the constructs of person, environment and occupation. More importantly, the models embed these constructs within complex, interactional relationship frameworks to describe and understand how and why people engage in their occupations within daily life and across their life span (Kielhofner, 2002; Law et al., 1996; Polatajko, Townsend & Craik, 2007). While the relationships between these constructs are conceptualized using various formats, the constructs of occupational performance/engagement remain central, providing insight into understanding the construct of daily life for this study. The constructs of occupation, meaning in occupational engagement, choice and control,
knowledge and context are the focus of the remaining section so as to provide a foundational knowledge for how this study was influenced. As these constructs are dynamically related, they will be presented under the headings of Occupation and Meaning, Context, and Choice and Control. The occupational science perspective, specifically these constructs and relationships, is referenced and expanded upon throughout this document to foster an understanding of the construct of daily life within this study.

1.3.1 Occupation and Meaning

Occupations are activities, or sets of activities, that are completed with a sense of purpose, meaning and/or reason; they provide structure to and are shaped by the environmental context in which they occur (Christiansen & Townsend, 2004; Creek & Hughes, 2008; Polatajko et al., 2007a). In turn, “Daily life consists of engaging in tasks to perform activities required by occupations.” (Harvey & Pentland, 2004, p 64) An occupation is not the same as an activity or a task (Christiansen & Townsend, 2004). Tasks are a set of actions or movements (Polatajko et al., 2007a) and activity is a set of tasks performed for a particular outcome (World Health Organization, 2001; Polatajko et al., 2007a). Occupations are comprised of tasks and activities however it is only at the level of occupation that personal meaning is attributed, thereby providing a feeling of value, meaning or worth to the person engaging in the occupation (Christiansen & Townsend, 2004; Harvey & Pentland, 2004; Polatajko et al., 2007a). The relationship between task-activity-occupation is fluid as these concepts are intricately linked; Law et al. (1996) described them as nested. Focusing only on what a person is doing underestimates the complexities of human behaviour and occupational choice; identifying the meaning and purpose for choices may assist in better understanding behaviours (Singlehurst, Corr, Griffiths & Beaulieu, 2007).

Consider the example of making tea. The activity of making tea is comprised of separate tasks such as filling the kettle with water, heating the water, pouring the heated water into the teapot, waiting for the tea to steep, and pouring the steeped tea into the cup. When the tasks are combined, the outcome of making tea is achieved, defined as the activity. However, at the task and activity levels the reason or purpose for making the tea is not
explained or considered; only at the occupation level does meaning become evident. Consider the different meanings attributed to making tea as part of a morning routine compared to making tea to warm up after a cold outing, or tea made for friends or family who have come to visit. Meaning attributed to an occupation emphasizes the active involvement or engagement in the occupation, more than just doing a task. Engaging in meaningful occupations also contributes to the meaning or purpose in the person’s life, shaping the composition of a person’s daily life (Christiansen & Townsend, 2004; Polatajko et al., 2007a). The composition of daily life occupations is determined by the interaction between meaning attributed to occupations and the contribution of those occupations to the meaning or purpose in the person’s life (Christiansen & Townsend, 2004; Harvey & Pentland, 2004; Wilcock, 2006). As this dissertation is located within the discipline of occupational science, the fluidity of meaning in the task-activity-occupation relationship will be referred to in the remaining manuscript using the term occupation.

1.3.2 Choice and Control

Choice and control are essential to meaningful occupational engagement as they shape the meaning attributed to the engagement in occupations (Harvey & Pentland, 2004). If control or choices are not present, decreased self-esteem, self-efficacy, sense of independence and motivation to participate result (Clark et al., 2006; Kurz, Saint-Louis, Burke & Steinman, 2008; Larsson Lund, Norlund, Nygard & Bernspang, 2005; Miller Polgar & Landry, 2004). Occupational choice and control reinforce the importance of a person-centred approach to understanding how people engage in their daily lives (Polatajko et al., 2007b).

The ability to make and influence decisions about occupational engagement, regardless of the level of physical ability available to participate, is related to perceptions of self-determination and higher satisfaction with quality of life (Kurz et al., 2008; Larsson Lund et al., 2005). When choice and control are present, a sense of self, as well as self-determination and accomplishment are also present (Kurz et al., 2008; Larsson Lund et al., 2005; Miller Polgar & Landry, 2004). Kurz and colleagues (2008) highlight several studies in which higher satisfaction, improved outcomes and lower levels of depression
were found if a person-centred consultation style for clinical assessment and intervention was used, with opportunities for collaboration of goal-setting and decision-making. Guidetti, Asaba and Tham (2007) found that study participants who experienced a recent stroke or spinal cord injury expressed the importance of choice in their action as a means to reclaim control over their bodies as part of their rehabilitation. Ville and Winance (2008) found, in a study of work trajectories with people who sustained spinal cord injuries three or more years previously, that the ability to work or physically complete an occupation was less important than being able to make occupational decisions and to follow through on those decisions. These studies reinforce the important contribution that choice and control make to the attribution of meaning in occupational engagement.

A key component of choice and control in occupational engagement is knowledge about changes and choices (Clark et al., 2006; Guidetti et al., 2007; Larsson Lund et al., 2005; Wilcock, 2006). Knowledge is important to understanding the implications for choices; understanding implications of choice then supports self-determination or control. Clinically, this relationship between knowledge and understanding implications of choice is often referred to as informed decision-making. Knowledge is central to the use of mobility technology as it allows a person to make meaningful choices regarding occupations by understanding the impact of attributes of each of the constructs of person, wheelchair technology and environment on those occupational choices.

Considerations of choice, control and meaningful engagement assist the person who uses mobility assistive technology to identify what successful use of that technology is from his/her own perspective (Cardol et al., 2002). Larsson Lund et al. (2005) found that the ability to make and influence decisions about activities of daily living, whether or not the person was physically able to participate, was important to perceptions of self-determination. The personal meaning attributed to engaging in an occupation can be so intense that it overrides typical barriers to engagement, such as physical pain or environmental barriers, allowing continued engagement in that meaningful occupation (Jedeloo, De Witt & Schrivijers, 2002; Samuelsson, Tropp & Gerdle, 2004). To understand how mobility assistive technology is used in daily life, insight is needed into the influence that the interplay of the elements of meaning, choice, need for control and
context has on the decision to engage or maintain engagement in occupations (Miller Polgar & Landry, 2004; Singlehurst et al., 2007).

1.3.3  **Context**

The meaning attributed to an occupation is also influenced and shaped by the context in which it is engaged, often resulting in variations in meaning for the same occupation across contexts and time (Harvey & Pentland, 2004). Returning to the occupation of making tea as an example, if tea made for family and friends was within a culturally-based context where the server is being judged on the quality of his performance, the meaning attributed to this occupation would be very different than if the context was an informal gathering of friends. It is the same activity, prepared using the same combined tasks but the meaning attributed to the occupation of making tea is different due to the influence of context. Contextual elements can be described as intrinsic or extrinsic. Intrinsic elements tend to be more personal attributes such as personality, skills, abilities, attitudes, motivation, values and health status (Harvey & Pentland, 2004; Whalley Hammell, 2004). Extrinsic elements tend to be environmental including physical, social, cultural and socioeconomic environments and resources that influence the meaning attributed to the occupation (Harvey & Pentland, 2004).

For people who use a wheelchair, including those with power positioning technology, the meaning attributed to engaging in an occupation is also influenced by the context of the wheelchair itself. This contextual influence is particularly influential for people where the wheelchair is their primary means for mobility as large portions of their day are spent in their wheelchairs (Hoenig, Landerman, Shipp & George, 2003; Fogelberg et al., 2009; Samuelsson et al., 2004; Sonenblum et al., 2008; Yang, Chang, Hsu & Chang, 2009). The ICF identifies mobility assistive technology as an environmental context (World Health Organization, 2001). A typical environmental contextual influence is the physical environment, especially the barriers it presents to wheelchair use for engaging in occupations (Samuelsson et al., 2004; Barker et al., 2004). The social environmental context, such as social stigma, also influences engagement in daily life occupations (Hoenig et al., 2003).
Other researchers suggest that the wheelchair is a personal context because the technology is so embedded within daily life that it is an extension of the person not the environment (Barker et al., 2004; Fogelberg et al., 2009; Laliberte Rudman, Hebert & Reid, 2006). As wheelchair is nearly always present in the person’s life, it requires significant, almost constant, consideration as part of their engagement in occupations (Barker et al., 2004; Cook & Miller Polgar, 2008; Fogelberg et al., 2009; Laliberte Rudman et al., 2006). Regardless of categorical location, it is the interaction of the wheelchair with other relevant contextual elements that affects the attribution of meaning for the occupation and the actual occupational engagement at that point in time.

1.3.4 Individual approach

The relationships between the elements of meaning, choice, control and context are dynamic, fluctuating, changing and adapting as challenges and changes occur within context and across time. These dynamic, interactive relationships result in endless variations in performing or engaging in an occupation, but ultimately contribute to the decision of whether or not to engage in the occupation (Harvey & Pentland, 2004). The person-centred approach of an occupational science perspective espouses the individuality of engagement in daily life occupations through the focus on the interactive relationships of meaning, choice and control on occupational engagement within the context of daily life. As a central construct, the person-centred approach of occupational science allows the focus of inquiry to remain on the person and how she chooses to engage in occupations (Polatajko et al., 2007a) rather than the focus shifting to the mobility technology when examining how a person uses it. By focusing on the person and her occupations, an understanding of how the relationships between the contextual factors of person, environment, occupation and mobility assistive technology are connected can be gained. The connection is identified through understanding from the person’s perspective, the meaning attributed to those occupations and why they were chosen, thereby advancing the understanding of why and how an individual uses their mobility assistive technology to enable engagement in daily life occupations.

The occupational science constructs and elements described above are integrated throughout this study, in some respects by virtue of the researcher being an occupational
therapist, and in others by purposeful design. The importance of a person-centred approach as a central value for the researcher informed the development of the research question and study methods. The elements of occupational engagement, particularly the influence of context, contributed to the understanding of the construct of daily life throughout this study. The relationships between attribution of meaning, choice and control, specifically informed the analyses related to understanding the fit of power tilt into daily life as discussed in Chapter 6.

1.4 Plan of Presentation

It is important for the reader to be aware that the plan of presentation for this dissertation does not parallel the actual research study path; it has been organized for ease of readability and clarity of study process, content and quality. As with most qualitative research there was often overlap between phases of the study. Where the actual research path varied from that being presented, it has been noted so as to remain transparent and ensure the reader is aware of how the elements of the study quality criteria were met.

The following research study explored the process of how power tilt was used in daily life particularly for the purpose of managing sitting pressures from the perspectives of people who use power tilt and therapists who prescribe this technology. The exploration of this phenomenon was situated at the intersection of several areas of interest that framed this study which were described in Chapter One. Chapter Two provides the background to this study specific to the use of power tilt. A scoping review of the power tilt literature related to how tilt is used in daily life is presented. In the discussion section of this review, parallels are drawn between the power tilt literature and the wheelchair use literature to highlight the potential for knowledge from the latter to inform the former.

Chapter Three begins the presentation of the study proper. Determining the philosophical and theoretical positions for this inductive study was critical as they guided the study methods. The rationale for choosing a qualitative approach to this research problem is described as is the rationale for choosing post positivist grounded theory methodology. The theoretical implications of this methodological approach for the study methods, as well as descriptions of the quality criteria implemented, conclude this chapter.
Chapter Four describes how the methods for this research study were designed and implemented including study trustworthiness through application of the quality criteria. Where applicable, the theoretical constructs from Chapter Three are highlighted to demonstrate how they informed the study methods.

Chapter Five is devoted to the results of the study, which explored how power tilt was used in daily life. As the study progressed it became clear that use of power tilt for pressure management was embedded within the totality of using power tilt in daily life. Participants from both groups could not describe power tilt use for managing sitting pressures without describing the full spectrum of how power tilt was used in daily life. Knowledge was constructed and a substantive theory generated to describe the process of how power tilt was used in daily life was generated as part of these results.

In Chapter Six, the substantive theory provides the foundation for discussing the results specific to using power tilt in daily life for pressure management. Knowledge created from this study related to how power tilt was used in daily life as well as for the purpose of managing sitting pressures is discussed. Congruencies with occupational science and transactionalism are discussed to substantiate the knowledge created in this study as well as add depth to the constructs and theory.

This document concludes with Chapter Seven in which the key findings and implications of the study are summarized. The chapter concludes with the contributions of this study to the advancement of knowledge and understanding in the field of wheelchair and seating technology as well as occupational science.
Chapter 2

2 BACKGROUND TO THE STUDY

Understanding how power tilt is used in daily life to manage sitting pressures is multifaceted. Power tilt is an assistive technology that is typically added to a power wheelchair base although it can be added to a manual wheelchair frame. Sitting in the tilt system, the person’s seat to back angle (hip angle) is maintained while the system rotates on an anterior-posterior plane from an upright position where the seat is parallel to the floor (0 to 5 degrees of tilt) through a range of degrees of tilt to a fully tilted position. The maximum amount of tilt in a fully tilted position can vary depending on the parameters set by the manufacturer (Dicianno, Betz, Arva, Lieberman, Schmeler et al., 2009; Michael, Porter & Poutney, 2007).

The introductory chapter situated the use of tilt as a pressure management strategy to address the health issue of pressure ulcer prevention and treatment. The benefits of shifting weight to redistribute pressure are supported by clinical best practice guidelines (NPUAP, 2009; PVA, 2000; RNAO, 2005 and 2007). Evidence from quantitative research studies reported in the literature suggests that using large amplitudes of power tilt is required to redistribute pressure at the sitting surface for those people who are unable to shift their weight manually (Giesbrecht et al., 2011; Sonenblum & Sprigle, 2011; Sprigle et al., 2010). However, in clinical practice issues have been identified with the use of large amplitudes of tilt in relation to its fit within the context of daily life.

To further explore this topic area, a scoping literature review of power tilt use in daily life was completed. The findings from this scoping review suggest that while a greater understanding of power tilt use has been gained, the understanding remains incomplete. To augment the discussion in this review, insights from the wheelchair use literature were included. Since power tilt is an assistive technology used in combination with a wheelchair, using the wheelchair use literature to round out the discussion was relevant particularly for situating this topic area in the context of daily life.
2.1 Scoping Review of the Power Tilt Literature Specific to Its Daily Use

As the purpose of this literature review was to gain a broad perspective of the content of the literature and not a critical examination of the literature, a scoping approach was chosen for this literature review (Arksey & O’Malley, 2005). The quality and rigour of a scoping review are ensured through transparency of process at each stage of the review; (a) identifying the research question, (b) identifying relevant studies, (c) study selection, (d) charting the data, and (e) collating, summarizing and reporting the results (Arksey & O’Malley, 2005).

2.1.1 Methods

The question posed to guide this scoping review was similar to the study research question; how is power tilt used in daily life particularly for the purpose of pressure management. The process of this scoping review is summarized in Figure 1. The literature search was conducted for English articles in the time period 2000-2013 to give breadth to the number of articles but also allow the literature to be current. To reflect the research question the search terms power, wheelchair, and tilt with variations such as tilt in space and dynamic tilt were chosen. To reduce the risk of too narrow a search, the term daily life was not included at this point.

The results of the database search using the above terms included; Summon 356 articles, CINAHL 22 articles, Scopus 20 articles, and Pub Med 17 articles. These results were culled first by title and then abstract, as well as eliminating duplicate citations across database searches. The review criteria applied throughout the culling process included that the article contained content specific to (a) power tilt, (b) the use of power tilt in daily life, and (c) adults of any age.
Forty four articles were identified for retrieval for full review. From these 44 articles, one was removed as only the abstract was in English and seven could not be obtained due to inaccessible conference proceedings or trade magazines. The remaining 36 articles were reviewed using the review criteria. From this review a total of 25 articles were removed: seven these pertained primarily to determining the parameters of power tilt use for managing sitting pressures but not how power tilt was used in daily life; twelve articles were overviews of/or pertained to issues related to all mobility assistive technology but did not contain content specific to using power tilt technology in daily life; two articles were duplicate studies and; three were opinion or rebuttal papers related to an eligible article. The resultant eleven articles were included in this scoping literature review.

Phase four of the scoping review process was completed on an electronic spreadsheet. Arksey and O’Malley (2005) described charting the data as a technique for synthesizing and interpreting the contents of the selected articles by reviewing and sorting the data according to key issues and themes. The data were categorized into the primary headings
of: (a) description of tilt, (b) issues raised, (c) identified purposes for using tilt, (d) study analysis and discussion, and (e) study conclusion.

In the last phase of this scoping review, the categorized data were further analyzed for similarities, differences, and themes related to using power tilt in daily life. The result of this analysis is presented in the next section.

2.1.2 Results

The descriptions of the final 11 articles in the review are summarized in Table 1. For those articles that were study based, further description pertaining to the study is provided in Table 2. All articles included power wheelchairs with power tilt technology but not exclusively. Most articles included the broader perspective of positioning technology, primarily tilt and recline, with a few articles including power elevating leg rests or seat elevation. Data extracted from the articles pertained only to the use of tilt where possible. Where data for power tilt could not be extracted separately, or where comparisons were completed, the details of the composition of positioning technology are included for clarity. The same approach was used for articles where manual and power tilt use were combined.

Prior to presenting the themes of this review, an overall conceptualization of the parameters of tilt use, as described by the authors, is presented. The purpose of this conceptualization is to frame the technical aspects of the tilt systems used in these studies.

The analysis of the categorized data for themes resulted in two primary themes. The first theme was the described purposes for using tilt. This theme provides some insight into the daily life issues that arise for which tilt is used. The second theme, use of power tilt in daily life, is presented using the sub-themes of wheelchair occupancy, frequency of tilt use in daily life, amplitude with frequency of tilt use in daily life and tilt use for activity and participation.
<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Location study conducted</th>
<th>Type of article</th>
<th>Purpose of article/study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dewey et al. (2004)</td>
<td>UK</td>
<td>Phenomenology study</td>
<td>To explore the everyday experiences of using tilt compared to non-tilt wheelchairs by people with MS</td>
</tr>
<tr>
<td>Dicianno et al. (2009)</td>
<td>USA</td>
<td>Position paper</td>
<td>To describe typical clinical application and provide evidence supporting application of tilt, recline, and elevating leg rests.</td>
</tr>
<tr>
<td>Ding et al. (2008)</td>
<td>USA</td>
<td>Descriptive analysis study</td>
<td>To examine how power positioning technology was used during typical activities of daily living.</td>
</tr>
<tr>
<td>Harris et al. (2010)</td>
<td>USA</td>
<td>Pre-post study</td>
<td>To examine influence of tilt for new users using a system designed to examine participation and activity among people who use power mobility technology</td>
</tr>
<tr>
<td>Lacoste et al. (2003)</td>
<td>Canada</td>
<td>Descriptive analysis study</td>
<td>To characterize the use of powered tilt and recline systems</td>
</tr>
<tr>
<td>Liu et al. (2010)</td>
<td>USA</td>
<td>Cross sectional study</td>
<td>To obtain user preference feedback for a virtual reminder for seat function use during daily life</td>
</tr>
<tr>
<td>Michael et al. (2007)</td>
<td>UK</td>
<td>Systematic review</td>
<td>To determine the effects of tilt in space seating on physiology and on activity.</td>
</tr>
<tr>
<td>Sonenblum and Sprigle (2011)</td>
<td>USA</td>
<td>Descriptive analysis study</td>
<td>To characterize the use of power tilt systems.</td>
</tr>
<tr>
<td>Sonenblum et al. (2009)</td>
<td>USA</td>
<td>Descriptive analysis study</td>
<td>To monitor and describe use of power tilt in daily life.</td>
</tr>
<tr>
<td>Souza et al. (2012)</td>
<td>USA</td>
<td>Systematic review</td>
<td>To systematically review the published literature concerning mobility assistive technology use among persons with MS.</td>
</tr>
</tbody>
</table>
### Table 2. Additional description of study-based articles included in the scoping review.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Technology studied (number using technology)</th>
<th>Diagnoses (number of participants)</th>
<th>Data collection time frame</th>
<th>Tools used to collect data</th>
<th>Data collected specific to power tilt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dewey et al. (2004)</td>
<td>Power tilt (5)</td>
<td>Multiple Sclerosis with severe spasticity (23)</td>
<td>Single time point per participant over 9 months</td>
<td>Semi-structured interviews</td>
<td>Themes of wheelchair use and transportation issues</td>
</tr>
<tr>
<td></td>
<td>Manual tilt (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manual wheelchair only (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power wheelchair only (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ding et al. (2008)</td>
<td>Power tilt only (2)</td>
<td>SCI (4), CP (3), MS (3), MD (1)</td>
<td>2 weeks</td>
<td>Data logger; interface pressure mapping; questionnaire</td>
<td>Wheelchair occupancy; amplitude of tilt use; frequency of transfers out of wheelchair; frequency of repositioning using tilt</td>
</tr>
<tr>
<td></td>
<td>Power tilt and recline (9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harris et al. (2010)</td>
<td>Power tilt only (5)</td>
<td>Diagnosis not provided</td>
<td>14 days</td>
<td>Participation and Activity Measurement System (PAMS); Prompt Recall Interview (PRI); Global Positioning System</td>
<td>Wheelchair occupancy; amplitude of tilt use; frequency of repositioning; wheeled distance; destinations travelled; contextual data related to usage (from PRI and GPS)</td>
</tr>
<tr>
<td>Lacoste et al., (2003)</td>
<td>Power tilt (26), Power recline (10), Power tilt and recline (4)</td>
<td>MS (17), neuromuscular disease (11), SCI (6), other (6)</td>
<td>Single time point</td>
<td>Questionnaire (reliability and validity not established)</td>
<td>Amplitude of tilt use; satisfaction with tilt use</td>
</tr>
</tbody>
</table>
Table 2 (continued). *Additional description of study-based articles included in the scoping review.*

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Technology studied (number using technology)</th>
<th>Diagnoses (number of participants)</th>
<th>Data collection time frame</th>
<th>Tools used to collect data</th>
<th>Data collected specific to power tilt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liu et al. (2010)</td>
<td>Power wheelchair with combinations of tilt, recline, seat elevate and elevating leg rests (9)</td>
<td>No diagnosis provided; study also included 6 clinicians</td>
<td>Single time point</td>
<td>Demonstration of virtual coach followed by exploration and interview</td>
<td>Position and usage patterns: tilt angle of back rest, seat recline, leg rest elevation, monitor wheelchair occupancy</td>
</tr>
<tr>
<td>Sonenblum and Sprigle (2011)</td>
<td>Power tilt only (45)</td>
<td>SCI (30), MS (4), CP (4), other (7)</td>
<td>1-2 weeks</td>
<td>Data logger</td>
<td>Wheelchair occupancy; amplitude of tilt use; frequency of repositioning</td>
</tr>
<tr>
<td>Sonenblum et al. (2009)</td>
<td>Power tilt only (16)</td>
<td>SCI (10), other (6)</td>
<td>1-2 weeks</td>
<td>Data logger</td>
<td>Wheelchair occupancy; amplitude of tilt use; frequency of repositioning</td>
</tr>
</tbody>
</table>

2.1.2.1 *Descriptors of tilt.*

Tilt was defined in the articles by indicating that the seat to back angle remained fixed or constant (Dicianno et al., 2009; Liu et al., 2010; Sonenblum & Sprigle, 2011; Sonenblum et al., 2009) or that an L shape was maintained during the tilt movement around an axis in a backward plane (Dewey, Rice-Oxley & Dean, 2004). This description applies to both manual and power tilt technology. No article described the electronic technology used to control the tilt function in a power wheelchair, however all participants were described as independent in operating both the power wheelchair functions as well as the power tilt functions.

All articles described the amplitude of tilt using degrees of tilt, with zero or near zero being an upright position in which the seat frame was parallel to the floor. Most articles
described the range of available tilt in each participant’s system from zero to maximum amplitude of tilt where the seat approached perpendicular to the floor. The maximum tilt available was not consistent across tilt systems used by participants. This inconsistency is due to differences in the tilt system product across manufacturers of this technology. Sonenblum and Sprigle (2011) identified that 29 of their 38 participants had an available tilt range greater than forty-five degrees. Ding et al. (2008) identified that two of their eleven participants had tilt range of zero to twenty degrees and nine had ranges of zero to forty degrees or more. Lacoste et al. (2003) identified that all participants in their study had power tilt systems with maximum tilt amplitudes greater than forty five degrees. The systematic review completed by Michael, Porter & Poutney (2007) found a variety of tilt ranges used across studies, from thirty degrees of anterior tilt up to forty-five degrees of posterior tilt. The range available in a tilt system can significantly influence the use of power tilt for managing sitting pressures.

2.1.2.2 Described purposes for using power tilt.

Purposes for using power tilt were not described separately from other positioning technology except where the article pertained solely to power tilt or noted differences. However, the described purposes of using positioning technology provide some insight into the types of issues or situations where tilt could be used during the day. Purposes for using the technology were described by the authors in the majority of articles reviewed, while only a few articles described purposes from the perspective of people who use the technology. The descriptions provided by the article authors are presented first in a summary list. The purposes described by participants from study based articles follow in Table 3.

The primary purposes for using power tilt as described by the authors in the background sections of the articles included: (a) comfort/discomfort/pain (Dewey et al., 2004; Dicianno et al., 2009; Ding et al., 2008; Harris, Sprigle, Sonenblum & Maurer, 2010; Lacoste et al 2003; Michael et al., 2007; Sonenblum & Sprigle, 2011; Souza et al., 2010); (b) pressure and/or weight shifting to redistribute pressure (Dewey et al., 2004; Dicianno et al., 2009; Ding et al. 2008; Sonenblum & Sprigle, 2011; Sonenblum et al., 2009; Souza et al. 2010); (c) manage spasms (Dewey et al., 2004); (d) increase sitting tolerance
(Dewey et al., 2004; Dicianno et al., 2009; Michael et al., 2007; Sonenblum & Sprigle 2011; Souza et al., 2010); (e) address fatigue (Dewey et al., 2004; Dicianno et al., 2009); (f) maintain postural alignment (Dicianno et al., 2009; Lacoste et al., 2003; Sonenblum & Sprigle, 2011); (g) function and participation (Dicianno et al., 2009; Ding et al., 2008; Harris et al., 2010; Lacoste et al., 2003; Sonenblum & Sprigle, 2011; Souza et al., 2010); (h) address physiological issues such as sudden changes in blood pressure (Dicianno et al., 2009; Lacoste et al., 2003); (i) affect transfers including reducing the number needed (Dicianno et al., 2009; Michael et al., 2007) and; (j) resting (Ding et al., 2008; Lacoste et al., 2003; Michael et al., 2007; Souza et al., 2010). These purposes represent a wide variety of potential reasons for using power tilt over the course of a day.

As part of their studies, Dewey et al. (2004), Ding et al. (2008), Lacoste et al. (2003), and Sonenblum and Sprigle (2011) used participant recall to collect data from their participants specific to their described purposes for using their power positioning technology. However, the manner in which these data were reported varied across studies. Therefore, the described purposes for using tilt are summarized in Table 3 as reported percentages of participants who identified that purpose, or using the descriptive term provided in the article. For those studies where the purposes were identified specific to tilt, this is indicated in Table 3 by the word tilt following the reported percentage.

In comparing the purposes of using positioning technology, differences were noted between the purposes listed by authors in the background sections of their articles, and the purposes identified by participants in the studies (Table 3). The only similarity was that both groups identified comfort/discomfort/pain as the primary reason to use positioning technology. In the author identified purposes for use, pressure management, increase sitting tolerance and function were also frequently identified whereas the participant reported resting/relaxation, function and posture as more frequent reasons to change position using the position technology. In regards to managing or addressing pressure on the buttocks, participants’ indications of use varied across studies from a primary reason for use, to minimal mention of this purpose. In the study by Dewey et al. (2004) only one of twenty three participants expressed knowledge related to the need to
change position to manage sitting pressures; the majority of these participants identifying that pressure management was achieved through the use of a cushion.

Table 3. *Frequency of participant descriptions of purposes for using power positioning technology as reported by study authors.*

<table>
<thead>
<tr>
<th>Purpose for using power positioning technology described by participants</th>
<th>Author (year) n</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort/discomfort/pain</td>
<td>77%</td>
<td>100%</td>
</tr>
<tr>
<td>Pressure relief/reduce pressure</td>
<td>73%</td>
<td>70%</td>
</tr>
<tr>
<td>Rest/relaxation</td>
<td>30%</td>
<td>Over 70%</td>
</tr>
<tr>
<td>Function</td>
<td>60%</td>
<td>37.5-57.5%</td>
</tr>
<tr>
<td>Posture</td>
<td>48%</td>
<td>60-65%</td>
</tr>
<tr>
<td>Breathing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevent sliding</td>
<td></td>
<td>Minority (reported only for power tilt)</td>
</tr>
<tr>
<td>Conserve energy or improve sitting tolerance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce need to return to bed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Study examined only power tilt*

The study by Lacoste et al. (2003) requested participants prioritize their top five reasons to use power positioning technology. These authors reported that the top five reasons
were very similar for both the tilt and the recline groups. The prioritized purposes included; (a) to increase comfort (more than 90 percent), (b) to rest (approaching 90 percent), (c) to decrease discomfort (approaching 90 percent), (d) to reduce pain (approximately 70 percent), and (e) relaxation (approximately 70 percent). It is interesting to note that three of the five prioritized reasons are related: comfort, discomfort, pain. Rest and relaxation could also be considered as similar. No reasons were prioritized that related to managing sitting pressures or to function.

2.1.2.3 Use of power tilt in daily life.

In the eleven articles reviewed, the conceptualization of using power tilt in daily life was limited. As indicated above, all articles reported the purposes of using this technology as descriptions of use in daily life. The only other conceptualization of using power tilt in daily life was from the articles that were research based studies (Table 2). In these studies, the construct of daily life was conceptualized using quantitative measures of tilt use, gathered while the participants carried out their typical daily life activities, in their typical environments.

The studies examined daily use of the technology primarily using the parameters of frequency, duration and amplitude of use. Ding et al. (2008), Lacoste et al. (2003) and Liu et al. (2010) examined different types of power positioning technology whereas Harris et al. (2010), Sonenblum and Sprigle (2011) and Sonenblum et al. (2009) examined only power tilt technology. Participants in all studies were identified as being independent in using their power positioning technology and used it full time. While much of the data presented are technical and quantitative, they do provide an overview of how power positioning technology was used by participants as they performed their daily life activities. Issues related to using this technology for pressure management were also identified in the studies. A compilation of findings from these studies is presented based on the themes; (a) wheelchair occupancy, (b) frequency of tilt use in daily life, (c) amplitude and frequency of tilt use in daily life, and (d) tilt use and activity and participation.
2.1.2.3.1 *Wheelchair occupancy.*

Wheelchair occupancy was measured in the studies by Ding et al. (2008), Harris et al. (2010), and Sonenblum et al. (2009). Wheelchair occupancy was defined as the number of hours spent in the wheelchair per day. Results were presented as averages with ranges of time in hours. The average wheelchair occupancy was similar across these three studies as demonstrated in Table 4. Only the study by Ding and colleagues (2008) identified an average number of transfers in and out of the wheelchair per day which was 5.0 +/- 5.3 times per day. Ding et al. also identified that 10.6 +/- 3.6 hours was the longest single time spent in the wheelchair. Sonenblum et al. (2009) identified that six of the sixteen study participants spent over twelve hours per day in their wheelchair.

Table 4. *Comparison of reported occupancy times in wheelchair.*

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Average hours per day in wheelchair</th>
<th>Range of hours per day in wheelchair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ding et al. (2008)</td>
<td>11.8</td>
<td>8.4 to 15.2</td>
</tr>
<tr>
<td>Harris et al. (2010)</td>
<td>12.48</td>
<td>10.2 to 15.7</td>
</tr>
<tr>
<td>Sonenblum et al. (2009)</td>
<td>11</td>
<td>5.0 to 16.6</td>
</tr>
</tbody>
</table>

These wheelchair occupancy data suggest that people who use power tilt and other power positioning technology, have it at their disposal for large periods of time in their day.

2.1.2.3.2 *Frequency of power tilt use in daily life.*

Measuring frequency of use of power positioning technology was an indication of how often the technology was used through the day. For all studies, frequency of tilt used was primarily measured based on occurrences of tilt per day averaged over the data collection time period. Frequency of tilt use was measured using a mechanical or electronic data logger attached to the wheelchair and positioning technology. Data loggers were used to track usage over time by four of the five studies that measured frequency. The same instrumentation was used in three of the studies including Harris et al. (2010), who added
a global positioning system to the data logger to gain additional information of destination location. This additional information was used in the Prompted Recall Interview to gather contextual data about participation and activities with wheelchair and tilt use, the results of which are presented later in this chapter.

Due to variation in how the frequency data were reported, a summary figure could not be used. These data are presented in the following paragraphs, with comparisons made between studies where possible. Specific to tilt use, Ding et al. (2008) found that on average participants used their tilt 19 (+/-14) times per day and spent 64.1 (+/-36.8) percent of their time in some degree of tilt. Harris et al. (2010) found that all study participants used tilt during the day with an average of 0.7 to 8.2 tilts per hour. Sonenblum and Sprigle (2011) reported participants used tilt an average of 3.0 (+/-2.9; range of 0.1-16.6) times per hour. Sonenblum et al. (2009) reported an average of 4.3 (3.9) tilts per hour with a median frequency of 3.1 tilts per hour. To illustrate the variability in frequency of use, Sonenblum et al. included the following data; (a) seven of sixteen participants tilted at least four times per hour, (b) two participants tilted less than once per hour, and (c) the frequency of tilt use tended to be skewed to the lower range.

While the above reported frequency of use was based on data logger collection, Ding and colleagues (2008) also compared frequency data gathered from participants’ survey with data from the data logger. They found a statistically significant correlation (ICC=0.63. p=0.004) between actual frequency of use and frequency recalled use by study participants.

2.1.2.3.3 Amplitude and frequency of power tilt use in daily life.

Amplitude refers to the degrees of tilt used which, when combined with frequency, can add depth to the description of tilt use. It is important to note that based on cited research in each of these studies, all researchers concurred that at least a large degree of tilt once per hour was considered to be the minimum amount of tilt required to promote pressure management (Ding et al., 2008; Harris et al., 2010; Lacoste et al., 2003; Sonenblum & Sprigle, 2011; Sonenblum et al., 2009).
Studies that collected amplitude data did so using data loggers. The exception to this method was Lacoste et al. (2003), who asked participants identify amplitude used in conjunction with each purpose of using tilt they identified. From these data, Lacoste et al. reported that 34% of participants identified that they used a small range of tilt (0-15 degrees), 42% used a medium range (16-30 degrees) and fewer than 24% of participants using a large range of tilt (31-45 degrees). Of that small number of participants who used a large range of tilt, very few identified that they used it for pressure management. No specific values were reported by Lacoste et al. for this last finding.

The studies that used data loggers to capture frequency and amplitude, reported results using the same amplitude ranges as in the Lacoste et al. (2003) study, with the exception of Ding et al. (2008). Ding et al. calculated frequency and duration of tilt use at ten degree increments (1-10, 10-20, 20-30, 30-40 and greater than 40 degrees) as summarized for ease of reading in Table 5. The frequency and duration steadily decreased as the amplitude increased with the exception of tilt use greater than 40 degrees. An explanation of this last variation was not offered by Ding et al. These results suggest that power tilt use to promote pressure management is low as large and extreme tilt was used less than twice per day.

Table 5. Summary of frequency and duration of tilt amplitude from Ding et al. (2008) study.

<table>
<thead>
<tr>
<th>Amplitude angle range of tilt measured in degrees</th>
<th>Frequency average number per day (standard deviation)</th>
<th>Duration average number of minutes per day (standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10 degrees</td>
<td>6.6 (+/-4.9)</td>
<td>272.7 (+/-228.7)</td>
</tr>
<tr>
<td>10-20 degrees</td>
<td>7.3 (+/-6.6)</td>
<td>157.3 (+/-171.8)</td>
</tr>
<tr>
<td>20-30 degrees</td>
<td>2.2 (+/-2.5)</td>
<td>24.6 (+/-37.8)</td>
</tr>
<tr>
<td>30-40 degrees</td>
<td>0.9 (+/-1.2)</td>
<td>11.6 (+/-21.6)</td>
</tr>
<tr>
<td>Greater than 40 degrees</td>
<td>1.6 (+/-4.1)</td>
<td>14.8 (+/-28.6)</td>
</tr>
</tbody>
</table>

Sonenblum et al. (2009) also found the use of large tilt was low as on average participants used large tilt 0.5 (+/-0.7) times per hour with a median of 0.13 per hour, the equivalent
of one large tilt every 7 hours. Sonenblum and Sprigle (2011) reported similar findings with a median frequency of tilt in the large or extreme range being once per ten hours. Of the nine participants who had existing pressure ulcers, this frequency was higher for only seven of them, with only two of these participants meeting the recommended guidelines of large tilt once per hour for duration of 60 seconds.

Sonenblum et al. (2009) also found that (a) only eight participants reached a large range of tilt at any point in time through their day, (b) only three of sixteen people accessed large tilt once per hour, and (c) some participants were not using large tilt at all despite pressure management identified as a reason for using tilt by eleven out of sixteen participants. Again these findings are similar to Sonenblum and Sprigle (2011) who found that twenty-six participants failed to tilt greater than 30 degrees on at least one day and six participants did not use large tilt at all during the week long data collection period. The authors noted this actual performance of large tilt was in contrast with the participants’ reported purpose of using tilt for pressure management (70% of participants identified it as a purpose for using tilt). The authors also indicated that three fourths of the participants accurately verbally described and demonstrated a large degree of tilt.

Small and medium amplitudes of tilt were used more frequently and for longer durations than large amplitudes of tilt. Harris et al. (2010) found that all participants used tilt daily, 0.7 to 8.2 times per hour of occupancy with ranges of tilt use being 0-29 degrees; few participants used more than 30 degrees. Sonenblum et al. (2009) reported that ten of sixteen participants spent most of their time in the small range of tilt with five of them spending more than ninety percent of their time in this tilt range. A further five participants spent the majority of their time in medium tilt. Sonenblum and Sprigle (2010) found that most participants used some amplitude of tilt throughout the day, however small and medium tilt were used more frequently compared to large and extreme tilt (median of 21.3 tilts per day compared to 0.7; 95% CI for difference (12.3, 25.7) p=0.000). In this study seventeen of the forty-five participants used their tilt regularly throughout the day spending more than 20 percent of their time in different degrees of tilt. It was noted that these participants changed positions more than once every half hour and did not have a typical sitting position. These participants also completed more tilts
into the large and extreme tilt ranges. Conversely, the remaining twenty-eight participants spent more than 80 percent of their time in a single tilt range. Sonenblum and Sprigle (2010) also found that participants who were able to reposition themselves using alternative methods to tilt spent more time in small tilt than those unable to use alternate methods (85% versus 50%, p=0.030).

The study by Liu et al. (2010) was included in this review as it was based on the findings similar to many of the above studies that large amplitudes of tilt are not used frequently enough to contribute to managing sitting pressures. The purpose of this study was to evaluate user feedback related to use of an intelligent power wheelchair sensor that provided coaching related to power positioning technology use particularly occupancy and amplitude, frequency and duration of position changes (Liu et al., 2010). The finding most relevant to power tilt use revolved around the feedback participants provided related to the operation and control of this additional technology, as the complexity of using power positioning technology has been identified clinically as a drawback to its use. Feedback on the use of the technology in the Liu et al. study suggested it should be simple, with considerations for size and line of vision, and ease of usability. The most salient point was the need to have control over the positioning technology. "Even when given the option to select the appropriate environment for controlling seat functions, the subjects still rejected the idea of auto positioning" (Liu et al., 2010, p 59).

2.1.2.3.4 **Tilt use in activity and participation.**

Only the study by Harris et al. (2010) examined the aspect of daily life from the perspective of how power tilt influenced mobility, activity and participation as a determinant of health. These authors hypothesized that the addition of power tilt would increase wheelchair use and participation in community activities. This study used the metrics of duration, frequency and amplitude of tilt use similar to the above studies but also tracked where the participant travelled. Tracking travel was achieved using a global positioning system as part of the Participation and Activity Measurement system (PAMS). The pre intervention data were gathered immediately after provision of the participant’s first power tilt wheelchair and the post intervention after three months. Following each data collection time period, a Prompted Recall Interview was conducted
in conjunction with the global positioning system data to collect contextual data surrounding the use of the power wheelchair. For each participant, each activity was described using the above quantitative mobility metrics as measurements of wheelchair use.

Harris et al. (2010) indicated that results for wheelchair use as well as number of community destinations visited varied from person to person and for the same person across days and did not change from pre to post assessment. The authors indicated that the addition of power tilt did not significantly impact activity or participation however no statistical values were provided to support this assertion. The authors discussed the challenges with measuring the effect of a mobility device on activity and participation, indicating that perhaps the quantity of activities performed was less reflective than the impact of the mobility device on activity and participation.

The systematic review by Michael et al. (2003) also identified a lack of attention given to the effect of using power positioning technology on health and participation. The limited number of articles in the current scoping review related to activity and participation is consistent with findings of Michael et al. It was proposed that the wide variations in study results indicated that the use of mobility metrics alone is not sufficient to understand how power positioning technology is used in daily life (Sonenblum et al., 2009; Harris et al., 2010). The need to include social and financial considerations as part of future studies was indicated in other articles (Sonenblum & Sprigle, 2011; Dewey et al., 2004). Dicianno et al. (2009) indicated that clinical judgment in the prescription of power positioning technology related to usability in daily life is required, but the authors offered no guidance as to how to ensure usability. The critically appraised paper by Curtin and Whalley Hammell (2006) highlighted the importance of reconnecting the data with the context from which it originated for full understanding of the use of power positioning technology in daily life. While most authors indicated the inclusion of daily life was a gap in current literature, there was consensus that to understand how power tilt is used in daily life, the concepts of person and the environment need to be considered.
2.1.3 Discussion

The results of this review lend some insight into the complexity of understanding how power tilt is used in daily life, although this insight is somewhat limited. The descriptions of purpose for using positioning technology provide insight into why the technology is used within the context of daily life but they lack depth. Examining positioning technology use in daily life through mobility-type metrics provided insight into how the technology is used but again this approach lacked depth. While the results from both of these methods of data collection do not fully explain positioning technology use in daily life, the insights gleaned do provide a foundation from which further research can evolve.

The most frequent reason to use tilt was identified as comfort/discomfort/pain, followed by the need to rest or relax. These reasons to use tilt were not linked to any particular pattern of tilt use. However, Ding et al. (2008) suggested that comfort and postural factors could be attributed to not only the frequency of use but also with the use of small amplitudes. Lacoste et al. (2003) concluded that their results were consistent with clinician and research opinions that most people who use power positioning technology use it frequently throughout the day in the small and medium ranges but not in large amplitudes. These opinions were consistent with findings in the Sonenblum et al. (2009) study, which indicated that those participants who spent 90% of their time in a small tilt range still changed position at least once per hour.

In contrast to the above findings of frequent use of tilt in small and medium ranges, frequency of use of large amplitudes for pressure management was variable and low. Use of large amplitudes of tilt did not meet the recommended minimum frequency of once per hour identified in the studies as required for pressure management, even though most people who require power positioning technology are already at high risk for pressure ulcer development (Ding et al., 2008; Lacoste et al., 2003; Sonenblum et al., 2009). The authors in these studies identified large amplitudes of tilt as necessary for pressure management, which was consistent with the systematic review by Michael et al. (2006). As part of their review, Michael et al. completed a meta-analysis of five studies that examined tilt use to reduce pressure under the ischial tuberosities in a range of tilt amplitudes. The analysis “produced more robust evidence of a statistically significant
reduction in pressure under the ischial tuberosities when participants are tilted backward compared to when upright." (Michael et al., 2007, p 1071) Recent research studying tilt in relation to pressure changes have confirmed that, on average, tilt greater than 30 degrees is required to significantly redistribute pressure on the sitting surface (Giesbrecht et al., 2011; Sprigle et al., 2010; Sonenblum & Sprigle, 2011)

The studies in this scoping review found inconsistencies between participants’ expressed reason of using power tilt and/or recline for pressure management and their actual use of large amplitudes (Ding et al., 2008; Lacoste et al., 2003; Sonenblum et al., 2009). While explanations for low use of large amplitudes of tilt were not evident in the study results, authors in each article recounted anecdotal expressions from participants related to using power tilt. Lacoste et al. (2003) indicated that participants differentiated between preventing pressure sores and preventing skin redness with large tilt being used more often for the latter but still infrequently. Mechanical issues related to the headrest, noise and reliability of the positioning systems were recounted (Lacoste et al., 2003; Sonenblum et al., 2009) Participants anecdotally reported that large amplitude tilt was uncomfortable, non-functional, created feelings of instability or caused red areas on their backs (Sonenblum et al., 2009). These anecdotal participant reports hint at issues that hinder the use tilt, especially large tilt.

Authors of study-based articles also expressed thoughts related to lack of uptake for the pressure management strategy of using large amplitudes of power tilt to reduce buttock surface pressure into daily life of adults who use power tilt wheelchairs. Compliance or lack of attention to the need for regular pressure management was suggested (Ding et al., 2008; Sonenblum et al., 2009). The wide variability in results across participants as well as across days for the same participant, particularly for the mobility-type metrics of amplitude, frequency and duration of tilt use, was also suggested to indicate that more than quantitative metrics are needed to understand power tilt use in daily life, particularly for pressure management (Sonenblum & Sprigle, 2011; Sonenblum et al., 2009).

Suggestions were also made that daily life variables such as living situation, variability of daily occupations and the person’s functional ability, affected the variability of results. Therefore, tilt use needed to be examined as individual behaviours rather than focus on
tendencies of the group as a whole (Michael et al., 2007; Sonenblum & Sprigle, 2010; Sonenblum et al., 2009). The influence of both the person and the environment on power tilt use was noted as being absent in the current measures of tilt use in daily life; quantitative data alone cannot fully explain the relationship between person and environment (Curtin & Whalley Hammell, 2006; Sonenblum & Sprigle).

The results of this review have elucidated not only the complexity of understanding how power tilt is used in daily life but also the paucity of research related to this topic. However, the low use of large amplitudes of tilt in people’s daily lives is evident from this scoping review. Given the implications of using large amplitudes of tilt to influence pressure ulcer prevention, there is a critical need to clarify how power tilt is used in daily life to understand the issue of low use of tilt for pressure management. Since power tilt technology is not used in isolation but in conjunction with wheelchair technology, the wheelchair literature was explored to determine if similarities exist between how power tilt and how wheelchairs are used in daily life. Based on parallels drawn between these two bodies of literature, insights were gained which contributed to the shaping of the current research study.

2.2 Insights from the Wheelchair Literature Related to How Wheelchairs Are Used In Daily Life

Parallels in the literature between the wheelchair use and power positioning technology use were noted primarily in the similar methods used to measure how technology was used within the daily lives of participants. Quantifiable mobility metrics, such as frequency counts, occupancy, and lengths of time using the technology, were used in studies for both wheelchair use and power positioning technology use. High variability in results across participants, across environments and across days for the same participants with no discernible patterns of use was also a similarity. While study results from both bodies of literature have contributed to the knowledge for the respective technologies, researchers in both fields identified that these quantifiable mobility metrics lacked adequate depth or breadth to fully capture how the mobility technology was used in daily life. For example, Baker, Bodner and Allman (2003) and Peel, Sawyer, Baker, Roth, Brown, Bodner and Allman (2005) used Life-Space Assessments to track distances
moved as well as frequency of moving and level of independence (amount of assistance required) as quantifiable mobility metrics for wheelchair use. Sonenblum et al. (2008) used similar mobility metrics to study twenty-five people who used power wheelchairs full time, including the environments where the wheelchair was used. Studies such as these advanced knowledge related to specific elements of wheelchair use such as wheelchair occupancy, but similar variability issues were found as in the scoping review. These types of measures did not fully captured how wheelchairs were used in daily life (Baker et al., 2003; Peel et al., 2005; Sonenblum et al., 2008).

Similar to the scoping review, researchers in the wheelchair use literature suggested that their studies focused too heavily on the parameters of wheelchair mobility, identifying the need to place importance on considerations for person and the environment in which the technology is used. These researchers proposed that wheelchair mobility was not the primary focus of the people who use wheelchairs but that the wheelchair acts as a facilitator for their involvement in their own daily life with the integration of the wheelchair within the person’s daily lifestyle defining successful wheelchair use (Barker et al., 2004; Carlson & Myklebust, 2002; Evans, 2000; Fogelberg et al., 2009; Laliberte Rudman et al., 2006; Scherer & Glueckauf, 2005; Shore, 2008). This proposition is where the wheelchair use literature has potential to inform further research related to how power positioning technology is used in daily life, as well as the current study of power tilt use.

It was proposed in the wheelchair use literature that to understand wheelchair use in daily life and its link to health, the interconnected relationships between the components of wheelchair use must be explored (Arthanat & Strobel, 2006; Chaves et al., 2004; Cook & Miller Polgar, 2008; Di Marco et al., 2003; Minkel, 2000; Ville & Winance, 2006). These components of wheelchair use were identified as: (a) the person, including their needs, abilities, skills, and preferences (person); (b) the multitude of social, physical, cultural and institutional environments in which the person needs to use the wheelchair (environment); (c) the availability of wheelchair and seating equipment and its suitability to meet the person’s needs (wheelchair technology, which includes power tilt); and (d) the requirements of the activity (occupation) in which the person using the wheelchair participates (Arthanat & Strobel, 2006; Chaves et al., 2004; Cook & Miller Polgar, 2008;
Di Marco et al., 2003; Hoenig, Giacobbi & Levy, 2007; Minkel, 2000; Ville & Winance, 2006). This interconnected relationship between person, environment and occupation is congruent with an occupational science perspective which was proposed by several authors to provide a more complete conceptualization of wheelchair use (Fogelberg et al., 2009; Laliberte Rudman et al., 2006; Ville & Winance, 2006). An occupational science perspective includes consideration for what a person does when in the wheelchair, but builds upon that understanding of wheelchair use by exploring how and why the person chooses to use her wheelchair to engage in occupations within the contexts of her environment(s) and her wheelchair technology. An occupational science perspective incorporates the perspective of the person using the wheelchair, especially the meaning or value she attributes to engaging in occupations, which captures the interconnected relationships between person, environment, occupation and wheelchair technology thereby providing a more complete understanding of wheelchair use (Fogelberg et al., 2009; Laliberte Rudman et al., 2006; Ville & Winance, 2006).

These occupational science constructs of person, environment, occupation as well as meaning attributed to engaging in occupations are evident in the wheelchair use literature. However, wheelchair use studies that used the concepts of the person, environment and occupation continued to find the same variability in results as experienced with the studies using mobility metrics measures (Hoenig et al., 2003; Meyers, Anderson, Miller, Shipp & Hoenig, 2002; Pentland et al., 1998). For example, findings from studies that focused on the concept of the environment indicated participants accessed or attempted to access a wide range and large numbers of destinations with a variety of barriers but variability in results was found. This variability was found in participants’ ability to overcome barriers, with some being successful and others not. Variations were also noted across participants as well as day to day variations for the same participant as indicated by participants being able to overcome barriers to access a destination one day but not on another day. These variations suggest that using the components of person, environment, and occupation alone is not adequate. The wheelchair use literature highlighted that to understand wheelchair use in daily life, the social aspects of participation as well as intrinsic factors such as, meaning attached to participating in particular activities, satisfaction and challenge in participation, need to be included. Considering each
participant separately using an individualized approach, to account for the variances by person, across environments and time was also strongly supported in the literature as a means to overcome the limitations from previous studies (Cardol, de Jong, van den Bos, Beelan, de Groot & de Haan, 2002; Hoenig et al., 2003; Larsson Lund et al., 2005; Meyers et al., 2004; Pentland et al., 1998). Occupational science purports that it is the relationship between person, environment and occupation that is critical, and that understanding the meaning attributed to engaging in daily occupations will lend insight into this relationship.

Studies in the wheelchair use literature demonstrate the critical necessity of considering participation using both an individual approach as well as from the perspective of the person and his/her values, experiences, attributes and supports, rather than considering participation based on societal expectations or norms (Cardol et al., 2002; Hoenig et al., 2003; Larsson Lund et al., 2005; Meyers et al., 2004; Pentland et al., 1998; Wee & Paterson, 2009). These studies further support the earlier proposal that the wheelchair acts as a facilitator for involvement in daily life and that this involvement is individually determined through the interconnected relationships between the person, the technology, the occupation and the environment. In using an individualized approach, the concept of meaningfulness in relation to participation was identified as a common theme in the studies by Cardol et al. (2002), Larsson Lund et al. (2005) and Wee and Paterson (2009). This concept of meaningfulness was important to participants; researchers suggested it has the potential to elucidate further understanding of this interconnected relationship. This construct of meaningfulness was evident in the wheelchair use literature as is demonstrated in the following studies.

Evans (2000) interviewed participants, who received a power wheelchair for the first time, regarding the impact the power wheelchair had on their lives. The participants’ responses did not focus on sitting, mobility, discomfort, or in which activities they could or could not participate. Rather, the participants identified the value of using the power wheelchairs by the quality of participation and the meaning it brought to their lives. The ability to achieve meaningful involvement was identified by the participants as the main reason for using the power wheelchairs (Evans, 2000).
Similarly, in a study of how participation in daily life was influenced by the use of a wheelchair as perceived by senior stroke survivors, the researchers found the participants focused on changes in participation in meaningful daily life occupations rather than on how the wheelchair was used (Laliberte Rudman et al., 2006). In their grounded theory study of sixteen stroke survivors who used wheelchairs and their caregivers, Laliberte Rudman et al. (2006) found that the complexities of the interconnectedness of the wheelchair technology with the other aspects of daily life were so intertwined that participants could not discuss the influence of the wheelchair in isolation. This finding resulted in two primary themes that appear to relate more to participation than wheelchair use; (a) living in a restricted occupational world, and (b) challenges to participation in occupation (Laliberte Rudman et al., 2006). These two themes support the perspective that the wheelchair acts as a facilitator for involvement in the person’s own daily life with integration into daily life occupations defining successful integration. These studies also confirm meaningfulness of involvement in daily life occupations as an important construct in understanding how mobility technology is used in daily life. The construct of meaning has potential to provide insight into understanding the interconnected relationship of person, technology, environment and daily life occupations thereby increasing knowledge related to how power tilt is used in daily life.

Many of the insights gained from the wheelchair use literature are congruent with occupational science constructs described in Chapter One. The concepts that demonstrate congruency are (a) an individualized approach, (b) focusing on the perspective of the person using the mobility technology, (c) the interconnected relationship between person, environment, occupation and technology, and (d) personal meaning attributed to participating in daily life occupations. The constructs of meaning, choice, control and the influence of context on occupational engagement provide an avenue for elucidating an understanding of the interconnected relationship between the constructs of person, environment, occupation and wheelchair technology, thereby addressing some of the issues and gaps identified in the above scoping review. It is suggested that the addition of an occupational perspective to the current knowledge related to power tilt use has potential to create a more conceptually robust and comprehensive understanding of how power mobility technology, particularly power tilt, is used in daily life.
2.3 Knowledge Gap

The knowledge gap identified in this scoping review of literature related to power tilt use in daily life was that an understanding of how people integrate power tilt use into daily life, particularly for pressure management, is lacking (Dewey et al., 2004; Sonenblum & Sprigle, 2010; Sonenblum et al., 2009). The review revealed that power tilt was used throughout the day but with great variability in frequency and amplitude. Low frequency of large amplitude tilt use was a consistent finding across studies, even in those studies where participants indicated they used tilt to manage sitting pressures. This discrepancy between reported and actual use suggests that power tilt wheelchairs are not being used to their fullest benefit for pressure management, however the reasons why use is low are not clear from the studies (Ding et al., 2008; Lacoste et al., 2003; Sonenblum et al., 2009). The lack of clarity was attributed to the use of mobility metrics of frequency, duration, and amplitude as measures of power tilt use in the context of daily life, which did not reflect the relationship between the components of person, environment and occupation.

There is a paucity of research studies that explore the issue of how power tilt is used in the context of daily life from either the perspective of the person who uses power tilt or the therapist who prescribes power tilt. Existing studies have not examined the interconnected relationship between power tilt technology and participation in daily life occupations beyond environmental considerations. Gaining insight into this relationship through the perspectives of adults who use power tilt as well the perspective of therapists who prescribe this technology is essential to identifying how power tilt use is influenced during daily life (Mortensen & Miller, 2008; Polatajko, 2004). Several wheelchair use studies suggest insight into this relationship may be achieved in part by understanding the personal meaning attributed to participating in daily life occupations. If the purpose of mobility technology is to facilitate participation in daily life occupations, then exploring the meaning of participation may provide insight into the interconnected relationship between person, technology, environment and daily life occupations.

The cost of the power tilt technology as well as the cost of healing pressure ulcers warrants a closer examination of how using this technology interfaces with the person and her daily life occupations. A clearer understanding of the relationship between
power tilt technology and participation in daily life is required to reduce this knowledge gap thereby increasing the potential to maximize the experienced benefit for managing sitting pressures through power tilt use.

The primary finding of the scoping literature review was that the understanding of how power tilt is used in daily life, including for the purpose of managing sitting pressure, is incomplete. Literature related to how wheelchairs are used in daily life demonstrated several parallels to the power tilt literature, suggesting that concepts from the wheelchair literature could apply to power tilt thereby assisting in reducing the power tilt knowledge gap. These concepts included: 1) focus on the interconnected relationship between the technology, person, environment and daily life occupations to elucidate an understanding of technology use in daily life; 2) using an individualized approach; 3) using an approach that includes the perspective of the person using power tilt; 4) understanding the personal meaning attributed to participating in daily life occupations will offer insight into understanding the interconnected relationship. These concepts contributed to shaping the research problem, questions and objectives presented in Chapter 1.

2.4 Conclusion

This scoping review has identified the need for further research into the area of power tilt use, especially for pressure management and with consideration for the context of daily life. While issues with variability of results limited explanation of daily use of power tilt, the knowledge gained related to use of large amplitudes of tilt has substantiated the question posed in this research study.

The goal in exploring the wheelchair use literature was to gain insight into how wheelchairs were used in daily life to determine applicability to power tilt use and this current study. The studies have highlighted the need for both an individual approach and the perspectives of the people who use the technology. These approaches are required to gain an understanding of how power tilt is used in daily life through the consideration of the interconnected relationships of person, technology, environment and daily life occupations. The construct of meaningfulness of involvement in daily life occupations was proposed to have potential to elucidate further understanding of this relationship.
This knowledge aided the shaping of the current power tilt study, particularly the use of an individual approach in the data collection methods, and the use of perspectives of people who use power tilt as well as therapists who prescribe power tilt. The concepts identified in the wheelchair use literature that are congruent with an occupational science perspective, have added depth to the analysis of the data collected.
Chapter 3  

3 METHODOLOGICAL AND THEORETICAL APPROACH

Studies in the literature have provided valuable knowledge to increase the understanding of how power tilt is used through tracking actual tilting occurrences using quantitative measures of frequency, amplitude and duration. However, to begin to address the knowledge gap identified in Chapter 2, a broader approach to exploring the experiences of people using power tilt in the context of their daily life was indicated. The inductive nature of qualitative research fosters a greater depth in understanding as it seeks to understand how the phenomenon occurs in context (Carpenter & Suto, 2008; Corbin & Strauss, 2008; Finlay, 2006b). The addition of qualitative knowledge related to this phenomenon contributed to furthering clinical knowledge and evidence based practice related to how power tilt is used for managing sitting pressures in the context of daily life, which was an important outcome of this study (Corbin & Strauss, 2008; Finlay, 2006a; Parahoo, 2009).

Conducting qualitative research requires the researcher to determine which methodological and philosophical paradigm will be used to guide the study methods. Different combinations of methodology and paradigms can potentially produce different viewpoints on the same phenomenon (Finlay, 2006a; Stanley, 2006). For this reason the methodology and paradigm used in this study and how they fit with the aim of the research are clearly stated in the following sections (Finlay, 2006a; Morse, 2009). The coherence between the philosophical position of the research methodology, paradigm, and research methods must also be demonstrated in the study (Finlay, 2006a; Morse, 2009). To achieve clarity of fit and coherence, the philosophical choice of a post-positivist paradigm is presented first, followed by a description of how it fits with the aim of the study. The methodological choice of grounded theory is then briefly described. Since the philosophical choice determines the type of grounded theory, a fuller description of post-positivist grounded theory is provided, followed by a description of how it fits with the aim of the study.
3.1 Philosophical Choice: Post-Positivist Paradigm

This study was guided by the paradigm of post-positivism, which takes the philosophical position that researching a phenomenon will not result in a singular explanation or reality of that phenomenon. The post-positivist paradigm contends that a single reality of a phenomenon does not exist (Cooney, 2012; Corbin & Strauss, 2008; Corbin, 2009; Finlay, 2006b; Lincoln & Guba, 1985). Each person had his own reality that is based on his/her experiences and the meaning attributed to those experiences, therefore reality is different for each person. However, through the analysis of commonalities and differences across multiple experiences knowledge can be constructed thereby leading to greater understanding and knowledge of how the phenomenon occurs (Corbin & Strauss, 2008). The role of the researcher in post-positivist grounded theory therefore, is to systematically collect and analyze these multiple perspectives from participants in their social context, which forms the data of this inductive process. From these data, concepts, relationships and provisional theories are constructed by the researcher to explain or describe the behaviour or phenomenon (Charmaz, 2006; Corbin & Strauss, 2008; Finlay, 2006a; Murdaugh, 1989; Stanley, 2006; Walls, Parahoo & Fleming, 2010). Since the experiences and therefore the knowledge construction are context based, it is also the researchers’ responsibility to clearly describe the context of the study to provide readers with adequate information to determine if the reality in this research is similar to the reality to which they wish to apply the findings (Corbin & Strauss, 2008).

A second post-positivist philosophical stance that influenced this study was that the researcher cannot remain completely outside of the research process. The researcher must strive to maintain objectivity in the research by being aware of her influence on the data thereby maintaining objectivity in the research (Corbin & Strauss, 2008; Lincoln & Guba, 1985). In the course of qualitative research, researchers bring their own experiences and knowledge to the study through interaction with participants as well as with the data. The post-positivist paradigm acknowledges the influence the researcher’s own knowledge and experience have on the research process and that these experiences and knowledge cannot be separated out of the research process. Awareness and sensitivity to the influence of the
researcher’s self on the research process is a key methodological construct (Corbin & Strauss, 2008; Lincoln & Guba, 1985; Morrow, 2005).

“Sensitivity means having insight, being tuned in to, being able to pick up on relevant issues, events, and happenings in the data” (Corbin & Strauss, 2008, p. 23). Sensitivity is also having insight into how one is influencing the research at any and all stages but also recording that influence so as to account for the influence on the data and research process. Reflecting on this influence opens the researcher up to identifying what she brings to the research plus what the data are saying, to delve deeper into the data adding to the thickness of data (Corbin & Strauss, 2008). Sensitivity is achieved by the researcher recognizing, acknowledging, and accounting for her influence on the participants, on data collection and on data analysis using a reflexive and transparent process typically by using a record of reflections (Corbin & Strauss, 2008; Finlay, 2006a; Lincoln & Guba, 1985).

3.1.1 **Fit between aim of study and philosophical paradigm**

The philosophical position of post-positivism was chosen to guide the methodology and methods of this study as it supports the aim of the study in advancing knowledge regarding clinical practice in a bio-medical practice area. The philosophical stance that reality can be approximated but never mirrored parallels clinical practice. There is an expectation that there should be a best way to use power tilt that will result in optimal outcomes. However, how people understand and enact this best practice is individualized based on the context of daily life. The primary aim of this study was to understand how power tilt was used for managing sitting pressures in the context of each participant’s daily life. The knowledge generated from this research formed the basis for understanding the process and context that have potential to influence how power tilt is used. This knowledge can inform clinical practice related to individualizing power tilt use within the context of the person’s own reality of daily life.

3.2 **Methodological Choice: Grounded Theory**

The primary purpose of grounded theory is to generate a theory from concepts developed based on synthesized data (reported experiences) from the perspectives of people
experiencing the phenomenon, resulting in new knowledge about the phenomenon (Corbin & Strauss, 2008; Finlay, 2006a; Morse, 2009; Murdaugh, 1989; Stanley, 2006; Starks, 2007; Walls et al., 2010).

Grounded theory enables the identification and description of phenomena, their main attributes, and the core, social or social psychological process, as well as their interaction in the trajectory of change. In other words it allows us to explicate what is going on or what is happening (or has happened) within a setting or around a particular event (Morse, 2009, p.13-14).

Theory generation is achieved through a systematic and iterative process of data collection, data analysis, constructing concepts and generating theory (Bryant & Charmaz, 2007; Corbin, 2009; Morse, 2009). This iterative process forces the researcher to remain in constant contact with the data throughout the study. In this way data collection and data analysis inform and shape each other resulting in a deeper, richer exploration of the phenomenon (Bryant & Charmaz, 2007; Corbin & Strauss, 2008).

3.2.1 **Post-Positivist Grounded Theory**

The philosophical underpinnings of post-positivist grounded theory place process as fundamental to understanding human existence rather that structure (Charmaz, 2009; Corbin & Strauss, 2008). The terms structure and context are used interchangeably in the literature, referring to the set of conditions in which the processes of human behavior occur (Corbin & Strauss, 2008). Context is created through engaging in processes with construction of action as the central problem or phenomenon to understand. Processes are shaped by the context in which they occur (Corbin & Strauss, 2008).

Understanding the process of the experience is integral to understanding human behaviour phenomenon (Corbin & Strauss, 2008). Personal knowledge about process is created through the interplay of actions, interactions and emotions in context as experienced by the person, through personal self-reflective thought about the actions/interactions/emotions and through the attributed level of meaning, often being formed as a response to consequences or contingencies (Corbin & Strauss, 2008). Change in action
requires self-reflective thought. Change in action alters the context and process of interaction. This interaction contributes to new knowledge and subsequently action to address the problem (Corbin & Strauss, 2008). For example, a person who has power tilt feels discomfort in her buttocks (problem) when in a transport van (context). Previous experience tells her if she tilts into a large amount of tilt she will relieve the discomfort. She is not able to do so in the van due to safety issues (self-reflective thought) so she tilts to a lesser amplitude (action). This results in a reduction of the discomfort (consequence) which she can manage for the duration of the ride (new knowledge).

The cumulative nature of these actions and interactions also contributes to knowledge of process (Corbin & Strauss, 2008). Since change is always present, the interaction between action and self-reflective thought must be considered to be influenced by temporality (Corbin & Strauss, 2008). Therefore creating new knowledge (understanding), as accomplished through research about a phenomenon must be concerned with process (Corbin & Strauss, 2008).

Though we are interested in how persons experience events, and the meanings that they give to those experiences, at the same time we consider that any explanation of experience would be incomplete without a) locating experience within the large conditional frame or context in which it is embedded; and b) describing the process or the ongoing and changing forms of action/interaction/emotions that are taken in responses to events and the problems that arise to inhibit action/interaction. We also look for consequences because these come back to be part of the next sequence of actions (Corbin & Strauss, 2008, p. 17-18).

The role of the researcher in post-positivist grounded theory is to elucidate the dynamic characteristics of the complex relationships between process and context, and uncover the meaning given to the variable responses to situations that shape personal experiences which forms an explanation of the human behaviour phenomenon under study (Corbin & Strauss, 2008).
3.2.2  Fit Between Aim of Study and Methodology

Post-positivist grounded theory was a natural fit with the aim of this research study: to gain an understanding of the process of using power tilt to manage sitting pressures in the context of daily life, from the perspectives of people who use power tilt wheelchairs as well as therapists who prescribe this technology. The study aim is consistent with grounded theory’s focus on process of the phenomenon in context as perceived by the person experiencing it. The theory generation, which is a primary reason to conduct grounded theory research, further supported the study aim of gaining an understanding of how power tilt is used so as to inform clinical practice and future research.

3.3  Coherence Between Post-Positivist Grounded Theory Methodology and Research Methods

Since grounded theory is an inductive process used for the exploration of a phenomenon, flexibility in the methods is essential (Finlay, 2006a). Flexibility in the methods allows the researcher to be responsive to the data as the study evolves, being guided by the chosen methodological and paradigmatic techniques to produce rich, thick, in-depth data to build a stronger theory or description about the phenomenon (Corbin & Strauss, 2008; Lincoln & Guba, 1985; Morse, 2009). This need for flexibility contradicts the methods of ensuring study quality used in quantitative research known as rigour. Rigour entails detailing the specifics of the research process prior to the study beginning and adhering to them through the course of the study (Lincoln & Guba, 1985; Morrow, 2005; Morse, 2009). In a qualitative study, the transparent demonstration of coherence between the research methodological and philosophical approaches and the focus of the research study in the research process denotes the level of study quality (Ballinger, 2006; Finlay, 2006a; Lincoln & Guba, 1985; Morrow, 2005).

In this study coherence was achieved using both the parallel quality criteria (Lincoln & Guba, 1985; Morrow, 2005) and the theoretical constructs consistent with post-positivist grounded theory. For clarity and ease of reading, the approaches used are presented in the following sections with the acknowledgement that there is overlap between methodology
and methods. The applications of the specific techniques used to support coherence are described in the methods chapter.

3.3.1 The Quality Criteria Used to Ensure Study Coherence and Trustworthiness

To maintain coherence with post-positivist grounded theory, the parallel quality criteria of credibility, transferability, dependability and confirmability were used. These criteria are termed parallel as they can be mapped against the quantitative criteria of internal validity, external validity, reliability and objectivity respectively (Ballinger, 2006; Lincoln & Guba, 1985; Morrow, 2005). Each of these quality criteria, as defined in Table 6, was considered and applied during the design of the study methods as well as while the study was conducted to ensure coherence. The specific techniques and methods used to address each criterion were chosen based on suitability for post-positivist grounded theory methodology as well as the purpose of the study. The demonstrations of quality criteria in a study often overlap; one technique or method may contribute to satisfying one or more quality criteria (Ballinger, 2006; Lincoln & Guba, 1985; Morrow, 2005). This overlap is evident in the descriptions of each criteria and how each criteria were applied in this study, which is summarized in Table 6.
Table 6. **Quality criteria used to ensure coherence and trustworthiness in this study.**

<table>
<thead>
<tr>
<th>Quality criteria</th>
<th>Description of criteria</th>
<th>Technique used and how it was applied in study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Credibility</strong> (internal validity)</td>
<td>1. Demonstration of confidence that the findings represent the views of the participants (Ballinger, 2006; Lincoln &amp; Guba, 1985; Morrow, 2005).</td>
<td>(a) Member Checking at start of second interview to verify analysis of the first interviews. (b) Constant comparative analysis through iterative process of data collection and analysis, (c) Peer debriefing at methodological design phase, concept development phase and theory generation phase. (d) Triangulation of data through multiple sources and methods of collection. (e) Self-reflection at all study phases.</td>
</tr>
<tr>
<td><strong>B. Transferability</strong> (external validity)</td>
<td>Demonstration of having provided data of adequate thickness of description to allow another person to determine the extent to which the study findings can be applied or transferred to other contexts (Ballinger, 2006; Lincoln &amp; Guba, 1985; Morrow, 2005).</td>
<td>(a) Use of theoretical sampling (b) Inclusion of examples of the data presented in this manuscript to demonstrate thickness of data (c) Multiple sources of data used contribute to thickness (as described in section A2b of Table 6)</td>
</tr>
</tbody>
</table>
Table 6 (continued). *Quality criteria used to ensure coherence and trustworthiness in this study.*

<table>
<thead>
<tr>
<th>Quality criteria</th>
<th>Description of criteria</th>
<th>Technique used and how it was applied in study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C. Dependability</strong> (reliability)</td>
<td>Repeatability of findings; is influenced by credibility.</td>
<td>(a) Triangulation of multiple sources of data; data analyzed separately and then together</td>
</tr>
<tr>
<td></td>
<td>Dependability can only occur in the presence of credibility and vice versa (Ballinger, 2006; Lincoln &amp; Guba, 1985; Morrow, 2005).</td>
<td>(b) Maintained an audit trail of the process.</td>
</tr>
<tr>
<td><strong>D. Confirmability</strong> (objectivity)</td>
<td>Demonstration of how neutrality of research was established and ensured (Ballinger, 2006; Lincoln &amp; Guba, 1985; Morrow, 2005)</td>
<td>(a) Triangulation</td>
</tr>
<tr>
<td></td>
<td>(b) Audit trail including: records of raw data, data reduction, analysis and synthesis; reflexive notes; memo records.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Record of reflexivity</td>
<td></td>
</tr>
</tbody>
</table>

Where the techniques identified in Table 6 are based on theoretical constructs, they will be further described in the following section. Otherwise the techniques will be described where it is applied in the methods chapter.

### 3.3.2 Theoretical Constructs Which Guided the Study Methods to Maintain Coherence

The methods and techniques used in this study to collect, analyze, and construct knowledge from the data, were consistent with the theoretical constructs of post-positivist grounded theory. The following section outlines the theoretical constructs used to guide the design and execution of the study methods. The methods and techniques employed to
maintain coherence to these theoretical constructs are briefly presented with further detail of application provided in the study methods chapter.

3.3.2.1 Theoretical Sensitivity

Theoretical sensitivity refers to the researcher’s experience with the phenomenon under study, which influences the researchers insight and ability to give meaning to the data as well as the sensitivity to determine what are relevant and non-relevant data related to the phenomenon (Corbin & Strauss, 2008; Strauss & Corbin, 1990). Theoretical sensitivity increased as the researcher worked with the data and reviewed the literature (Strauss & Corbin, 2008). Post-positivist grounded theory requires the researcher to be familiar with the phenomenon however it is proposed that too much familiarity may bias the researcher (Corbin & Strauss, 2008; Strauss & Corbin, 1990). Corbin and Strauss (2008) suggest that this bias can inhibit creative and novel exploration of concepts and theories.

To account for theoretical sensitivity and/or bias, the researcher was required to demonstrate self awareness of these potential influences on the study process to ensure the researcher’s own knowledge about the phenomenon was not directing the collection/analysis process (Corbin & Strauss, 2008). Given that this study’s researcher has extensive clinical experience with the prescription of power tilt wheelchairs and working with people with pressure ulcers, flexibility in the study methods was used to minimize the potential for over-sensitivity. For this reason a limited review of the literature was completed prior to the study. The brief review provided adequate familiarity with the problem area to establish the research topic area and question as well as to allow theoretically sensitive questioning during data collection and analysis (Corbin & Strauss, 2008). The full scoping review occurred following the first draft of the discussion chapter, despite the scoping review being located prior to the methods in this manuscript.

The techniques of peer debriefing and member checking were also employed as quality checks to identify potential researcher bias or influence that may have arisen due to over familiarity of the topic area. Recording self-reflections was also used to monitor the influence of the researcher on the research process. These records included reflection on
the researcher’s thoughts and decision-making during the iterative process of data collection and analysis as well as during peer debriefing and member checking (Corbin & Strauss, 2008; Lincoln & Guba, 1985). These techniques were employed as part of the audit trail which ensured clarity and transparency of the decisions and choices made throughout the research process (Corbin & Strauss, 2008).

An audit trail is a verifiable record which transparently demonstrates what the researcher did at each phase of the study. The audit trail also includes the thinking processes and decision-making that supported the action which occurred within each phase (Corbin & Strauss, 2008; Lincoln & Guba, 1985). In this study, audit documents were in the form of (a) raw data, such as field notes and recordings, (b) written summaries and, (c) decision records, to track methodological cohesion as well as the decision-making process for generation of concepts or theories (Corbin & Strauss, 2008; Lincoln & Guba, 1985). The records are part of the qualitative research process and should provide a clear picture of the entire process such that it would satisfy an audit (Corbin & Strauss, 2008; Lincoln & Guba, 1985).

3.3.2.2 Theoretical Sampling

Theoretical sampling is a central procedural technique in post-positivist grounded theory which guides all aspects of the research process (Corbin & Strauss, 2008; Strauss & Corbin, 1990). Theoretical sampling is a concept driven method of working with the data based on the concepts derived from the data analysis which then directs or guides the study. Theoretical sampling allows flexibility to change the research process to facilitate in depth exploration but uses a systematic process to do so (Corbin & Strauss, 2008). Used in conjunction with comparative analysis, theoretical sampling forms the basis of the rationale for choosing specific directions in the study such as (a) participant selection (e.g. choice of participants, recruitment locations), (b) initial selection of data collection methods (e.g. interview, observation, focus group), (c) ongoing data collection (e.g. same participants over many times points or different participants), (d) data coding selection techniques (use and timing of open, axial and theoretical coding), and (e) data analysis (Corbin & Strauss, 2008).
3.3.2.3 Comparative Analysis

Comparative analysis is the primary analytic method used in conducting grounded theory research; its use supports the credibility of the study (Corbin & Strauss, 2008; Finlay, 2006a). Comparative analysis involves revisiting and re-working the data throughout the iterative process of collection and analysis to ensure fit between the data and knowledge being constructed (Corbin & Strauss, 2008). Comparative analysis contributes to the development of thick data (Corbin & Strauss, 2008; Morrow, 2005). This iterative process of data collection and data analysis forced the researcher to be immersed or in constant contact with the data, which then shaped and guided the progression of the study. For example, the initial questions for the first interview focused heavily on using power tilt for managing sitting pressures, requesting participants to expand on only this particular reason to use power tilt. This approach reflected my clinical background and approach to interviewing clients, focusing specifically on the problem area. Participants found it difficult to describe how they used power tilt for pressure management without describing how they used it for all other reasons, in order to describe using tilt in the context of daily life. In reviewing and transcribing the first interview and then again for the second interview, the researcher confirmed this finding as well as identified how the questioning, wording, approach and focus needed to change to broaden the focus and be more open ended. In this way, the focus of the interviews was expanded to include all reasons for using power tilt using a less clinically focused format, which allowed the researcher, during subsequent interviews, to delve deeper and in a manner more focused on the participant’s experiences rather than the interview questions, enabling richer and thicker data to be gathered.

Two types of comparative analyses were employed in this study, constant and theoretical (Corbin & Strauss, 2008). Constant comparative analysis required that all new data were analyzed and coded after each data collection session and compared with previously analyzed data (Corbin & Strauss, 2008; Strauss & Corbin, 1990). This analysis involved comparing and coding data based on similarities and differences at a property and dimensional level to provide a way of knowing or understanding the data. Analysis continued until saturation was reached, that is until no new concepts were constructed...
from the data (Corbin & Strauss, 2008). In this study, the data were coded using open and axial coding techniques. Open coding is breaking data apart into pieces based on their properties, dimensions and meanings with consideration for the context of the data and then identifying a conceptual label which reflects that block of data. Open coding requires brainstorming and creativity to explore the data from various perspectives prior to labeling (Corbin & Strauss, 2008). Axial coding is the relating of concepts to each other forming a different or new concept (Corbin & Strauss, 2008). Corbin and Strauss indicate that while open coding and axial coding are defined as separate, in reality they occur together.

A variety of analytic strategies can be used to facilitate coding. For this study, the strategies included asking questions and making comparisons of the data during coding based on the properties and dimensions of the data. Through use of these analytic strategies, constant comparative analysis allowed the data to be grouped into concepts of description as well as concepts of relationships and interactions enabling the researcher to move through higher levels of analysis for advanced concept development, leading to theory generation (Corbin & Strauss, 2008). This process of examining and coding the data, also termed concept development, is essential for constructing knowledge and generating theory about the phenomenon (Corbin & Strauss, 2008).

Analysis begins after the first day of data gathering. Data collection leads to analysis. Analysis leads to concepts. Concepts generate more questions. Questions lead to more data collection so that the researcher might learn more about those concepts. This circular process continues until the researcher reaches the point of saturation; that is the point in the research when all concepts are well defined and explained (Corbin & Strauss, 2008, p. 144-145).

Theoretical saturation is the point at which there are no new data codes, concepts, constructs or relationships depending on the study phase. Saturation is dependent on the use of multiple sources of data, as well as depth and thickness of data collection (Corbin & Strauss, 2008).
Theoretical comparisons are used when the properties of the data are not evident. The researcher’s experience, sensitivity and the literature are used for the purpose of comparison of the concepts and gaining understanding to elucidate the properties of the data (Corbin & Strauss, 2008). These sources are not used as data in the analytic comparison. In this study, theoretical comparisons were used both in conjunction with the constant comparative analysis and as the theory construction became the prominent research activity.

3.3.2.4 Theory Generation

Theory generation is an advancement of concept development as described in the previous section. Corbin and Strauss describe three types of theories that can be generated; formal, mid-range and substantive. A substantive theory remains focused on a narrower topic area whereas formal or mid-range theories are of a higher level of abstractness, widening the applicability of the theory (Corbin & Strauss, 2008). Since using power tilt in daily life especially for managing sitting pressures is a specific and relatively narrow clinical topic area, the generation of a substantive theory was the chosen direction for this study.

Generation of a substantive theory is based on the knowledge created through concept development from the iterative process of data collection and analysis. During the process of final theory integration the focus shifts from concept development to integrating the concepts around a central or core concept. Corbin and Strauss (2008) identify the first step in refining the theory as identifying the core category. A core category represents the main theme of the research findings and is frequently linked with other categories and concepts, creating a high potential for that category to be the unifying link within the theory. A core category is identified therefore by its frequency of appearance in the data at all levels of analyses. It also must be abstract enough that statements of relationships and interactions with other categories can be made thereby giving it depth and explanatory power (Corbin & Strauss, 2008). Final theory integration is complete when all processes and sub-processes are well defined and explained (Corbin & Strauss, 2008).
3.4 Summary

The methodological and paradigmatic approaches used in this study guided the study methods. Post-positivist grounded theory was used as the purpose of the study was; (a) to gain an understanding of the phenomenon of using power tilt to manage sitting pressure so as to construct new knowledge which could influence clinical practice, and (b) to examine the phenomenon from the perspectives of people who experience it. The philosophical and theoretical constructs presented here guided the choices made in study design and process, to ensure cohesion between methodology, paradigm and study. The details of the study design and process are presented in the methods chapter that follows.
Chapter 4

4 METHODS

The study methods are presented in two sections as study design and study process. The methods are also presented in their entirety as an illustration in Figure 2. The study design framed the study ensuring its coherence to post-positivist grounded theory methodology. The design is presented using the headings of multiple sources of data and multiple methods of data collection. The methods employed for collecting data from multiple sources include participant selection, recruitment and the number of participants. The multiple methods of data collection section include interviews and a time-tilt journal. Aspects of theoretical constructs, content and rationale for decision-making related to the chosen study design components are also provided to remain transparent.

The study process section describes how the study design was implemented to systematically collect and analyze the data and generate theory (Corbin & Strauss, 2008; Finlay, 2006a; Murdaugh, 1989; Stanley, 2006; Strauss & Corbin, 1990; Walls et al., 2010). The study design was based on the methodological constructs of post-positivist grounded theory with comparative analysis being central to the iterative approach used for data collection, data analysis, construction of concepts and generation of theory (Ballinger, 2006; Corbin & Strauss, 2008; Finlay, 2006a).

The study methods are illustrated in Figure 2. The black boxes indicate the data collection components of the study with the dark blue arrows indicating order of occurrence. The orange boxes and green arrows illustrate the study process. The orange boxes indicate the analysis phases and the green arrows indicate directionality between design components with the double headed green arrows indicating the iterative approach between the analyses and study design components. The use of this back and forth approach between all study phases created a non-linear process. This approach assisted in ensuring that the researcher was immersed in the data throughout the data collection, analysis and theory generation. The purple box indicates the final integration of constructs into the theory for theory generation.
In Figure 2, the illustration of study methods is shown:

1. **Group 1**
   - Adults who use power tilt
   - **Interview 1**: Individual Semi-structured interview
     - Constant Comparative Analysis
   - **3-day Journal**: Lived daily experiences of using tilt
     - Within group comparative analysis
   - **Interview 2**: Individual In-depth interview
     - Generated from data and theoretical sampling
     - Constant Comparative Analysis
     - Within group comparative analysis

2. **Group 2**
   - Therapists who prescribe power tilt
   - **Interview 1**: Individual Semi-structured interview
   - Constant Comparative Analysis
   - Within group comparative analysis

3. **Comparative analysis across groups generating preliminary theory**
   - Within group comparative analysis
   - Constant Comparative Analysis

4. **Final integration and Theory generation**
   - Literature review
For ease of presentation of the study methods a linear approach was taken. The reader is requested to keep in mind that much of this process is occurring simultaneously; each phase was not completed in its entirety for all participants prior to proceeding to the next phase. The study ethics are presented first followed by the components of the study design. The study design section elaborates on the specific details of the data collection components including demonstration of coherence with post-positivist grounded theory methodology. The study process section is presented in the order that the phases occurred as illustrated in Figure 2 including the data collection components, the analytic components and, the processes connecting the data collection and analytic components. Inclusion of quality criteria are highlighted throughout this chapter. As the purpose of using grounded theory methodology in this study was to create new knowledge through the development of concepts and from these concepts generate theory, concept development and theory generation will be presented in the last two sections to summarize the study methods as well as lead into the results chapter.

4.1 Ethics

Ethics approval was received prior to beginning the study. Following approval of the study proposal by the study advisory committee, ethics approval was received for Western University February 17, 2011, followed by VHA Healthcare May 15, 2011 and Saint Elizabeth Health Care with Community Care Access Centre approval May 26, 2011. Recruitment of gatekeepers and participants followed. Approval for recruitment through St. Joseph’s Health Care – Parkwood Hospital was received June 23, 2011 as a strategy to increase the recruitment pool. Additionally to increase recruitment, approval was received October 27, 2011 to remove the upper age limit of 64 years of age. Due to difficulties recruiting participants, approval to extend the study four months beyond the original end date was also received. (Refer to Appendix A for all ethics and letters of approval.)

4.2 Study Design

Consistent with post-positivist grounded theory methodology and the parallel quality criteria, triangulation of multiple data modes were chosen to frame the study design,
specifically multiple sources of data and multiple methods for data collection (Ballinger, 2006; Corbin & Strauss, 2008; Lincoln & Guba, 1985).

Triangulation is a technique in which the outcomes from different methods of exploring the same phenomenon are compared to verify consistency (Ballinger, 2006; Lincoln & Guba, 1985). In this study the triangulation modes chosen were multiple sources of data (2 different groups of participants; multiple people in each group) and multiple methods (2 interviews in each group and the addition of a 3 day journal for participants who use power tilt). Please refer to Figure 2 for added clarity to this design description.

4.2.1 Multiple Sources of Data

There were two participants groups; (a) adults who use power tilt and, (b) occupational therapists or physiotherapists who prescribe power tilt. The decision to include two groups of participants was made primarily based on clinical knowledge. If the study was to have clinical relevance then the perspectives of both groups were essential as they function for the most part as a team during the process of obtaining power tilt and for managing sitting pressures. The use of two data sources also increased the credibility of the study through triangulation. The design aspects of participant selection for these two groups are detailed in the following sections.

4.2.1.1 Participant Selection

Consistent with post-positivist grounded theory methodology, participant selection was guided by theoretical sampling. Based on the researcher’s clinical experience, the literature related to power tilt use and the purpose of the research study, the selection criteria were established as outlined in Table 7.

The inclusion criteria of being community based and the level of experience warrant further explanation. Living in the community requires a certain level of independence and control of daily life activities of which tilt use would be included. It was also felt that living in the community would provide greater diversity of experiences with opportunity for use of power tilt in a variety of environments. For Group 1 participants, this criterion meant living in and accessing their community, therefore people who lived in nursing
homes or were in hospital were excluded. For Group 2, therapists needed to prescribe power tilt wheelchairs for people who lived in the community therefore their work context was as community service providers or therapists working on hospital outpatient programs.

Table 7. Inclusion criteria for participant groups.

<table>
<thead>
<tr>
<th>Inclusion criteria for adults who use power tilt (Group 1)</th>
<th>Inclusion criteria for therapists who prescribe power tilt (Group 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speak English</td>
<td>Speak English</td>
</tr>
<tr>
<td>Reside in the community (i.e. home/apartment, assisted living)</td>
<td>Prescribe power tilt wheelchairs for people living in the community</td>
</tr>
<tr>
<td>Between the ages of 18 and 65; upper age limit removed October 2011.</td>
<td>Must be an authorizer with the Ontario Ministry of Health and long Term Care Assistive Devices Program (ADP) for wheelchairs and mobility devices</td>
</tr>
<tr>
<td>Used a power wheelchair with power tilt only – no recline or power elevating leg rests or power elevating seat.</td>
<td>Have at least 2 years experience prescribing power tilt systems</td>
</tr>
<tr>
<td>Have used power tilt for at least 6 months</td>
<td>Prescribe at least 2 power tilt systems per year</td>
</tr>
</tbody>
</table>

Participant knowledge and experience in using power tilt were essential to gain the insights needed for this study. For Group 1, participants were required to have used tilt for at least six months, which was long enough to establish tilt use in daily routines. For Group 2, therapists were required to be an Ontario Ministry of Health and Long Term Care Assistive Devices Program (ADP) authorizer with experience prescribing power tilt for at least 2 years. This rationale was based on the funding structure in Ontario where funding for mobility devices, including power tilt wheelchairs, is provided almost exclusively through this ministry. To become an authorizer, therapists are required to have a minimum of 2 years experience specifically in the area of mobility equipment. Requiring therapists to be ADP authors set a minimum level of competence and experience in the area of wheelchairs and seating. Additionally therapists’ were required to have prescribed at least two power tilt systems for clients living in the community over
the last year. Requiring more than two power tilt prescriptions per year would have significantly reduced the selection pool.

4.2.1.2 Recruitment

Recruitment occurred through clinical occupational therapists and physiotherapists within London and Middlesex counties in Ontario, Canada. Recruitment was initiated through information sessions set up with the professional practice leaders. At these sessions the study was introduced, the process for recruitment was explained, and letters of information were distributed. If interested, therapists contacted the researcher directly so as to maintain confidentiality and anonymity given the small clinical community in this geographical region. At the time of contact, the therapist indicated if they wished to participate as a gatekeeper and/or as a participant. Eligibility criteria were reviewed with potential Group 2 participants but not with gatekeepers, as eligibility criteria were not needed to participate as a gatekeeper. Gatekeepers were provided with a list of the eligibility criteria, letters of information to distribute to their clients who used power tilt, and a script to read to their clients to introduce the study. Potential Group 1 participants contacted the researcher directly, to maintain confidentiality and anonymity for both the client and the therapist.

This small size of the clinical community and likelihood that participants held a collegial or therapist-client relationship with other participants prompted the need to ensure confidentiality in the data reported in this manuscript. During the writing of this manuscript it was identified that there was high potential for identification of a particular participant if pseudonyms were used. To maintain confidentiality, quotes were identified only as a therapist or an adult who uses tilt. Direct reference of each quote used in this manuscript as an example of the data within a constructed concept has been recorded in a separate secure document. In this way the researcher was able to ensure the data was a result of multiple participant perspectives and study credibility was maintained.

Once a potential participant contacted the researcher, arrangements were made to review the study, confirm eligibility, answer any outstanding questions and make arrangements
for the first interview. All participants reviewed the letter of information and signed the consent form prior to beginning the study.

Recruitment began in the spring of 2011 with community service agencies. Due to slow recruitment through this avenue, the outpatient programs at St. Joseph’s Health Care - Parkwood Hospital site were added as a recruitment avenue in June 2011. In October 2011, the upper age limit was also removed to expand the recruitment pool. The original rationale for the upper age limit was to maximize the potential that participants were accessing their community; it was felt that older adults would not access their community as frequently as adults between 18 and 64. After reflection on this criterion, and discussion with clinical colleagues related to the age of their clients using power tilt and their community activity levels, the researcher determined the rationale for the upper age limit did not warrant limiting the potential recruitment pool.

4.2.1.3 Number of Participants

In post-positivist grounded theory methodology, the number of participants recruited is dependent on reaching theoretical saturation of the data. (Strauss & Corbin, 1990; Corbin & Strauss, 2008), which has been discussed early in this manuscript. The first interview was the starting point of the study for each group of participants. To reduce the chance of early or false saturation, it was decided in advance that the minimum number of participants in each group would be three. This number was based on the specificity of the problem being studied and the small community size of adults who use power tilt and therapists who prescribe this technology. For each participant group, the total number of participants was determined using a constant comparative approach to data collection and analysis for the first interview, whereby when coding is repeating, with no new codes identified. This process is described earlier in the manuscript.

4.2.2 Multiple Methods of Data Collection

The methods of data collection chosen for this study were semi-structured interviews and a three-day journal. For Group 1 this format was; (a) a first interview to open discussion about using power tilt, and raise awareness of this process which is often tacit through discussion, (b) completion of a 3-day time-tilt journal, and (c) a second interview to allow
member checking of first interview analysis and facilitate greater depth of exploration. The format for Group 2 was the same with the exclusion of the journal. The details of these methods are described in the following sections.

In choosing these methods, study credibility was ensured through (a) triangulation of data modes, (b) member checking, which occurred at the start of the second interviews and, (c) maintaining coherence of study methods with the chosen methodological approach through representing multiple realities or viewpoints of the same phenomenon (Corbin & Strauss, 2008). Using multiple data modes also enabled the development of thick data in this study. Thickness of data refers to the depth or having substantial description detail of the participants’ experiences (data) such that there is an adequate knowledge base to understand the findings presented (Corbin & Strauss, 2008; Lincoln & Guba, 1985). The quality criteria of transferability is affected by thickness of data in that adequate description of data is present so the reader can discern if the findings are applicable for use in other contexts as well as substantiate the concept development.

4.2.2.1 Interviews

The choice of using interviews was based on the purpose of the study as well as clinical experience in working with both groups. Gaining the participants’ perspectives and insights through semi-structured interviewing allowed exploration of the processes involved in using power tilt for managing sitting pressures, which could not be achieved with non-discussion based methods. Given the relatively small community of therapists and people who use power tilt, and the potential for professional relationships between these two groups, anonymity was important to allow in-depth sharing of personal and professional experiences to occur. The researcher was also concerned about burden on participants such as travel, the need for extra assistance and scheduling. Individual interviews allowed anonymity as well as scheduling and location to be at the convenience of the participant thereby minimizing burden. Interviews occurred at the participants’ preferred location which included their homes, places of work and at Elborn College, Western University, London, Ontario.
4.2.2.1.1 **Content of first interview.**

Questions for the first interview for both groups were developed based on the literature, the researcher’s clinical experience and the purpose of the study. Semi-structured interview questions were developed to encourage participants to discuss their experiences with using power tilt for the purpose of managing their sitting pressures (Appendices B and C). The interview questions were loosely applied during the interviews which allowed the participants’ responses to guide the interview, as per theoretical sampling. In using this technique greater depth of the data was gained. After each interview, the audio recording was transcribed, analyzed and coded as per the iterative process of data collection and analysis consistent with post-positivist grounded theory (Corbin & Strauss, 2008; Strauss & Corbin, 1990). Again, as guided by theoretical sampling, the knowledge gained from this process guided the subsequent interview resulting in richer data being gathered (Corbin & Strauss, 2008; Strauss & Corbin, 1990).

To gain insight into the participants’ perspectives of various amplitudes of tilt, each participant was asked to demonstrate various amounts of tilt. Group 2 participants were asked to position a power tilt wheelchair in what they perceived as 15, 30 and 45 degrees of tilt (Figure 3).
Figure 3. Illustration of amplitudes of tilt requested during Group 2 first interviews.

The researcher measured each amount with an angle goniometer for comparison purposes and recorded it in relation to the requested amount. This information was shared with the participant once they completed all measurements, to facilitate further discussion and obtain feedback. Tilt demonstrations for Group 1 participants were completed towards the end of the interview in preparation for the time-tilt journal. Each participant was asked to demonstrate in their own wheelchair what they believed to be a small, medium and large amount of tilt. The terms used for tilt size differentiation were similar to that
used in the study by Sonenblum et al. (2009). Each tilted position was measured using the angle goniometer and recorded for use in the journal analysis.

At the end of the first interview, general descriptive information about each participant was gathered, such as years using or prescribing tilt. This information was used to describe the study groups thereby contributed to the transferability of the study findings.

4.2.2.1.2 Content of second interview.

The content of the second interview was developed from the comparative analysis completed after the first interview and subsequent peer debriefing with the researcher’s supervisory committee. Peer debriefing is a technique that was used to ensure not only the researcher’s objectivity but also credibility of the study (Lincoln & Guba, 1985). During the debriefing, the rationale for choices made, directions taken and interpretations of data, were explored, raising the researcher’s awareness of variations in data interpretations (Lincoln & Guba, 1985).

Following the peer debriefing, the direction for the second interview questions were determined for each group (Appendices E and F). During the second interview all participants were offered the opportunity to review their original transcripts (raw data); all declined. Also during the second interview, member checking of the analysis to date was employed. Lincoln and Guba (1985) indicate this process is the most important technique to demonstrate credibility of study findings. Since interactions with participants occurred only at two time points in this study, member checking was completed at the beginning of the second interview for all participants. This member checking provided the participants with the opportunity to provide feedback, consensus and disagreement with the constructed concepts and the preliminary provisional theory. Theoretical sampling guided the exploration of participants’ reactions to, and discussion about, these preliminary results generating rich, thick data for the continued analysis.

At the end of the second interview, all participants were thanked for their time and arrangements were made for dissemination of the findings if the participant was interested. Several participants were interested in having the results presented in some
format. One participant requested a copy of the transcript from both interviews as this participant realized during the course of the interviews, several ‘ahha’ moments arose that the participant wished to reflect upon for clinical application.

4.2.2.2  **Time-Tilt Journal**

In between interview one and two, Group 1 participants were asked to complete a time-tilt journal (Appendix D). The purpose of the journal was to gain insight into how the participants used power tilt in the context of their daily life and identify what influenced use or non-use over a 3-day period. The self-report approach used captured the context of power tilt use, rather than just a representation of the parameters for frequency, duration and amount, which was already completed in previous studies (Sonenblum et al., 2009; Ding et al., 2008; Lacoste et al., 2003). The journal was explained and equipment provided at the end of the first interview to reduce the burden of time and travel on participants. The timing of the journal completion was based on clinical experience suggesting that due to the embedded nature of tilt use in daily life, especially for experienced users, the interview was needed to raise participant’s awareness of their power tilt use. Participants had the option to complete the journal in written or audio recorded format. Group 2 participants were not asked to complete the journals as it was known by the researcher that their experiences related to power tilt wheelchairs could not be gathered in a multi-day journal.

4.2.3  **Summary of Study Design**

The use of both multiple methods and multiple sources of data provided the bases from which thick, rich data were gathered in this study. The techniques and methods used in the study design to maintain coherence with post-positivist grounded theory methodology have been detailed. The process by which the study design components were connected is detailed in the next section.

4.3  **Study Process**

The study design components form the foundation of the study, however equally important are the processes by which the components are executed in this study. To
maintain methodological coherence, both an iterative approach to data gathering and analysis as well as comparative analysis were employed. For ease of presentation, the study processes will be presented under the following subsections; (a) constant comparative analysis during the first interview phase, (b) within group comparative analysis, (c) time-tilt journal (Group 1 only), (d) comparative analysis across groups, (e) second interview with constant comparative analysis, (f) within group comparative analysis, (g) comparative analyses across groups following second interviews and, (h) theory generation. Again the reader is requested to keep in mind that these processes did not occur in as linear a fashion as suggested by the presentation. Also the reader will note there is repetition of many of the processes. For this reason there will be greater detail in the initial subsections to elaborate on the processes, however in similar subsequent subsections fewer details are noted. The reader can assume the processes were the same unless differences or changes in approach are specifically described. The reader can also assume the processes were the same for Group 1 as for Group 2 unless differences or changes are noted specific to the participant group.

4.3.1 **Comparative Analysis during the First Interview Phase**

First interviews were conducted with both groups simultaneously as each participant was recruited. The decision to keep the iterative process separate for each group rather than combining the groups was made in advance by the researcher. The purpose was to allow the opportunity to analyze each group’s perspectives separately before combining the perspectives, so as to provide more in-depth richer data. Figure 4 illustrates the iterative process used during the first interviews in this study.

To add depth and richness to the data collected, the knowledge gained from the data analysis was used to guide the next data collection session as per theoretical sampling (Corbin & Strauss, 2008; Strauss & Corbin, 1990). Concepts or ideas from the analysis were raised during subsequent interviews to explore concepts more fully. Questions also varied in how they were posed to participants to elicit more complete responses or more directed responses.
As each participant’s first interview was completed, the analytic process was initiated using a constant comparative approach within the participant groupings. The audio taped interview was transcribed into written format, removing of all identifiers to maintain confidentiality. In completing the transcription personally, the researcher was able to conduct a first read through without any coding, as is strongly suggested by Corbin and Strauss (2008). In doing so the researcher became more connected to the data through both written and auditory means. During the second read through of the written transcript the researcher completed manual line by line coding using both open and axial coding. Analytic strategies employed to facilitate coding included asking questions of the data and making comparisons during coding, to assist in examining the data from a variety of perspectives (Corbin & Strauss, 2008). To assist with this process, a master list of coded concepts for each participant group was developed to which new codes were compared.
Data were determined to either fit within an existing coded concept or a new coded concept label was created. Any new coded concepts were added to the master list. Several times coded concepts were reworked to better reflect the data. When new concepts were added to the master list, all the data in the effected concepts were reviewed to ensure fit or re-coded. Memo notes were kept to reflect the decision-making behind the choices made by the researcher as well as to note researcher influence on the interview process.

This iterative process of data collection and data analysis was followed after each first interview for each participant until no new codes or concepts were identified and all concepts were well constructed and defined (theoretical saturation) within each participant group (Corbin & Strauss, 2008). Once theoretical saturation was reached, data collection for that group was complete and no further first interviews were conducted. This process through the first interviews determined the total number of study participants as this process was not employed at any other phase of the study.

To ensure credibility of this analysis, peer debriefing was completed with the researcher’s supervisor. The original transcripts for these first interviews were blind reviewed and coded by the researcher’s supervisor without knowledge of the researcher’s codes. The researcher then compared the coding between the researcher and supervisor, counting the similarities and differences in coded concepts resulting in an 83% agreement in coded concepts.

4.3.2 Within Group Comparative Analysis Following Completion of First Interview Phase

Following peer debriefing the cumulative coded concepts for each participant group were further analyzed using open and axial coding in conjunction with the analytic strategies of making comparisons and asking questions. The concepts were re-analyzed, compared and related concepts grouped together into higher level concepts called categories (Corbin & Strauss, 2008). These categories represented relationships or interactions between concepts specific to process and/or context of using power tilt based on participants’ experiences (Corbin & Strauss, 2008). The raw data associated with the concepts in each category were reviewed to ensure the categories were grounded in the data. These
relationships were recorded as hierarchical lists with the layers of lower level concepts being categorized under the respective categorical label. As the analysis progressed, the analytic technique of diagram drawing was employed to illustrate the processes and subprocesses of how power tilt is used in varying contexts as well as facilitate reflection on the relationships and interactions between categories (Corbin & Strauss, 2008; Strauss & Corbin, 1990). During this analytic process, memo notes were taken of the researcher’s thought processes for connecting concepts and explaining relationships and interactions between concepts and categories.

As a result of this higher level analysis, the first drafts of initial theories were constructed for each participant group. Throughout this phase of the study, the researcher returned to the data to ensure credibility between the data and the emerging analytic scheme. This iterative approach entailed moving back and forth between the data, concepts developed, and theory being constructed, continuing to use the analytic techniques of diagram drawing, making comparisons and asking questions thereby ensuring the study results were grounded in the data (Corbin & Strauss, 2008). Once all categories were defined and the credibility of the emerging scheme was confirmed (conceptual saturation), peer debriefing between researcher and supervisor was employed to compare and contrast interpretations of the constructed theories and data for agreement. Following this peer debriefing, the researcher continued the iterative approach to analysis and theory generation using the same analytic techniques to advance theory generation. Diagrams continued to be used as an analytic tool during the iterative comparisons of categories, concepts and data to further the analytic scheme towards theory related to the factors that influence the process of power tilt use in context, was generated from the collected participants’ perspectives of how they used power tilt in the context of their daily lives (Corbin & Strauss, 2008).

4.3.3 Time-Tilt Journal Phase

As noted, the time-tilt journals were completed by Group 1 participants after their first interview. Participants left the first interview with the required equipment and instructions; the researcher picked up the journals at a pre-arranged time. At the time of pick up, the journal was briefly reviewed with the participant to ensure clarity in the
researcher’s understanding of the information. Immediately following collection of each journal, a first read through was completed by the researcher to gain a sense of content and determine whether new ideas or data were identified in comparison to the participants’ first interviews. The data from the time-tilt journals were merged with that of the first interviews.

An iterative approach for data collection was not used with the journals as the journals were to reflect each participant’s actual use of power tilt in their daily lives. For this reason the full analysis was completed once all journals were completed and collected. The data were transcribed by the researcher into a spreadsheet based on the first participant’s journal format. There was great variability across journals in the number of entries made ranging from 9 to 79 entries per day. Following transcription, open and axial coding was used to begin concept development similar to that completed for the first interviews.

Journal content was further analyzed based on the amplitude of tilt indicated with each entry. All entries tagged as large tilt were grouped together, similarly with small and medium tilt entries. Using the same analytic techniques as in the first interview analysis, codes from each grouping were then compared and contrasted to elucidate differences and similarities in dimensions, properties and context between different amplitudes of tilt. This analysis provided a more in-depth analysis of the activities that occurred in these specific amplitudes of tilt. The concepts developed from the time-tilt journals were combined to the results from the first interviews, which added richness and depth to the existing categories and preliminary theories.

4.3.4 Comparative Analysis Across Participant Groups

Following the group analyses of the first interviews and the time-tilt journal, the comparative analysis combining the data from both groups was completed. The purpose of this analysis was to begin to address the study goal of clinical applicability of results, to advance knowledge creation, and contribute further to study dependability and confirmability through triangulation of these multiple sources of data. Saturation of data was not a goal at this point in the process as the primary goal of the analysis was to
increase researcher sensitivity to the data and to identify the content and questions for the second interview based on theoretical sampling.

Analytic comparison across the two participant groups contrasted the lists of higher level categories and their associated lower level concepts as well as diagrams that were developed during the within group comparative analysis. This comparison examined the categories for similarities and differences between the two participant groups. Comparison of the analytic diagrams drawn during each within group comparative analysis followed.

The results of the comparative analyses to this point were reviewed with the researcher’s advisory committee as a peer debriefing technique. The outcome of this peer debriefing was agreement with the preliminary analytic schemes presented as well as the direction and content for the second interview phase of study.

4.3.5 Second Interview with Constant Comparative Analysis

The content of the second interview was developed based on the preliminary findings of the first interviews and the peer debriefing of those findings with the researcher’s advisory committee. The purpose of the second interviews was to maximize richness in data collection, increase triangulation of data through multiple sources of data, and employ member checking therefore all participants completed a second interview. The researcher also felt strongly that verification of the preliminary results across all participants was critical to advance the study towards the goal of clinical application. For these reasons, all participants were requested to complete a second interview.

The second interview consisted of: (a) a review of the results to date using both the categorical lists and the process diagrams developed during the within group comparative analysis and; (b) open ended semi-structured questions designed to elaborate on the results from the first interview and journal analyses. The initial process for the second interview was the same as the first, including the use of the iterative approach with constant comparative analysis for data collection and data analysis and analytical strategies. The list of categories and associated lower level concepts developed from the
analyses of the first interviews were used for comparative purposes. Data that confirmed or expanded upon an existing concept were added to that grouping adding further depth and richness to the analysis. Data that did not fit into existing concepts formed new concepts which were analyzed using a similar approach to that of the first interview phase. For example, the method by which participants managed their sitting pressures was a new concept identified in the second interview. This new concept challenged the researcher to remove her clinical lens, which would have been to educate and correct misconceptions related to best practices related to pressure management. Through reflection during the course of the interviews and in reviewing the transcriptions prior to the next interview, the researcher was able to modify her verbal and non-verbal approach to the interview to reduce the clinical influence.

4.3.6 Within Group Comparative Analyses Following Second Interview

Following the completion of all second interviews, a comparative analysis was completed within each participant grouping. This analysis followed the same processes as completed for the first interview phase. New concepts were explored using the same analytic strategies to develop higher level concepts, categories and relationships until conceptual saturation was reached. The reader is reminded that the length of this section of the study process is not reflective of the process itself as much of the process presented in section 4.3.2 was repeated in this phase.

4.3.7 Comparative Analysis Across Groups Following Second Interview

The final comparative analysis across groups was completed using the analytic strategies of asking questions of the data and making comparison as were employed in previous comparisons. Diagram drawing was advanced to incorporate the similarities and difference as well as feedback received during member checking. The analysis also focused on delineating the influence of process and context of using power tilt with respect to the data.

Using the iterative approach to this comparative analysis supported the credibility and confirmability of this part of the analysis. Where differences between groups occurred, the same approach used initially to identify the differences continued along the entire
analysis trail. The researcher returned to the raw data to re-examine it using the analytic strategies of making comparisons, and asking questions of the data, as well as about the context and process of using power tilt. Where differences were not fully explained, the analytic strategy of theoretical comparisons were employed by drawing on personal experience and exploring various meanings of words (Corbin & Strauss, 2008). Drawing on personal experience, the researcher expanded creative thinking to further explore varying perspectives and potential interpretations. The researcher’s experience was not included in the data but was used as a catalyst to advance interpretations to elucidate possible meanings attached to the data. Exploring the various meanings of particular words in relation to the identified differences also assisted in advancing the interpretations of the data. For example, the words pressure management and managing skin were used only by Group 2 and Group 1 participants respectively. Both words convey similar meanings but different contexts and resulted in different actions. Analyzing these words assisted in clarifying how and why the process differed between these two groups and the implications of that difference in respect to using power tilt. This re-work of the differences between groups elucidated how these differences influenced the process of using power tilt as well as the influence of context on creating or contributing to these differences. The comparative analysis at this phase continued until all concepts and categories were well defined and explained in relation to process and context.

4.3.8 Theory Generation

As was noted in the introduction to this section, theory generation and concept development are an iterative process. In the analysis of higher level concepts and categories, the process by which concepts interact and/or are related as well as the contexts in which they occur, played a larger role. This higher level analysis shifted from exploration of the data by description to more abstract theoretical interpretation, thus ensuring theory generation was driven by the concept development (Corbin & Strauss, 2008). Theory generation started in the early stages of concept development after the first interviews. The various types of analyses used to integrate categories and concepts have been presented in the previous sections and have highlighted the analytic approach
taken at various phases of the study to raise the raw data to more abstract concepts and theories about the interactions and relations between concepts.

During this higher level analysis, diagram drawing became a key analytical strategy used in conjunction with asking questions of these higher level categories and relationships thereby generating preliminary theories related to how power tilt is used in daily life. Diagrams developed during the first interview phase formed the preliminary theoretical scheme. A critical component of the diagram drawing strategy was returning to the raw data to validate that the data supported the preliminary theoretical framework being constructed in the diagram (Corbin & Strauss, 2008). This scheme was validated by participants at the start of the second interview. The analyses from the second interview phase built upon this preliminary theoretical scheme, adding depth and richness through the confirmation and expansion of the existing categories and relationships.

4.3.8.1 Final Theoretical Integration

While theory generation occurred throughout this study, final integration of the substantive theory to explain how power tilt was used in everyday life began towards the end of the second interview analyses. During the process of final theoretical integration, the focus shifted to integrating interrelated categories and concepts around a core category to consolidate the theoretical framework. Early in the final theory integration phase, peer debriefing occurred first with the researcher’s supervisor followed by debriefing with the researcher’s advisory committee. The process was similar to that of previous peer debriefing, with the confirmation of the core category and conceptualization of the process and context categories the outcome.

The primary analytic technique employed in final theory integration was the continued use of integrative diagrams to verify and refine relationships between categories in relation to the core category (Corbin & Strauss, 2008). The theoretical structure illustrated in the diagram was reviewed, including the categorical relationships and application of conditions from the raw data to confirm applicability and internal consistency of the scheme. Where gaps in clarity of the structure were identified, the researcher returned to the concepts and raw data to review and re-analyze for clarification.
or expansion upon interpretations. A scoping review of the power tilt literature was completed as a means to further explore possible meanings within the data where gaps existed but also to refine and validate the theoretical scheme (Corbin & Strauss, 2008).

4.4 Summary of Methods

Chapter 4 has illustrated how this study has maintained coherence between methodology, paradigm and study goals through both the study design and study process thereby ensuring study quality. The use of multiple sources of data and multiple methods of data collection in the study design set the foundation for the study process as well as ensuring the quality criteria of credibility, transferability, dependability and confirmability were addressed. The study design was based on the key methodological constructs of post-positivist grounded theory with comparative analysis being central to the iterative approach used for data collection, data analysis, construction of concepts and generation of theory (Ballinger, 2006; Corbin & Strauss, 2008; Finlay, 2006a). Using this approach allowed for the systematic collection and analysis of data for the development of concepts, categories and relationship which formed the basis for theory generation (Corbin & Strauss, 2008; Finlay, 2006a; Murdaugh, 1989; Stanley, 2006; Strauss & Corbin, 1990; Walls et al., 2010). Figure 4 illustrated the back and forth nature of the iterative approach used in the study design and process, which ensured that the researcher remained immersed in the data throughout the study.

The purpose of this post-positivist grounded theory study was to create new knowledge and to generate a substantive theory regarding the process of how power tilt is used in daily life, specifically for the purpose of managing sitting pressures. This chapter has highlighted how this goal was built into the study methods. In the chapters to follow, the knowledge created through concept development and the generation of a substantive theory will remain the primary focus.
Chapter 5

5 STUDY RESULTS

This post-positivist grounded theory research study resulted in the creation of new knowledge and subsequent generation of a substantive theory related to how power tilt is used in daily life, particularly for managing sitting pressures (Corbin & Strauss, 2008; Morse, 2009; Murdaugh, 1989; Stanley, 2006). In this study, knowledge was created as the researcher developed concepts based on the shared properties and characteristics of the participants’ described experiences. These concepts began to explain the behaviours involved with using power tilt in the context of daily life. As concept development progressed, becoming richer with greater depth of description so too did theory generation, especially as concepts were raised to higher levels of abstraction through in-depth analysis. The analysis of the relationships and interactions between these higher level concepts enabled the development of the preliminary theories of power tilt use (Corbin & Strauss, 2008).

Concept development and theory generation occurred iteratively during analysis at each phase of this study as outlined in the design and process framework in the methods chapter. Using an iterative approach allowed the analysis to remain grounded in the data thus ensuring validity of concept development and theory generation.

If theory building is indeed the research goal, then findings should be presented as a set of interrelated concepts, not just a listing of themes. It is the overall unifying explanatory scheme that raises findings to a level of theory. The subconcepts with all their properties and dimensions provide the detail. Concepts are related through statements that denote the nature of the relationship (Corbin & Strauss, 2008, p. 104).

Since generating a substantive theory was a goal of this study, the results have been presented based on the analysis of the relationships and interactions that resulted in the construction of the theory scheme.
5.1 Plan of Presentation

The knowledge descriptors are presented first to allow the reader to determine the applicability of the study’s context to his or her own situation. In this way the context of the study is described thus ensuring study quality through the criteria of transferability.

Following the description of the study context is the overview of the substantive theory. The purpose of presenting an overview is to orient the reader to the theory, as the presentation of the results is based on the theory. The diagrammatic representation of the final theoretical scheme depicts the phases of the process and the contextual factors that influence the process phases of using power tilt in daily life. The diagram is followed by a brief explanation of each theory phase. This overview of the theoretical scheme provides the framework for presenting the results of this study in the subsequent sections.

It has been noted in several places in this manuscript that process and context do not occur in isolation or linearly but occur iteratively with each influencing the other throughout the course of this phenomenon. For the purpose of this paper, process and context are presented separately, forming the primary sections of this chapter. The phases for the process of how power tilt is used in daily life are presented first followed by the phase of contextual factors, including how they interact with and influence the process. Within each of these two primary sections each phase of the process and each contextual influence are described under the headings of concept development and theory generation. Concept development is comprised of descriptions of the in-depth analyses of the relationships and interactions between concepts and categories which are presented to elucidate how they were constructed from the participants’ experiences. Participant statements are used to demonstrate that concepts were grounded in the data (Corbin & Strauss, 2008). Theory generation sections describe how the knowledge created in concept development for that phase contributed to the generation of the theory.

This chapter concludes with applying the theory to daily life as a means to summarize and highlight the iterative nature of process and context in using power tilt in daily life.
5.2 Context of the Study

The context in which this study occurred is described first to ensure transparency and coherence with quality criteria. Study descriptors not only elucidate the transferability of the study results for the reader but were also used to guide the researcher to ensure the analysis remained within the contextual parameters of the study. This study occurred in Middlesex County and the city of London, both of southwestern Ontario, Canada. The descriptive information provided during the first interview was transcribed into Table 8 for Group 1 participants and Table 9 for Group 2 participants.

Table 8. Descriptors for Group 1 participants (people who use power tilt).

<table>
<thead>
<tr>
<th>Descriptors</th>
<th>Participant number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>Age</td>
<td>34</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>SCI</td>
</tr>
<tr>
<td>History of pressure ulcers</td>
<td>Previously on right scapula</td>
</tr>
<tr>
<td>Gender</td>
<td>F</td>
</tr>
<tr>
<td>Time using power tilt</td>
<td>9 years</td>
</tr>
<tr>
<td>Amount of time out of home</td>
<td>14 hrs/wk</td>
</tr>
<tr>
<td>Amount time up in wheelchair</td>
<td>14hrs/day</td>
</tr>
<tr>
<td>Living arrangement</td>
<td>house</td>
</tr>
<tr>
<td>Urban/rural</td>
<td>urban</td>
</tr>
</tbody>
</table>
Four Group 1 participants were recruited through a regional rehabilitation hospital outpatient program and one was recruited via another Group 1 participant. All Group 1 participants completed all three components of the study. Only one participant was employed but not for the full duration of the study. Two participants described plans for travel outside of the country in the six months following the study.

Table 9. Descriptors for Group 2 participants (therapists who prescribe power tilt [Th]).

<table>
<thead>
<tr>
<th>Descriptors</th>
<th>Th1</th>
<th>Th2</th>
<th>Th3</th>
<th>Th4</th>
<th>Th5</th>
<th>Th6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years Practicing</td>
<td>24</td>
<td>30</td>
<td>24</td>
<td>34</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Years Prescribing</td>
<td>10</td>
<td>20-25</td>
<td>20</td>
<td>12</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Number of power tilt systems prescribed</td>
<td>1-6/year</td>
<td>20-30/year</td>
<td>5-6/month</td>
<td>1-2/year</td>
<td>4/year</td>
<td>3-4/year</td>
</tr>
<tr>
<td>Work Setting</td>
<td>Community</td>
<td>Hospital outpatient program</td>
<td>Hospital outpatient program</td>
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<td>Hospital outpatient program</td>
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</tr>
<tr>
<td>Diagnostic populations prescribing power tilt</td>
<td>CP; frail elderly; Parkinson’s</td>
<td>MS; CP; SCI adult</td>
<td>MS; ALS; SCI adult</td>
<td>CP; SB</td>
<td>SCI</td>
<td>SCI</td>
</tr>
<tr>
<td>Age range of population</td>
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<td>18-65</td>
<td>20-40+</td>
<td>middle age</td>
<td>24-30</td>
<td>19-70+</td>
</tr>
<tr>
<td>Living situation(s) where seeing clients</td>
<td>personal homes</td>
<td>group home; assisted living</td>
<td>assisted living</td>
<td>home</td>
<td>rural &amp; urban</td>
<td>not stated</td>
</tr>
</tbody>
</table>
Three of five Group 1 participants indicated they had a pressure ulcer on their buttocks in the past but none had a current ulcer. One participant experienced a scapular pressure ulcer for which she used tilt to sit upright to reduce the pressure felt at the site as a method to reduce risk of recurrence.

Three of the five participants were known to the researcher with only one having been a client but over 8 years previous. To establish a trusting relationship with Group 1 participants, during the consent process it was made very clear that information gathered would not be shared with anyone. The researcher was also transparent in sharing that she worked part time for the local rehabilitation hospital’s outpatient wheelchair and seating program but that she could not provide any wheelchair related service.

All Group 2 participants completed both interview components of the study. All Group 2 participants were experienced therapists ranging from 17 to 34 years of experience. While all these participants met the eligibility criteria of prescribing at least 2 tilt systems per year, there was great variability in the number prescribed across participants. There was less variability in the populations for whom tilt was prescribed, with three of the six participants working entirely with people with spinal cord injury. All Group 2 participants were known to the researcher as clinical colleagues. In this relationship between the researcher and Group 2 participants, mutual respect and acknowledgement of the level of knowledge and skill for this topic area existed. This relationship fostered an open discussion particularly since the participants additionally knew the researcher was bound by confidentiality and was trustworthy of this bond, based on that clinical relationship.

The purpose of the descriptors was not for comparative purposes with the study results, therefore the influence of personal characteristics such as gender, age or years of experience on the results were not analyzed. This descriptive information is presented to assist the reader to determine if this study’s context is similar enough to his or her own situation to allow application of the results.
5.3 Overview of Theory

The purpose of this study was to explore how power tilt was used in daily life particularly for the purpose of managing sitting pressure. The theoretical scheme, as illustrated in Figure 5 represents the process and context of how power tilt was used in daily life. Results related to using tilt for managing sitting pressures are described within the phases of the theory. Consistent with post-positivist grounded theory, this theory scheme was generated around the core concept. As noted in the methods chapter the core category represents the main unifying theme of the findings and is linked to most other concepts and categories, giving it explanatory power (Corbin & Strauss, 2008). The core category in this study was identified as the decision to use or not use tilt. The colour coded boxes in Figure 5 represent the phases of the process and contextual factors.

The Need Identification phase (red box) represents the issue/problem/situation which has arisen, that requires a change physical body position. The identification of the need to change body position is followed closely by the decision to use or not use tilt. The Decision Making phase is illustrated by the yellow interconnected boxes. In the first sub-process, the possible action(s) to address or resolve the issue/problem/situation are considered. If using tilt as a means for changing body position to enable the action was considered, then decision making process flowed into sub-process of weighing the benefit of using the tilt against the benefit of not using the tilt. Throughout the shared experiences, situations were described where tilt was not a consideration. In these situations, weighing of benefits did not occur. As illustrated in Figure 5, regardless of whether the decision making pathway included using tilt or not, the end result was always an action. The action (purple box) enabled: (a) the need to be directly addressed or resolved and/or; (b) participation in an occupation. The full theory is situated in daily life as represented by the large light gray box. The process of using power tilt did not occur in isolation but in the context of the participants’ many daily life occupations.
The contextual categories of person, environment and function were derived from participants’ experiences. The importance of the interaction between contextual categories is represented by the single blue box enclosing these three categories. The
collective contextual influence on all the phases throughout the entire process is illustrated by the blue bracket.

Throughout this process, from incident to action, feedback is received that contributes to learning and gaining experience, which then shapes decision making the next time a similar incident occurs. Feedback is represented by the large black arrow on the right side of Figure 5.

This purpose of this overview was to orient the reader to the entire process and context of using power tilt in daily life. With this orientation, it is anticipated that within each of the following sections the reader will relate the descriptions, concept development and theory construction back to the theory. Relating content of each section back to the overall theory will assist in fully understanding the fluidity of the interactions and interplay between concepts, categories, relationships and theory phases, which have been challenging to capture in the linear format of a written manuscript.

5.4 Process: Basic Framework of Theory

The basic framework of the theory was generated from the preliminary analysis of the participants’ described reasons for using their tilt. These reasons included factors that influenced how and why they used tilt in their daily life. Group 2 participants described similar reasons as Group 1 but from a more collective view based on their experiences with numerous clients. Group 2 also described reasons they prescribe power tilt, which were included in this analysis. The following section presents the analytical progression from data to concepts to conceptual relationships which comprise concept development. From this concept development, the basic theoretical framework was formed which denotes the relationships and interactions between the described reasons for using tilt and the action of using tilt. This basic theory framework is further elaborated in section 5.4.2 titled Theory Construction.

5.4.1 Concept Development

The various levels and types of analyses used in this study to achieve conceptual saturation are highlighted in previous chapters so will not be repeated here. The findings
presented here are the result of triangulation of 27 sources of data during the comparative analyses as described in the methods chapter. The sources of data included ten Group 1 interviews (five participants, two interviews each), five Group 1 time-tilt journals and twelve Group 2 interviews (six participants, two interviews each).

The first conceptual category, labeled as Reasons for Using Tilt, was developed from experiences from both participant groups. All participant descriptions included how tilt was used within different contexts of daily life experiences as well as the factors that limited or enabled use.

Group 2 participant experiences alone formed the category Reasons Therapists Prescribe Tilt (section 5.4.1.2). These results are presented to highlight the differences between the participant groups in the conceptualization of power tilt use and to elucidate the challenges faced in reconciling prescription and actual use described by Group 2 participants.

5.4.1.1 Reasons For Using Power Tilt

Throughout the interviews, participants in both groups described reasons they either used, or felt people used, power tilt. Similar concepts were grouped together, forming the higher level categorical concepts of; (a) resting/relaxing, (b) fatigue management, (c) to be able to function, (d) comfort/discomfort, (e) physiological needs, (f) fatigue, (g) posture/positioning, (h) use by caregiver to support the person, (i) feeling pressure, and (j) pressure management. The development of these categories was confirmed by both groups during member checking at the start of the second interview as well as by the time-tilt journals. From this second interview, no new ideas which fit into the Reasons for Using Tilt category were identified. Experiences which expanded upon previous data were combined with the concepts in the appropriate above category. It is important to note that an exclusive relationship did not exist between a participant statement and a categorical concept. Statements often contained several overlapping ideas therefore aspects of each statement are often reflected in more than one categorical concept. For this reason, some participant statements are used in more than one category.
Each of the above identified categorical concepts is presented in the sections that follow. An overview of the concepts that created the categorical concept is provided, followed by samples of participant statements to demonstrate the relationship between concepts and category.

5.4.1.1.1 Resting/relaxing.

This conceptual category was constructed from the interviews from both participant groups as well as the time-tilt journals for group 1. The time-tilt journals of Group 1 indicated that for resting, napping and watching television, large degrees of tilt were typically used. This use of large tilt was consistent with data from the interviews where participants identified positioning themselves in a large degree of tilt to rest, relax or have a nap. “I will tilt back quite far and put my head up against a wall. “Sometimes I will take a nap or just rest” (Group 1 participant). “Some people use it to sleep in as well” (Group 2 participant).

Some participants spoke of needing to monitor how far back they tilted to avoid inadvertent sleeping during the day. Others spoke of using tilt as a substitute for laying down in bed or to reduce the number of transfers back to bed required in the day.

“Because uhm I see a lot of people using it for rest periods. It avoids that extra transfer in and out of bed, or two or three transfers” (Group 2 participant).

If my back is sore or like uhmm I am tired, I will just tilt it back all the way and then have a nap or whatever. I can’t get in and out of bed myself. Like if I was up late or whatever, or just tired for whatever reason then I usually do that to just have a little nap. (Group 1 participant)

Like there’s probably no way I would put it all the way back unless I wanted to have a nap. Cuz when it’s all the way you are basically on your back so there’s really not much else you can do other than sleep (Group 1 participant)

Participants in both groups indicated that using large amplitudes of tilt was useful primarily for napping or resting as it was not a functional position to be in regularly
through the day. No other ranges of tilt amplitudes were described in association with resting, relaxing or napping.

5.4.1.1.2 Fatigue.

Several participants describe using tilt to help address fatigue. Fatigue was described as body fatigue or low energy. While there is overlap in meaning between fatigue and being tired, it was felt to be a separate concept, especially since several participants had a diagnosis of multiple sclerosis.

Uhmm fatigue yah. I start getting fatigued around dinner time. But then again after, that’s when I will try to tilt back, again evening time, TV time. But then I’ll you know, I’ll stay reclined for a bit and I’ll start to find things that I need to start preparing. (Group 1 participant)

Do you find it (tilt) influences your energy levels? (researcher)
Yes it does, thank goodness. Because if I didn’t uhm, it, uhm, it takes more energy if you have to, uhm, uhm conserve energy, that’s what the tilt helps me do. It’s to help conserve the energy. Cuz if I was straight in the chair, I would have to, yah, it would take energy to sit straight. But now at least I’m able to tilt and to conserve energy. (Group 1 participant)

5.4.1.1.3 Fatigue management.

Several participants described their experiences with using tilt to manage their fatigue through the day. One participant described her use of tilt for fatigue management as a structured and/or timed use. This planned use of tilt assisted with managing fatigue so as to reduce the impact of fatigue on her ability to function throughout their day.

What I have found is that it’s by the clock. You are not clock watching but if a half an hour goes by and you have had no piece of rest or change of position, then the second hour will not go well. If it’s half a day and there’s been no rest, you will pay for it later. For me I have a 4 day payback time. If I overdo it Sunday, Wednesday I will have a downer. I may hardly wake up in the morning.
Unbelievable. And how I have learned that is, that I would have a terrible day of weakness and tiredness. (Group 1 participant)

Ya, my level of fatigue is probably better because the tilt is used more often, no questions. We are discussing things here and I’m half laying down. If I were sitting up this long simply talking about something I would be far more fatigued. I just get weary…it’s really important to avoid issues of fatigue. And one is sitting in the same position for too long. Whether it’s church or a meeting, sitting with your knees under a table or long meal, I’ve learned that. It’s nice to go out for dinner with somebody but if it’s more than an hour though, I’m not comfortable and I’m tired. (Group 1 participant)

Using large degree of tilt to manage fatigue was often consciously planned or built into the day as a means to reduce the impact of fatigue on the ability to function through that day and the days following. Other descriptions included just using a variety of tilt ranges to changing position frequently through the day to offset fatigue and discomfort but these were also planned to some degree. In all related participant statements there was not a clear delineation of differences in fatigue in this category and the fatigue described in the previous category (section 5.4.1.1.2) however the use of tilt in a planned manner as opposed to the use of tilt in response to fatigue warranted separate concepts.

5.4.1.1.4 Comfort/discomfort.

Using power tilt to change position to address or resolve discomfort was described by participants numerous times in many ways. Descriptions were related to muscle or back strain, discomfort in a specific area of the body or just generally not feeling comfortable. “And yeah, my back’s sore, my bum’s sore or whatever. I can use it (tilt) to move around and get a little more comfortable” (Group 1 participant). When participants were asked what kinds of things would make them tilt during the day, discomfort or feeling uncomfortable or needing to move to a comfortable position were very frequent responses. “Probably lack of comfort. If you are uncomfortable, you just have to be body aware. Even before skin breakdown or anything, just body aware” (Group 1 participant).
Addressing or resolving issues of discomfort or lack of comfort by using tilt to change body position was often described by participants as one of the benefits of having tilt. Many described tilting for this reason as an automatic or subconscious response to the physical need. “Discomfort always makes me move” (Group 1 participant). During the interviews, it became apparent that discomfort was a primary reason that tilt use was triggered. However with further exploration it was also identified that several of the other categories within the Reasons for Using Power Tilt were a precursor to discomfort. These relationships between categories contributed to theory construction therefore are elaborated in that section.

5.4.1.1.5  

*Use of tilt by caregiver to support the person.*

The use of tilt by caregivers to support the person in the wheelchair was identified by participants in both groups as an important use of tilt. Participants reported that caregivers used tilt to facilitate proper positioning, especially as part of the morning care routine. “Getting a good position at the start of the day right from when you get going and then maintaining that through the day” (Group 2 participant). Tilting the chair into a large degree of tilt to facilitate proper positioning in the chair at the start of the day was a common reason for using tilt identified in both participant groups.

In the morning when I get up they use the lift and they tilt the chair all the way back to get (me) into the chair. And then, uhm, the rest of the day I just use it to go like get pulled back in the chair, when I slide out I can just tilt back. (Group 1 participant)

I get up in the morning I’m lifted out of bed and the first thing that is important is the chair is tilted well back so I’m landed from the sling into the chair; I’m in the sling, so landed in the chair. If the chair is uhm, tilted back, yes tilted back you get a landing into the back of the chair and my bum really settled into that little L shape of the chair…I’m right back in the chair when I first get up. (Group 1 participant)
And to get seated in the chair properly with the tilt. Like when I train my girls when they come in to do morning shift when I have to get into the chair, that’s one of the most important parts is that they get me into the chair properly. Because this is where I am going to be for the rest of the day. (Group 1 participant)

Several Group 1 participants also described how their caregivers used tilt to change the participant’s position in space to facilitate activities such as personal care, or how participants changed their own position using tilt to make care provision easier on caregivers.

Well uhm, my girls, my staff they uhm, they use the tilt in different ways. Well yah, when I’m getting out of bed, it has to be a certain, it can’t have tilt to put me in the chair but when they set me back into the chair it has to have a large amount of tilt so my butt slides all the way back into the chair. And then when we are eating breakfast, I’ve got to be in a bit of tilt otherwise my food doesn’t go down properly. And then when I’m, uhm, in the, when I’m doing my teeth. Don’t forget it’s (all) done for me. Uhm there’s a lot of different ways that I use tilt. (Group 1 participant)

Yeah, I usually tilt back and let them put my shoes on and stuff like that, so I don’t slide out. (Group 1 participant)

Participants, particularly from Group 1, described using tilt to augment or replace physical movement required for different activities as a way to assist or participate in their daily life occupations.

5.4.1.1.6 Posture/positioning.

Participants described using power tilt to change their position in space to address issues with posture. “I find if I tilt back too long uhm I start slouching so I’ll consciously tilt more vertically so I am sitting up straighter because I value good posture” (Group 1 participant). Participants also described using tilt to facilitate a change in their body
position when maintaining that position was causing issues or problems for them. “The other thing I tilt for, I have no stomach or chest muscles so if I am going down a hill I will tilt the chair back so that I don’t fall forward” (Group 1 participant).

And then the rest of the day I just use it (tilt) to go like get pulled back in the chair when I slide out, I can just tilt back. If somebody is here they can help me by going behind me and pulling, and I can push with my feet. If I have the headrest on then I can do it myself, I push with my feet...if I don’t have the headrest on I can’t do it by myself. If I do have it (headrest) on it gives support behind my head so it’s easier to do. (Group 1 participant)

Very frequently the discussions about posture and positioning were related to discomfort and how the trigger to use tilt was actually discomfort, caused by a posture or positioning issue or problem. Group 2 participants more often described the use of tilt to support posture as a means to improve balance against gravity to affect function or as a means to evenly distribute sitting pressures.

I think that people that use it (referring to tilt) and use it well are probably the ones that get it in a more and I will say timely fashion meaning they maybe are starting to need it for postural control or for positioning and then they see the benefit of it where if they get it later where maybe they have managed in an upright positioned then they don’t always see; again because they are used to functioning in that position they don’t always see the postural benefits or positioning benefits when they actually get it. (Group 2 participant)

Yea, so personally I think I look at it first and foremost from the postural benefits. I think that to me is a direct link to the pressure management, because if you can posturally support them and maintain that posture then we [italics denote participant emphasis] know there are benefits in terms of how they are weight bearing more equally. (Group 2 participant)

The differences in perceptions of posture and the effect on other reasons for using tilt between Group 1 and Group 2 are evident in these participant statements.
5.4.1.1.7 **Physiological reasons.**

Participants in both groups described different physiological reasons tilt was used, such as managing hypotension and swelling in feet “I don’t know if I talked about swelling feet but that’s another reason for the tilt” (Group 1 participant). Often these physiological reasons for tilting caused a feeling of discomfort, which would trigger tilt use. Other times the physiological reason itself was the direct trigger to tilt use “I’ve got uh, really low blood pressure so it always messes with my head so I am always tilting back or tilting up for blood pressure mainly” (Group 1 participant).

But for our people, spinal cord right, it’s all interlinked, so respiratory function and the influence of how they are sitting, how their diaphragm is resting against their abdominal content, would be influenced by the tilt so that can be helpful that way too. (Group 2 participant)

And also another reason someone had been recommended for a power tilt was because of hypotension and not postural instability but because he couldn’t sustain an upright posture without getting blackouts. (Group 2 participant)

The relationships between the reasons for using tilt are exemplified in the second last participant statement, where the reasons are described as interlinked.

5.4.1.1.8 **Feels pressure.**

A few participants in Group 1 described feeling pressure on various body parts as a reason to use tilt to change body positions. Pressure was often related to feeling uncomfortable and needing to relieve the discomfort by moving to change the pressure.

And I think uhm it takes a bit of pressure off of the back. Like my when I’m sitting straight, I have different strain on my back then I do when I go into tilt. It takes the strain away. (Group 1 participant)

And I have just another thing. My uhm, I put pressure on my elbows, and I need, if I have too much, if my elbow is bothering me, if I put tilt on, it takes a bit away
of the stress on my elbow…cuz my arms hold part of my body up. (Group 1 participant)

Using tilt to resolve or address pressure was not a frequently cited reason for using tilt among the Group 1 participants. However when the concept of discomfort, as a reason for using tilt, was further explored, the cause of the discomfort was often related back to feeling pressure. Participants acknowledged that sometimes it was pressure that caused the discomfort which then triggered using tilt to resolve that discomfort. “When I’m watching TV., to be more comfortable I will tilt back a bit just so that uhmm I don’t have pressure on my butt. It’s more comfortable to sit back a bit” (Group 1 participant).

Group 2 participants described how feeling pressure could trigger the use of tilt for shifting weight and changing pressures on the sitting surface. Group 2 participants also described experiences where their clients’ lack of sensation reduced use of tilt because pressure was not felt therefore did not trigger the need to use tilt to change position.

Whereas someone who is a quadriplegic or something where the tilt is mainly for skin protection, you don’t always feel that discomfort and that you are breaking down (referring to skin breakdown) so you don’t think about it, “Gee I’ve got to go back into tilt”. (Group 2 participant)

5.4.1.1.9 Pressure management.

Pressure Management was a concept that was not stated as obviously as all the other reasons for using tilt by Group 1 participants. Group 2 participants however, indicated that they often prescribed power tilt for the purpose of managing sitting pressures and expected it was being used that way. “As for skin issues, they are worried they can’t shift their weight around and can’t off bear (off load) from their skin, so they tilt back” (Group 2 participant). In the second interview Group 2 participants expressed surprise at the limited identification by Group 1 participants of pressure management as a reason to use tilt. “…none of the clients talked about using tilt for pressure management (researcher). They don’t change pressure or pressure points in terms of amount of changing pressure?!?” (Group 2 participant)
While Group 1 participants did not identify pressure management as a reason to use tilt initially, once it was brought to their attention during the review of findings during the second interview, they did acknowledge its importance and discussed how they managed their skin. Management for some was an awareness of an area of risk and monitoring it through the day. “Sometimes, the pressure sore that was on my shoulder blade, so I have to be aware of that, so I tilt up for that” (Group 1 participant). Other Group 1 participants interpreted managing sitting pressures as monitoring their skin and acting accordingly if there were issues noted. In the following statement the participant based the amount of tilt use, or alternative ways to shift her weight, on the report she gets from her caregivers.

From a prevention point of view, is that something that plays into the use at all, in terms of, I know you said you were told you should be tilting to prevent pressure sores? (researcher)

But by having the girls continuously look and monitor, I’m asking the same questions every morning and every night “How red is it?” That’s basically, I’m basing what I do upon what they are telling me. (Group 1 participant)

When Group 1 participants were asked if they felt they used their tilt to its fullest benefit to managing sitting pressures, all indicated they did. When asked how their use of tilt would change if they did develop a pressure ulcer, all Group 1 participants indicated they would use tilt more, indicating this meant being in larger degrees of tilt more often through the day.

I would change position more often. And I would go by the clock then I know, every ten minutes I should move. It’s the same thing as fatigue. If I am tired I’ve waited too long, I should have made a change sooner. I should have rested sooner. With the pressure sore business, if I feel like I have pain then I have waited too long. I should have moved sooner. It’s too late to avoid the problem after you already feel it there. (Group 1 participant)

Descriptions of pressure management by Group 2 participants paralleled this previous participant’s statement. Pressure management was a planned use of tilt to change
pressures at the sitting surface by using large tilt for several minutes at a regular frequency over the course of the day.

So I guess again it’s the therapist’s interpretation of using it well, is consistently repositioning themselves a few degrees forward and back as opposed to for specific purposes. “I go into this much tilt cuz I’m going to make a transfer in that position and then I come out of it” or “I drive in this position.” It’s very specific task oriented positions as opposed to the way you or I shift naturally in our chair. (Group 2 participant)

For Group 2 participants there was a link between pressure management and posture, in that a symmetrical posture contributes to an even weight distribution across the sitting surface thereby managing sitting pressure. Using power tilt as a weight shifting strategy also influences the ability to maintain a symmetrical posture. Group 2 expressed concern that this link was not well understood by their clients.

I’m not sure they actually are thinking pressure relief. I don’t know. I think that they think more comfort, fatigue management, can’t hold myself up against gravity anymore and they are not thinking that, but they are struggling with that, so they bring themselves back. (Group 2 participant)

A common theme expressed by Group 2 participants was that clients didn’t think of using power tilt to manage sitting pressures until they experienced a pressure ulcer. “I think a lot of my clients may start to look at tilt when they’ve had pressure sores” (Group 2 participant).

5.4.1.1.10 To be able to function.

The ability to function was a commonly repeated reason for using tilt throughout the interviews amongst both groups. There were some differences in the wording used between groups to describe this reason for using tilt. Group 2 participants referred to the need for tilt to fit into their clients lives. “I think it is that making it fit into their day to day tasks, but it’s how do you get past that to get them to see that tangible benefit when it
is a little bit more of an abstract” (Group 2 participant). This concept of abstract and tangible benefits of using tilt is elaborated later in the manuscript.

Group 2 participants often referred specifically to the need of tilt use to be functional or that tilt, especially large amplitudes of tilt, was not functional.

Yea but there are definitely some people who choose not to tilt. “Oh I can’t go back in tilt because then I can’t function”. Well again we are not asking you to tilt when you are trying to do a functional activity. It’s when you are not doing an activity that you can go back. (Group 2 participant)

Group 1 participants described using tilt to facilitate function in daily life activities in several ways: (a) to put themselves in a functional position, such as sitting at a table; (b) to facilitate function through substitution of a physical movement, such as tilting into full upright sitting posture to enable an action like reaching forward to retrieve items off a table during morning care routines; and (c) to put themselves in a certain position to enable participation in an occupation, such as playing games on the computer with friends.

It (tilt) goes forward so I can lean forward and get those things just out of reach. I can get things out of the fridge, to reach a bowl or a pot, like things that aren’t too far away. (Group 1 participant)

If I’m going up a vertical incline like a ramp, I’ll tilt more vertically so I don’t fall back. (Group 1 participant)

Oh yes I’ll have a pedicure done when I’m at the mall and they’ll say “We will do it in about 15 minutes”, I will say to them “I’m going to lay down over here in the corner out of the way”, and they say “That will be fine”. And that’s another thing I use tilt for; I tilt back so they can work on my nails. Because I cannot go up to those big things that people sit in to soak their feet. (Group 1 participant)

Oh another way I use tilt is, I wash my hair in the sink so I’ll tilt all the way back to the sink. (Group 1 participant)
Group 1 participants’ experiences suggested that being able to function was the priority for using tilt. Group 2 participants acknowledged the importance of tilt use fitting into day to day activities, but in considering tilt for pressure management, it was identified that tilt use needs to be more than just for functional activities.

Yeah, so I guess again it’s that therapist’s interpretation of using it well, is consistently repositioning themselves a few degrees forward and back as opposed to for specific purposes “I go into this much tilt cuz I’m going to transfer in that position and then I come out of it”, or “I drive in this position”. It’s a very specific task oriented positions, as opposed to the way you or I shift naturally in our chair, they are using the chair to do that fine adjustment…probably the clients that are using it consistently, frequently, not task specifically probably are getting the benefit of pressure management. I don’t know if they would actually on a cognitive level be thinking of it that way. (Group 2 participant)

This statement also alludes to cognition being a component of tilt use for pressure management. This concept is further elaborated later in the manuscript.

5.4.1.2 Reasons For Prescribing Power Tilt

The concepts in the Reasons for Using Power Tilt category are a combination of both participant groups’ experiences; however Group 2 participants also described the reasons for which they prescribed power tilt. Many of the reasons for prescribing power tilt were similar to the concepts in the Reasons for Using Power Tilt category but they varied enough to warrant separate analysis. The Reasons for Prescribing Power Tilt category is composed of concepts labelled using Group 2 participants’ own wording: (a) skin issues and/or skin risks; (b) inability to do own weight shifts; (c) pressure management; (d) pain prevention; (e) physiological needs such as breathing, hypotension or aging; (f) energy levels related to fatigue and time up in wheelchair; (g) ability to mobilize in the environment; (h) tone management and; (i) caregiver burden in relation to frequent transfers or repositioning. Few participants indicated they prescribe tilt specifically for one or two of these reasons.
In terms of my guys who are spinal cord clients they have been recommended and agreed to have a power tilt chair, one for skin issues and two, more for postural support. Those are the guys who can’t sustain proper sitting posture in a normal upright wheelchair for driving the chair. (Group 2 participant)

More often, Group 2 participants articulated that the reasons they prescribed power tilt were all interconnected and needed to be considered as a whole rather than as separate reasons for recommending power tilt. “I would be thinking of it (referring to determining the need for tilt) as a big picture not specific” (Group 2 participant).

Also sometimes clients will start to and I will start to recommend tilt if they are having issues in terms of energy and breathing, and management of tone…and also for transfers in terms of caregivers. If they need to be repositioned frequently sometimes we will look at that as well. (participant)

And in terms of some of those, when you are looking at comfort and positioning and transfers, are you separating it out? Like do you have clients that have those needs without needs for pressure management? (researcher)

I don’t think so, because, let me think, I’ll go back a few clients…usually if somebody needs to be repositioned in their chair frequently then they are sitting in their chair for long periods of time, therefore they would have some issues in terms of pressure so I think those go hand in hand…I don’t wait for a wound to happen in order to prescribe tilt. I will take a look at how long people stay in their chair, their ability to weight shift and get out of positions of extreme pressure. (Group 2 participant)

Group 2 participants described at length how the different reasons they prescribed power tilt interacted, especially how pressure management was part of that interaction.

Uhm part of it is pressure management, part of it, yeah that’s one aspect of it, um some of it is increasing the length of time they can be in, well I guess that’s an aspect of pressure management. They would have to get out of the chair sooner not just only for skin but for fatigue, so I guess reducing caregiver burden as well. The odd time I’ve had people where from a respiratory point of view, the power
tilt helped there, kind of thing. I find its kind of a whole package and using it (tilt) for pressure reduction is one of these components. (Group 2 participant)

So typically I think I prescribe power tilt in situations where postural control is a real issue. So trunk control, the ability for that individual to maintain themselves up against gravity and be functional in that position…The other big reason is for those individuals who don’t have the ability…to independently do their own pressure relief strategies, pressure redistribution strategies so you are thinking tilt is going to be there to help them with that…so posturally sometimes too, not just the trunk is a problem but their head on trunk alignment allows them to interact with their environment. So I may consider tilt in situations where, I mean it wouldn’t be the only reason but I guess I would use it to think about influencing their ability to keep their eyes engaged in their environment…to influence pain so where a lot of our people it would be neck pain, shoulder pain, that kind of thing. So if their ability to sustain upright (position) negatively influences their pain. And again it wouldn’t be, probably bigger picture, it wouldn’t be only pain…So again it’s all interlinked. I don’t know that I can weed one out from the other. (Group 2 participant)

The interconnectedness of the concepts in the Reasons for Prescribing Power Tilt category described by Group 2 participants was important to understanding how they perceived power tilt was used. Using the analytic technique of diagram drawing to explore these interconnections, the complexity of critical thinking process related to prescribing power tilt became evident (Figure 6).

The concepts described by Group 2 participants are expressed in the boxes with the arrows indicating how the concepts interconnect based on participant descriptions. As an aside, the process being described exemplifies the iterative nature of concept development and theory generation that occurred throughout this study. While Figure 6 and the following associated descriptions could also fit with the theory generation section, it is placed here for continuity of concepts and ease of presentation.
All Group 2 participants indicated that regardless of the reason for prescribing or how the concepts interconnected, tilt needed to facilitate function and comfort for it to be used well. The grey area in Figure 6 represents function as it overlaps with all reasons for prescribing tilt.

I guess when I’m thinking about those people, do they need the power tilt, it’s looking at if they’re in a power chair and they don’t have tilt what are the limitations of the functional use of the chair. Whether that’s in their functional activities or in getting in or out of the chair (participant).

So how that can be limited by the addition of tilt? (researcher)

I think actually, it usually, it means expanding the use actually. That it’s making it easier for them to accomplish those things they want to do. Even as basic as getting them into the chair in a good position to start the day and then carry on
with their tasks. I’m not always sure that clients really understand the, all the benefits that we as therapists see for them in terms of power tilt. So I think that they may see it in a very limited way where we see it in a more global way. (Group 2 participant)

In the last two sentences of the above participant statement as well as some of the earlier statements, a disconnection was evident between therapist’s intended use of tilt and their perceived actual use by clients. Group 2 participants described that they knew the recommendations they made related to how and why tilt should be used need to fit into the person’s daily life, but they are uncertain how this fitting process occurs. The above participant attributes this disconnection to differences in interpretation or understanding of the potential benefits that are based on the reasons why tilt was prescribed. Group 2 participant statements below attribute differences to other factors such (a) as a lack of specific evidence to guide and justify therapists’ recommendations for best use of tilt, (b) client’s perceived benefit of using tilt for different purposes, and (c) client choice.

You know I’ve done some reading in terms of how often you should pressure shift and this, and to me it, maybe I’m reading the wrong sources, but there doesn’t seem to be a great consistency in how often, how frequently and how long to stay in that tilt. And then to justify it back. So it seems to me that you kind of give some parameters to the client and then the client chooses what fits into their comfort level. If they’re not having pain and they’re not having any discomfort or ramifications, then it is really hard for them to go to a huge degree of tilt and really inconvenience themselves during the day. If there is no evidence that I am providing to back that up. (Group 2 participant)

And there seems to be a lack of understanding that we are not expecting then to go back into say 20 or 30 degrees of tilt and stay there; that we are recommending that they go back several times a day for say 5 minutes or something like that. And there’s just again, I think just a lack of understanding that of course you can’t be back in that amount of tilt for long periods of time in a day and still be able to function. (Group 2 participant)
I think life gets in the way, whether they are married with family, or I think they get so busy, they get into the routine of life. All of them know we have said, or I have said, once every half an hour. uhm I think they, they do it when they remember, so uhm I don’t think it’s because they don’t want to, I think they just get busy doing other things...It’s just not important until say the spouse or caregiver says “Oh Mr. Smith, you have a red spot on your bum!” Then they get more aware and start tilting more. But when things are fine skin wise they do it when they remember I guess. (Group 2 participant)

I mean the thing is, they can’t follow it if we don’t teach them about it. And then what they do after they leave, you know we can’t control that. (Group 2 participant)

Many of these concepts in the category of Reasons for Prescribing Power Tilt are similar to those in the category Reasons for Using Tilt however there are variations in wording and intent of meaning. For example, posture/positioning was a common concept to both categories however in the Reasons for Prescribing Power Tilt category the data described postural alignment and its influence on fatigue, breathing, pressure distribution and how tilt system can be used to address these issues. In the Reasons for Using Tilt category, posture/positioning concepts described more of the action of using power tilt to change position in response to an issue such as sliding or using tilt to get positioned well in the chair first thing in the morning. In the following section the relationships and interactions between concepts are described to expand the understanding of how power tilt was used in daily life thereby contributing to the generation of the theory.

5.4.2 Theory Construction

During concept development, preliminary relationships and interactions between the concepts were explored, initiating theory construction. As this exploration unfolded, a basic theory of the process of how power tilt was used in daily life, particularly related to what triggered using power tilt and the outcomes of using power tilt, was constructed. The results of this exploration of conceptual relationships and interactions are presented as the foundation to the basic theoretical scheme.
5.4.2.1 Construction of the Basic Theoretical Scheme

During the above described analysis, several process-related relationships were identified that contributed to the creation of the initial theory scheme. The first relationship was that for each concept identified in the Reasons for Using Tilt category, there was an event or events that required the person to physically change their body position. This identification of the need to change position is what triggered or initiated the use of tilt, not the specific reason as described by participants. For example, repositioning due to sliding was mentioned by one participant as a reason to use tilt. Repositioning was the outcome for using tilt to address the issue of sliding. The issue of sliding required a change in body position which triggered his use of tilt for that purpose. With further analysis of this relationship, it was determined that the events which arose, triggering the need to change physical body position, could be identified as a problem (e.g. discomfort), an issue (e.g. sliding) and/or a situation (e.g. need to reach something). This process-related relationship formed the Need Identification phase of the preliminary theory illustrated in Figure 7.

A second process-related relationship that contributed to the development of the preliminary theory scheme was that each conceptual description was action-based. To demonstrate this relationship, an earlier presented Group 1 participant’s statement is repeated here. “Oh another way I use tilt is, I wash my hair in the sink so I’ll tilt all the way back to the sink”. In this statement, the action of concern for the participant was getting set up at the sink to enable participation in the activity of washing her hair. Tilt was used as a means to change body position which resulted in the action that enabled participation in the activity of washing her hair. In another previous participant statement, the action enabled the need of low blood pressure to be addressed and resolved. “I’ve got uh, really low blood pressure so it always messes with my head so I am always tilting back or tilting up for blood pressure mainly” (Group 1 participant).
These two relationships formed the key conceptualization of the basic understanding of the process of how tilt was used in daily life in this preliminary theory scheme. This understanding is as follows: an issue/problem/situation arose that required a change in body position; tilt was used as a means to change body position, which enabled an action; the action further enabled the identified need to be addressed/resolved and/or participation in an occupation.

However, this basic process did not explain how tilt was used when competing demands between identified needs existed. It also did not explain the process if tilt was not used. This preliminary theory assumed that tilt was always used, which is clear from the previous analyses and participant statements to be false. Further comparative analysis related to these process issues are presented in the following section.

5.4.2.2 Relationships/Interactions Between Concepts

During the above analyses it was noted that many of the concepts had characteristics or properties that overlapped with other concepts. To expand the understanding of how power tilt was used in daily life, an analysis was completed of the relationships and

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*Figure 7. Basic theoretical scheme of the substantive theory.*
interactions between and within concepts in the category Reasons for Using Tilt. The results of this analysis, as depicted in Figure 8, elucidate the elements that participants in this study considered throughout their day related to tilt use, and the complexity of the relationships between these elements as well as the influence on actual tilt use.

Most concepts interacted with one or more other concepts but interactions varied, influencing how that relationship existed. For example, sliding forward caused discomfort, so tilt was used for re-positioning to resolve the discomfort. “I wasn’t comfortable so I put it (tilt) back and repositioned myself” (Group 1 participant). The double headed arrow between discomfort and posture represents the interconnected relationship between these two concepts. Tilt was also used to directly resolve the positional issue of sliding without discomfort being present. “I try to tilt it back a bit so I don’t slide out” (Group 1 participant).

*Figure 8.* Relationships between reasons for using tilt (Group 1 and 2 participants).
Discomfort was interconnected the most with other concepts, suggesting that tilt use was frequently initiated due to discomfort. Participants often described discomfort as a reason to use tilt. “Just plain comfort. Just being uncomfortable so you change to be more comfortable” (Group 1 participant). Group 2 participants also identified comfort as a primary reason they thought their clients used tilt. “In thinking about it, it seems to me and this is just thinking about my caseload, those people that use the tilt more for comfort and more for positioning, I think tend to use the tilt more” (Group 2 participant).

It was noted in the Group 1 interviews that if the participant was asked to elaborate on what they meant by discomfort, there was acknowledgement that the discomfort was sometimes caused by another reason such as poor posture or fatigue, but interpreted by the participant as discomfort. A similar association was also acknowledged by participants between discomfort and feeling pressure.

So you don’t use it (tilt) necessarily for pressure per se? (researcher).
No I don’t think so because the way I’m sitting now doesn’t seem like it’s a lot of tilt. But without the tilt I would be uncomfortable so it’s not like I need; I think I’m talking out both sides of my mouth. No, I do use it so my butt isn’t sore. I didn’t realize, yah, I realize that yah it is. (Group 1 participant)

The only two concepts where a relationship with discomfort did not exist were the concepts To Be Able To Function and Pressure Management. The relationship between pressure and discomfort is described above. Indirect relationships between feeling pressure and pressure management were identified, which are represented by the dotted arrows. Participants did not identify pressure management as a reason to use tilt but they did identify that they used strategies to manage their skin and would increase the use of large amplitudes of tilt to manage pressure if they developed skin issues.

As illustrated in Figure 8, the concept To Be Able to Function was not directly linked to any other concept. It stood alone as a reason to use tilt. The experiences provided by participants often referred to how using tilt either assisted or hindered the ability to participate in daily life occupations. The experiences that composed the concept To Be Able to Function were often described as competing with the other reasons; either tilt was
used to reduce discomfort or the participant stayed sitting at the table in the restaurant to engage in the occupation.

So then if you are using the tilt based on comfort, so you will change your position to make yourself more comfortable but then if you are doing an activity in that amount of tilt, it doesn’t work, then you will come out of that? (researcher). Ya that’s right. You can, exactly. The amount of tilt depends a lot on the activity, that way I can say normally I am at this tilt, but because I am doing this. Like tomorrow I am going to play scrabble and I know there will be times when in order for me to see the scrabble board correctly I have to be down a bit and then I’ll go up to some where that’s more comfortable, and then, ya, it’s a good thing to have tilt (participant).

So you stay in some tilt and when, then it’s essentially your turn or you need to see the board you come out of tilt (researcher).

That’s right, ya (participant).

And you are a little bit uncomfortable in that position (researcher)

Ya, ya (participant).

So as soon as you are able to, you are done your turn (researcher).

That’s right, I’ll tilt back…to be more comfortable…But again, it depends, depends so much on the activity. (Group 1 participant)

Participants identified that tilt was used as a means to participate in daily life occupations. If there are no competing demands to function, then function would determine the amount of tilt used. However, there often were competing demands between the need to function and any of the other concepts in the Reasons to Use Power Tilt category. The above participant description illustrates well, the back and forth decision making related to using tilt to meet competing needs. Despite being uncomfortable in a more upright sitting position this participant put herself into that position to be able to participate in playing scrabble. She was able to move back and forth between positions of comfort and function in that situation.
The following participant description is repeated from earlier to illustrate a different weighing of benefit to using tilt based on the personal value placed on each reason to use tilt in context.

If we are out for dinner and I’m in a restaurant and under the table I can get really sore in my bottom cuz I’ve sat for half an hour, an hour for dinner. (participant) So when you are out at a restaurant you don’t pull away from the table and use the tilt? (researcher) I can’t, I can’t unless I ask. If I’m with a group and we’re there for an hour or 2, like for my birthday, I know I do. I pull right out from under the table, turn sideways along the table and tilt right back in the restaurant. Forget pride. I just hurt too much to stay in one position. (Group 1 participant)

For this participant in this particular situation, the need to participate in the dinner outweighed the discomfort. She chose not to use tilt to address the problem of discomfort because the value of remaining at the table to participate in the dinner was greater. Over time as the level of discomfort increased, the need to change position using tilt outweighed the need to remain at the table and tilt was used.

To ensure credibility of concept development to this point and with the preliminary theory, member checking was employed. All concepts and figures presented to this point were reviewed with all participants at the start of each second interview to ensure accuracy of the researcher’s interpretation of the data. No concerns or issues were raised by participants; all participants confirmed the conceptual schemes with some expanding further on the original data.

Bingo. Exactly. I’m relating to your graph there exactly. Yup, it really makes a lot of sense to me that functional need at that point in time, what I’m doing, it relates. For example reaching the light switch, the function, what I am doing, shopping I’m trying to reach something on the shelf, so every function relates to a tilt degree. Uhmm, there was, where did I see, used by caregivers, yes they use it to tilt it back for seating from the lift into the chair. (participant) To get into the chair well? (researcher)
So, yes. There’s what I think; I just named 4 different boxes on your graph there.

(Group 1 participant)

The above participant statement also highlights the process relationship that not all participants identified every Reason For Using Power Tilt as part of their own repertoire. The above analyses of the relationships and interactions between concepts furthered the comparative analysis, elucidating the need to examine the data for process content related to how decisions to use tilt were made.

5.5 Process: Decision Making

From the results of this in depth analyses, it was very clear that there were challenges and contexts which influenced not only if tilt was used but also how tilt was used. Concept development at this stage of the analysis focused on the relationships between concepts and categories, further exploring the content of the data for process related to decision making. While this analysis occurred iteratively between concept development and theory generation, they are presented separately in the following respective sections.

5.5.1 Conceptual Relationship Development

The preliminary theory illustrated in Figure 7 applied to many of the experiences described by participants but it did not explain all of them. Many participants described situations where their use of tilt as a means to support an action was challenged, such as the experience at the restaurant described above by a Group 1 participant. Participants also shared experiences where they choose not to use tilt such as the following statement.

I don’t know. It’s not relaxing (referring to using full tilt). I don’t, I will find myself during fatigue time, I will park myself in front of the bed just in case. So I will nod off in the chair but not in the tilt. It’s not comfortable to me. (Group 1 participant)

Many Group 2 participants described experiences where their clients would choose not to use tilt. “Yea but there are definitely some people who choose not to tilt. ‘Oh I can’t go back in tilt because then I can’t function’.” (Group 2 participant). Also described were
experiences where clients were not aware of the potential for tilt to be used to address or resolve certain issues; “It didn’t even occur to me to notice. I didn’t realize I didn’t know about tilt. I used it when I needed” (Group 1 participant). Statements such as these suggested that a prerequisite awareness of tilt being an option was needed for tilt use to even be considered as a means to the action.

The following participant experience elucidates that not only is awareness a prerequisite for using tilt but so is the concurrent acknowledgement of the benefit of using tilt to achieve the goal.

Certainly using the pressure mapping to...demonstrate to people how going back into tilt does reduce the pressure over the buttocks, like that’s quite an eye opener for them. “Oh wow, yah, it really does make a difference.” I think it makes a difference to their understanding or like it convinces them, just that visual feedback uh, really I think backs up what we are telling them. Now does it make a difference to using the tilt during their everyday life? Don’t really know. (Group 2 participant)

Prerequisite awareness and acknowledgement of the potential benefit of using tilt was a key relationship related to decision making that resulted from the analyses.

A second relationship was the immediacy of realized benefit from using tilt. Almost all experiences described by participants in Group 1 identified immediate benefits of changing their physical position being realized when using tilt to address or resolve an issue/problem/situation or to enable participation.

So are there other things that help you in terms of remembering to tilt or is it all just based on your comfort? (researcher)

I believe it’s based more on comfort. The more we’ve talked about this it seems to be what comes through to me. (participant)

So you don’t have a timer, you don’t have someone reminding you. (researcher)

No. Tilting is always self-initiated. (Group 1 participant)
This participant, as with most previous participant statements, described using tilt to change position to immediately resolve or address the issue of discomfort. The amount and frequency of tilt was dependent on how much change in position was needed to resolve the discomfort, which varied from participant to participant as well as situation to situation. Participants in Group 2 spoke more globally of experiences with their clients indicating that tilt was used more often for those incidents where tangible, concrete benefits were experienced and immediate benefits were realized. The following participant statement highlights how using tilt was not a consideration at all if the benefit was not immediately tangible, or “in your face”.

And then there are some that I’m not so sure that it’s a choice in the sense of “Oh I should tilt but I’m not going to” but I think it’s just that...they don’t think about it. And then when we sort of ask them about it they think “Oh ya maybe I should be tilting a little bit more.” It’s sort of...like if it’s not in your face then you don’t think about it. (Group 2 participant)

To gain an understanding of the relationship between using power tilt and immediacy of perceived benefit of using tilt the researcher returned to Figure 8 which depicted the interconnections between concepts in the category Reasons for Using Power Tilt. Using this illustration, the identified relationships between the Reasons for Using Power Tilt concepts and immediacy of perceived benefit were added, creating a diagrammatic representation as depicted in Figure 9. The green arrows represent those concepts for which there were immediate tangible benefits experienced as a result of using tilt.

There were two concepts that did not fit completely into this relationship; Fatigue Management and Pressure Management. The dashed green line from Fatigue Management indicates the benefit was not as immediate as the other categories. Past experience influenced the decision to use tilt for managing fatigue as the negative effects of not managing fatigue were seen within a short period of time such.
The concept Pressure Management did not have data support for inclusion in this relationship where immediate tangible benefits resulted from using tilt to change position, suggesting that the perceived benefit of using tilt for pressure management was more abstract.

Uhm, there are certainly some people who are very, what’s the word, cognizant sort of the, cognizant of the seriousness of pressure sores...so they will, and very in control of their care...and they will sort of get it; that to prevent a pressure sore this is one of the things they can do. They can take control and they can do this and its sort of taking control of what’s going on with them, so they will do it (tilt). Anything they can do to prevent a pressure sore. I don’t think those people are in the majority. I think...the majority will be, you know, they sort of get into their
routines during the day and they just forget to do it (tilt). And again if they don’t feel discomfort...they are just not as apt to do it (tilt). (Group 2 participant)

If the perceived benefit was more abstract, conscious thought was needed to initiate using tilt to change position for the reason of pressure management. As was noted previously, participants who used power tilt identified that they felt pressure, which caused discomfort resulting in them changing their physical position using tilt; they did not initially identify using tilt for pressure management. In most participants’ descriptions using tilt was automatic, being used without much thought suggesting it was more intuitive or tacit than cognitive. This tacit or intuitive reaction of using tilt as a means to an action was noted in most concepts in the category Reasons for Using Tilt except for the concept Pressure Management. The following Group 1 participant describes changing position due to pressure on her shoulder blade when in a tilted position but that pressure was addressed based on feeling the pressure and reacting to the discomfort by tilting upright, not as a method of managing pressure. “Yeah I don’t consciously say OK I should tilt now. It’s mainly the pressure on my shoulder blade, the blood pressure” (Group 1 participant). The statements that follow further demonstrate that often the response to an issue/problem/situation was an automatic or subconscious reaction which resulted in the use of tilt, rather than a cognitive, conscious decision.

And I think its uhm uhm it’s almost an unconscious thing that you do. See you have me thinking about it now. But uhm, yah, I think because you’ve got the tilt yah, you just tilt backwards because it’s just more comfortable. (participant)
That is certainly some of the things I’m getting from other people I’ve interviewed, it’s not something you plan. (researcher)
No. No. (participant)
It’s usually a reaction to some sort of feeling, usually some sort of physical feeling or physical factor. (researcher)
Yah…That’s right yah. And you do it almost unconsciously. I mean I don’t know exactly now that I have tilt how I could manage without it. (Group 1 participant)

Because of course when you get uncomfortable...you are going to want to do something about it. So you go back into tilt and sort of comfort and positioning
are sort of intertwined there. If you begin to slide forward or lean to the side...at the same time you get uncomfortable, therefore you may be more apt to go back into tilt and get yourself repositioned. Whereas someone who is a quadriplegic or something where tilt is mainly for skin protection, you don’t always feel that discomfort and that you are breaking down so you don’t think “Gee I’ve got to go back into tilt”. (Group 2 participant)

The last statement above highlights the differences in response when sensation was present as opposed to when sensation was absent. The relationship between using tilt and pressure management when sensation was lacking was identified mainly from Group 2 participant experiences. Group 2 participants described tilting for pressure management as more abstract, requiring cognitive thought to identify first that a need to redistribute pressure on the sitting surface exists, and then the need to use tilt as a means to change physical position thereby shifting or redistributing the pressures on the sitting surface. This cognitive versus tacit relationship is illustrated in Figure 10. The blue arrows represent the researcher’s interpretation of the relationships between concepts based on participants’ experiences in relation to using tilt to manage sitting pressure.

To confirm the accuracy of the researcher’s interpretation of the data and development of these three key relationships related to decision making, both Figures 9 and 10 were reviewed with all participants as part of member checking at the start of the second interviews. Only one participant from Group 1 raised a concern which was in regards to Figure 10. This participant had sensation and had experienced a pressure ulcer within the past 2 years.

No it (referring to tilting for managing sitting pressure) was more cognitive. I would think, “Maybe I’m getting too comfortable even though I feel comfortable I think I should be tilting”. Ya it was strictly something you think of. Like this is too comfortable, this is not good. (participant)

So you think the pressure management is more cognitive regardless of whether there is sensation or not? (researcher)

Yes. (participant)
Because you have sensation; it was still a cognitive thing? So you cued yourself thinking about it, and saying I need to change my tilt position? (researcher)
Ya. (Group 1 participant)

Figure 10. Relationship between pressure management and considering using tilt.

The red arrow in Figure 10 was added after this discussion with this participant to reflect that regardless of whether sensation on the sitting surface was present or absent, using tilt to manage pressure was cognitive. After this change was made, no other participant subsequently interviewed raised any other concerns with the relationships illustrated in either Figure 9 or 10, and all agreed with the change represented by the red arrow.

Concurrent to the above analyses and concept development, the basic theoretical scheme was expanded to incorporate an understanding of how decision making occurred in the
process of using power tilt in daily life. This expanded generation of the theoretical scheme is presented in the following section.

5.5.2 Theory Construction

The relationships identified during concept development shaped the decision making phase of this process theory as part of the full theory. The decision making process within the full theory as illustrated in Figure 5. For ease of reference Figure 5 is repeated here as Figure 11.

The decision making process was fluid and seamless, which is represented by the interconnected boxes. As part of the first theory diagram drafts, arrows between separate boxes were included. However, during the theory integration phase of the study it was found that the depiction of directionality and linearity by the arrows was not representative of all the data. The fluidity of the process was felt to be better represented as interconnected boxes.

The decision making phase flowed seamlessly from the Need Identification phase. As a need arose, potential options for actions to address/resolve the need were identified. These options may or may not have included using tilt as a means to change position. Shaped by the relationships described in the previous section, for tilt to be a consideration, the prerequisite awareness and acknowledgement of the potential benefit of using tilt was required. Recall the Group 2 participant who shared the experience of a client who did not consider using tilt for managing sitting pressures until pressure mapping was used to demonstrate and support this purpose. The client was aware that tilt could be used to change position for managing sitting pressure but did not acknowledge the importance or benefit of doing so. Acknowledgement of the benefit occurred during the pressure mapping demonstration; however the value the client placed on that potential benefit was not clear to the therapist so it was unclear if the client continued to use the tilt as a means to change position for managing sitting pressure. Therefore the acknowledgement of the benefit and valuing that benefit of using tilt as a means to change position were also considerations.
To review, at this first sub-process in the decision making phase of the theory, several concepts were important in order for tilt to be a consideration; (a) awareness that tilt can be used as a means to support the desired action, (b) acknowledgement of the benefit to

*Figure 11. Decision making phase of process of using tilt in daily life.*
using tilt as a means to support the desired action and, (c) the potential use of tilt was valued as a means to support the desired action.

An earlier participant statement is repeated here as it further demonstrates this construct of the first phase of decision making.

I don’t know. It’s not relaxing (referring to full tilt). I don’t, I will find myself during fatigue time, I will park myself in front of the bed just in case. So I will nod off in the chair but not in the tilt. It’s not comfortable to me. (Group 1 participant)

This participant demonstrated awareness that tilt could be used to address/resolve her problem of fatigue. She also acknowledged that tilt could be beneficial to use for this problem but she did not value using tilt for this problem because she found it uncomfortable. For this participant using tilt to address/resolve fatigue was never a consideration and alternate methods were used to enable the action. This participant statement demonstrates that tilt use was not required for the action to occur.

If tilt was a consideration as a means to enable the desired action, the benefits of using tilt were weighed against the benefits of not using tilt. The influence of the context was prominent in the sub-process of weighing the benefit of using tilt. In the following statement the participant weighed the known benefit of tilting to reduce discomfort against the benefit of not tilting when in public. The personal context of social image influenced use of full tilt. This participant equated full tilt to laying down, which was perceived to be socially unacceptable and contributed to feeling different. She described that she would have to be very uncomfortable before the benefit of using full tilt would outweigh her perceived personal benefits of not using tilt.

No, I guess its cuz I don’t want to feel like uhm, so different I guess or whatever you want to say. I don’t want to be laying down. But I also want to be comfortable, so if I was really sore I wouldn’t keep it up for appearances, or whatever if it was really sore, then for sure I would put it back. (participant)

But it would have to be really sore? (researcher)
Well, yeah, pretty uncomfortable I guess but I don’t like to be uncomfortable so I would. (participant)
So at some point comfort wins over the image thing? (researcher)
Yeah definitely. (Group 1 participant)

Weighing the benefits of using tilt often occurred as a balance between conflicting needs in order to enable an action. An action always occurred to enable further action in the form of (a) the identified need being addressed or resolved and/or, (b) participation in an occupation, both of which may or may not have included using power tilt. It was the process by which the actions occurred that varied from incident to incident and person to person, with the context at that point in time significantly influencing the decision. The breadth and depth of the influence of context on decision making process is underscored by the size of the Contextual Influences section which follows in section 5.7.

The rates of response to the identified need were different for both sub processes of the decision making phase. For most participants, their reported experiences suggest that considering tilt and weighing the benefits occurred quickly. As demonstrated in Figures 9 and 10, the benefits of using power tilt as a means to support the action to achieve a goal were almost always immediate. Some participants described it as intuitive. “I guess you just use it as part of your life...I didn’t really have to think about it that much” (Group 1 participant).

For most shared experiences, considering using tilt and weighing the benefits both occurred rapidly, with what appeared to be little or no thought. The change in position provided immediate feedback of the benefit, to a point where using tilt for certain identified needs had become tacit. “After a while I started to realize I basically have a routine of doing things. Before I started to do this (referring to the study) I never thought about it (using tilt) much” (Group 1 participant). Tilt use had become a tacit part of everyday occupations.

However, where the benefit of using tilt was more abstract, the decision making process required cognitive/conscious thought, potentially in both sub processes. The last participant statement demonstrated how the participant’s cognitive process has become
more tacit based on experience and learning. The above participant is referring to how she has become more body aware, having learned when she needs to use tilt to change to a resting position as part of fatigue management.

Participants’ shared experiences demonstrated the fluid nature of the decision making process. The process does not occur in a step wise manner, nor are both sub processes necessarily clearly delineated. The decision making processes occurred at different rates of response with different resultant actions based on the participants’ experiences and learning as well as the context in which the decision making occurred. As was stated at the start of this chapter, processes are not linear nor do they occur separate from the context in which they occur. The influences of context are described in greater detail in section 5.7. The following section describes the influence of feedback from the process occurring on learning, which then influenced the next process for the next situation.

5.6 Process: Feedback Contributing to Learning and Knowledge

Demonstration of the influence that feedback has on the process of using power tilt in daily life has been intertwined with the results presented throughout this chapter. Post-positivist grounded theory descriptions of process and content indicate that feedback from an experience creates personal knowledge about that phenomenon thereby influencing how the process for the next experience occurs (Corbin & Strauss, 2008). Feedback is influenced by the level of meaning attached to the actions, often formed in response to consequences or contingencies (Corbin & Strauss, 2008) thereby shaping the personal context of knowledge and experience through learning. Feedback was introduced in the previous section as part of the descriptions of the immediate or delayed benefits realized from using tilt. The concept development and theory generation related to process feedback continued to build upon that knowledge. As the analysis progressed, concept development and theory generation became very blurred. For clarity of presentation, concept development and theory generation are presented together for this phase of the process.
5.6.1 Concept Development and Theory Generation for Feedback Phase

Feedback related to the outcome of the process has an integral influence on the entire process of using tilt in daily life. The most significant influence however is from the level of meaning attached to the action. In the example below, a Group 1 participant described a single incident of getting stuck in full tilt because she was unable to overcome the effects of gravity on her ability to reach her tilt control button. Feedback from this single experience resulted in this participant quickly learning that she could not tilt past a certain degree. The level of meaning attached to this experience was high and negative resulting in an immediate change in behaviour. This single incident resulted in her having the tilt technology altered to permanently reduce the full tilt position to be the point just before gravity prevented her from accessing the tilt control switches. Since the participant did not have a history of pressure ulcers, had sensation and had her caregivers check her skin daily, the tangible, concrete benefit of reducing the available range of tilt to prevent getting stuck in tilt again outweighed the more abstract, potential benefit of reducing risk of skin integrity issues gained from access to full tilt.

No, no, I rarely go back all the way. In fact uhm if I go back too far which I’ve got the chair set, set at a spot where that’s as far as it will tilt back. Otherwise I can’t operate the chair. If I’m back too far then my head, yah my head won’t, then I can’t operate the side pads (tilt control switches) (participant)
So you can’t reach the controls anymore when you are back all the way?
(researcher)
We’ve done that. (participant)
So you’ve locked it out so your chair won’t go back? (researcher)
That’s right. My chair won’t go back. I can’t operate it to get me to go forward.
Yah. (participant)
Did it happen that you got stuck back there? Is that how you kind of discovered this? (researcher)
Uhm yah. That’s right, that’s what happened. (participant)
That must have been an uncomfortable experience. (researcher)
Yah it was kind of. But I have people coming in enough times so that’s pretty uhm. Or I was able to, no I wasn’t able to change, no that’s right I had to wait for somebody to come in. So that’s when I got the guys from (vendor name) to make sure that the tilt didn’t go back too far cuz otherwise I can’t operate. I can’t hit the switches. (participant)
That’s a problem. (researcher)
Well live and learn. So now that we have that fixed, don’t have to worry about it anymore. And the girls know that uhm put me, to go back as far as this chair lets us, to get me into the chair and it works just fine. The angle of the tilt is good for both. (Group 1 participant)

Knowledge and experience was gained through feedback from the process. The feedback process is represented in Figure 11 by the large black arrow. Participants shared many experiences which negatively affected how they used their tilt, particularly large amplitudes of tilt. The meaning attached to an experience could significantly affect how the process occurred. A single experience, especially if it resulted in fear or mistrust, potentially had immediate and long term effects. The participant statement below is an example. It starts with the researcher sharing results from the first interviews using participant experiences to which the participant readily agreed and expanded upon using her own experiences.

“You can’t drive, you can’t do anything. You are there until someone comes to get you”. And I mean for a couple of people it happened once 3 chairs ago but it’s still a fear. (researcher)
Yah! That’s one of the reasons I tilt the way I do when I’m going into my van. I will always have somebody behind me. The first time I got into the van 8 years ago I tilted back, flipped back and then when I bounced off the little wheelie things on the back, I got flung forward and I was thrown into the driver’s seat head first and it really scared me. And so ever since then I’ve had somebody behind me helping me and going into full vertical position whenever I go in and out of the van. (Group 1 participant)
The level of meaning attached to the above two participant experiences resulted in immediate and long terms changes in how tilt was used. The immediate learning that occurred during and just after the process related to the incident influenced the next similar incident at both sub-processes of decision making. If over time the outcome from the action is somewhat consistent then the experience becomes a personal contextual influence. This cumulative effect over time is evident in other participant experiences previously described.

The influence of both knowledge as a contextual factor and learning through feedback as a process element is iterative, therefore there are similarities and overlapping concepts. For the purposes of this manuscript, knowledge gained from feedback from the process experiences has been located within the personal context. As part of the process, the large, black feedback arrow represents the immediate feedback that occurs as a result of the experience, which adds to the learning process from which knowledge is gained. Knowledge then, as a personal context construct, influences the subsequent incidents where a need is identified to change body position. While the black arrow represents the feedback process, it is enclosed within the blue bracket on the left side of the figure, indicating the overlap and iterative influence between the feedback process and knowledge. In this relationship between the concepts of feedback, learning, and knowledge, it was their combined influence on all phases of the process that was critical to understanding how power tilt is used in daily life. These influences are further described in the Contextual Influences section that follows.

5.7 Contextual Influences for Using Power Tilt

In post-positivist grounded theory the data are analyzed for not only process but also context of the phenomenon being studied (Corbin & Strauss, 2008). This was achieved by analyzing the data with the focus on contextual influences on the process. For example, participants described how tilt enabled an action such as reaching, but descriptions varied depending on the context. Participants also described reasons tilt was not used or why they only used certain amounts of tilt in certain situations. In these experiences there were strong contextual influences that enabled, inhibited or modified how tilt was used as a means to an action. This in-depth analysis resulted in the creation
of this high level category labeled Contextual Factors That Influence Using Power Tilt. The reader is reminded that this analysis for context was completed iteratively with the analysis for process during each phase of the study. For ease of presentation, the category of Contextual Factors is presented as Concept Development and Theory Generation in the sections which follow.

5.7.1  **Context: Concept Development**

Through the iterative process of concept development and theory construction three main Context subcategories were created and labeled as Function, Environment and Person. During this analysis it was identified that concepts, categories, relationships and interactions were intertwined resulting in fluidity of concepts between categories and subcategories depending on the contextual and process influences as part of a particular incident. For clarity and ease of presentation, the concepts have been grouped into subcategories to provide some structure to the contextual analysis. The concepts however, are not definitively or exclusively identify within categories. The location of a concept within a subcategory is less important than understanding the contextual influence that concept has on the process as this has potential to vary from person to person and incident to incident. Concept development is presented in the sections of Functional Need at that Point in Time, Environment and Person. The subcategories and concepts identified from the analyses are expanded within each of these sections.

5.7.1.1  **Functional Need at That Point in Time**

The ability to function was a powerful need that influenced the decision making process related to if and how power tilt was used. The contextual influence of Functional Need at That Point in Time is intimately connected to the process subcategory To Be Able To Function from the category Reasons For Using Power Tilt as described above. As part of the process of using power tilt in daily life, participants described how tilt enabled them to be functional, such as to reach items out of the fridge or off of the table. However, participants often described competing demands or tensions between being able to function and any of the other reasons for using tilt. When tensions existed then the influence that function had on the process had more of a contextual influence.
So how often do you think that you are tilting? (researcher)
8-10 times an hour at a minimum. Unless I’m doing some project like having dinner out or I’m at the computer and I’m not getting away from the project and I overdo it. And then I spend an hour, I pay (referring to level of discomfort).

(Group 1 participant)

In this example, the participant became uncomfortable when participating in a project, therefore the issue that arose for which an action was needed was discomfort not function. The participant was already in a tilted position conducive to being able to function. The process for deciding to change body position using tilt to address or resolve the issue of discomfort was dependent on the functional context of what the participant was doing at that point in time. Therefore functional need at the time the issue of discomfort arose was a contextual factor. The interaction between context and process at the decision making phase is also demonstrated in this example. The perceived benefit of changing body position using tilt to address discomfort did not outweigh functional need at the point in time, until such a time as the project was done or the discomfort need outweighed the benefit of continued participation.

A majority of the shared experiences described where this tension between identified needs and context existed, were related to how using a large degree of tilt interfered with functional needs and therefore influenced tilt use. For example, each power tilt system has a safety feature called drive lock out that disables the ability to drive the power wheelchair when a certain degree of tilt is reached. Using tilt beyond the drive lock out setting requires extra steps to be able to move to function.

And if the phone rings, I have to get to the phone, cuz the chair doesn’t work as well, I don’t work as well on a high tilt driving so I have to tilt down again get to the phone. It’s easier to, uhm you can hear my voice better if I am down a bit further so. You can hear people, the people on the phone can hear me better.

(Group 1 participant)

I know why I don’t go all the way back, because once you are in the all the way back position you can’t move. There’s no drive. And I always like to be able to
move. If something is happening then it’s easier to go forward. (Group 1 participant)

The other thing is too, when the chair is in so much tilt you can’t drive it. I unofficially had that removed from my chair. (participant)

Why did you have that removed from your chair? (researcher)

Uhh, because especially at the beginning I was in so much tilt so often, like I would regularly be almost laying down, and I would have to drive around. So I couldn’t stop my day and then sit up quickly drive forward and lay back, sit up quickly drive forward and lay back. Because my blood pressure was so low. (Group 1 participant)

The power tilt safety feature of drive lock-out has implications for function therefore influenced how tilt was used during the day. Large amplitudes of tilt limit the ability to move immediately or spontaneously. Participant descriptions of function in section 5.4.1.1.10 demonstrate that using large amplitudes of tilt interfered with function and smaller amounts enabled function. The participant statement below describes tilting small amounts to change position to enable computer use. A particular position for comfort was preferred but a certain degree of tilt was needed to accommodate watching television through progressive eyeglass lenses.

Ok, there, ya, if I go to my computer I need to be up, I tilt up a bit so that I can see the screen properly and uhm, because my computer is voice activated I have to be in a certain tilt so it hears my voice properly. And if I’m watching TV I need to be in a certain tilt just to be comfortable. And the thing is I have my wonderful bifocals so I have to be in a certain tilt for those. (Group 1 participant)

The frequency of using tilt was also altered by the need to function or to be involved in an activity. For the following participant, a small amount of tilt was used during driving, and the amount of tilt used once driving was stopped was comfort based.
Well for driving around, I have very little tilt. And then when I get to the spot at the restaurant or whatever I usually tilt back. But to drive around in a mall there is hardly any tilt on. (participant)

So then when you drive you are in a little bit of tilt, you get to wherever you are going you tilt to whatever is comfortable or function, and then do you change that throughout the time you are at the restaurant or wherever? (researcher)

No I usually find a spot that’s comfortable. (Group 1 participant)

This participant went on to describe that the amount of tilt used once stopped was within a range that was perceived to be acceptable for interacting with friends while having tea, which may not be the optimal amount of tilt for full comfort. Many participants’ descriptions indicated using smaller amounts of tilt during function and highlighted how large tilt precluded function except for resting and napping. Using a large degree of tilt was equated to lying down. Several participants reported they used large tilt for watching television but the amount of tilt was determined by their line of sight especially if they wore glasses with progressive lenses.

I rarely tilt back all the way but I have on occasion used that (participant).
And what would be the occasions that you would do that? (researcher)
Uhmm, probably if I was taking a nap. (Group 1 participant)

I don’t want it back so far that I feel like I’m lying down or whatever. It’s kind of hard to drive like that. (Group 1 participant)

I think some of my clients would say you can’t drive and go into extreme tilt. (Group 2 participant)

Like this is probably the farthest back I would sit and watch TV. because I don’t really want to fall asleep all the time. That’s another issue why I don’t put it back, because I don’t want to fall asleep. But it’s you know, like if you sit on the coach and lean back, you might not want to fall asleep but it’s so comfortable that you drift off. (participant)

If you are all the way back can you watch TV.? (researcher)
Not really. Because my feet are up in the air so I can’t see anything in front of me really. That’s another reason I don’t really put it back all the way very often.

(Group 1 participant)

Both participant groups indicated that tilt was often used to enable function but more often using a smaller range of tilt. Using large tilt interfered with function especially driving. The functional uses of large amplitudes of tilt described in the interviews as well as the time-tilt journals were almost exclusively for napping, resting, repositioning and assisting the caregiver to position them well in the wheelchair in the morning.

While Group 1 participants did not directly identify using tilt for pressure management, they alluded to its use for this reason through their frequent descriptions of why they could not or did not use large tilt. This relationship between using large amplitudes of tilt and pressure management was confirmed in the second interview as all Group 1 participants identified that in the event of a pressure ulcer developing, they would use more large tilt more frequently to address or manage the pressure. Consistency in descriptions of using varying amplitudes of tilt to influence posture and positioning also existed between participant groups. Where the groups differed was in how addressing posture, positioning and fatigue influenced managing sitting pressures. Group 2 participants described the influence of using varying degrees of tilt to address postural and fatigue issues, which were felt to significantly influence pressure redistribution which were consistent with their descriptions of why they prescribed power tilt. While Group 1 participants used power tilt of varying ranges to affect posture or positioning, there was no support in the data to suggest that there was an association with influencing or affecting pressure. Group 2 participants described this discrepancy in perspectives as one of the challenges in translating their knowledge to clients in order to optimize use of tilt for pressure management.

5.7.1.2 Environmental Contextual Influences

The prominent Environmental Contextual Influences were the social environment and the physical environment. Descriptions related to the physical environment tended to relate to how the physical environment limited the range of tilt that could be used in specific
physical environments or that the set up of the physical environmental was such that a change in the tilt angle was required to remain functional.

How far back (referring to tilting back) changes when you are in a vehicle. Trains are a very tight quarter so I couldn’t tilt all the way. You are most restricted by the positioning of the space I’m parked in and the fact that if you are in a moving vehicle, it’s (tilting) not the thing to be doing. (Group 1 participant)

I was going down the curb and the footrest got caught. If I had kept pushing it then it (the wheelchair) probably would have flipped right over on my head forward. So that was kind of scary. So like I said learning from things like that. You don’t want it (tilt) too far forward cuz that’s no good (Group 1 participant).

The social environmental context was the strongest influence noted from the participant interviews. Using tilt in public, especially large amplitudes of tilt was perceived as being socially inappropriate. Participants described a preference to use alternate means to change positions rather than using tilt when in public due to the perceived social image.

OK. Now we talked a little bit about when you are out and about, say for example at restaurants, that you don’t feel comfortable tilting back (researcher).
Not in a full tilt. (participant)
If you are there for an hour or hour and a half? (researcher)
I would just would. (participant)
You could but for a shorter period of time do you just endure the discomfort or do you do something else to help relieve or decrease that discomfort besides tilt? (researcher)
I probably would try to shuffle a little more in my chair or maybe tilt a very slight amount under the table, maybe even tilt down as far as I could just to have a different position and then go back up to as much as the table would allow me under it. And try not to be too obvious when I’m doing it. (Group 1 participant)
The following participant describes her perception that as the need for more advanced mobility technology progresses (i.e. from scooter to power chair to power tilt wheelchair), the stigma attached to using mobility technology also progresses.

There seems to be a social stigma using a power chair over a scooter, it’s more socially acceptable to use a scooter. So once you’re into power chair in her mind is less, and then when I brought up the idea of power tilt with her, there was no way…So I think it’s not wanting to look different when it’s that bigger chair, tilting. It’s obviously different, it’s not just a mode of transportation from A to B you can get up out of. (Group 2 participant)

Equating use of full to tilt to lying down was noted earlier as a contextual influences in the Function Need subcategory as it inhibited the ability to engage in functional activities. As a social environment contextual influence, laying down in public or when visitors were present at home was felt to be socially inappropriate.

Uhm well if you are in a restaurant having dinner would you just lie down in the restaurant. If there was a bench at the front door and you felt tired would you go to the front door park yourself and lay down? Most people wouldn’t, you don’t, it’s just etiquette (participant).

So you kind of associate tilting with lying down, it’s kind of the similar position? (researcher)

Yah. (Group 1 participant)

Large tilt was equated to a person lying down on the sofa when there was company present; it was just not appropriate to do. “Not really. Ah, just cuz it’s a little weird to be laying down, maybe not all the way lying down but it feels weird to be all the way back and everyone else is sitting up or standing” (Group 1 participant). Participants also reported concerns related to the image using large amplitudes of tilt conveyed such as being more disabled or being in a vulnerable position. These feeling were exaggerated by the drive lock out feature and inability to easily move.
I think I’ve heard from some clients that, uh, not being able to, it, it looks very different, it doesn’t look normal when you are driving a chair, to pull over somewhere and tilt back fully. One of my clients, when I suggested that, she volunteers at a hospital, and if she’s there for more than 4 hours she gets really tired, saying that maybe she could find a quiet area and tilt herself back and take a break. She was worried how it would look to other people. She worried that some people would come up and ask if she was OK. Or be concerned about her welfare or well being. (Group 2 participant)

A second strong Social Environment Contextual influence was the image associated with using the headrest, especially in public. Participants in Group 1 described in some detail and with emotional intensity, how they felt they were perceived personally if they used their headrest in public. The concepts developed from these experiences were labeled as: increases look of disability; look child-like; look less intelligent; look more vulnerable or weaker.

I always have to remember “Oh I’m getting my picture taken, would you take the headrest off please, so I just look like a normal person.” Normally you don’t think about it, but that was an indication where you definitely look disabled or you look like Mickey Mouse. (Group 1 participant)

It was like the graduating moment…You leave (the rehab facility) and you finally get rid of your headrest. You don’t want to go back. (Group 1 participant)

You personally… what kind of perception does that give people? (referring to using the headrest). (researcher)

I guess maybe that you are weaker I guess, or vulnerable or more vulnerable, you have more problems. (Group 1 participant)

These perceptions influenced the use of the headrest such that most participants indicated they never used the headrest, or they used it only at home. One participant orchestrated her whole day around whether or not her smaller, less conspicuous headrest could be
substituted for the larger, more comfortable headrest when leaving the home. She would rather cancel the outing than go out with the large headrest in place.

So you like the large headrest for comfort but not necessarily for going out and about? (researcher)
That’s right. (participant)
And is that because of the way it looks? (researcher)
Uhmm, its bulky, its huge. It’s bigger than my head let’s put it that way. (participant)
So it is a little bit about how it looks? (researcher)
It is. So I keep the small headrest on if I know I’m going to go out. So that’s the time that I would have that. But if I know I’m going to be staying home, we leave the big one on me and I can lay back. (Group 1 participant)

That’s part of the reason I don’t have the headrest on all the time either, I don’t like the way it looks to be honest, and also because it’s so awkward when I try to drive and you try to look behind you and there’s the thing right behind your head, I don’t know, it just feel weird, so I never have it on when I’m out. I only do it at home. I don’t care like if people are over I will put it on. It doesn’t matter then. But I won’t go out with it on. (Group 1 participant)

These participant statements also exemplify the interaction between different contexts and the influence on the process of using power tilt. The interaction between contextual influences of Functional Need when outdoors (driving) and the concept of personal social acceptance (feeling weird with headrest in place) from the Social Environmental Context and the Personal Context of equipment set-up (not having headrest in place when out of home) influences the process by limiting the options available for consideration when a change in body position is required. Not having the headrest in place eliminates the options of using large or even medium amounts of tilt as the means to change body position as the necessary head support would be lacking.

To a large extent the social environmental context dictated if and how tilt was used especially when out in public or with other people. Most participants equated being in a
fully tilted position with laying down, which was perceived as unacceptable in public. The perceptions of looking more vulnerable or more disabled were associated with being in a large degree of tilt as well as with using the headrest. There often was however, a point at which an identified need such as discomfort, took priority over the Social Environmental Context and the participant would use tilt. The intensity of the conflict between the perceived image of using the headrest or large amplitudes of tilt influenced both sub processes of decision making. Often the process of using power tilt in daily life was altered based on the Social Environmental Context thereby influencing if and how power tilt was used to as a means to change position to support an action to enable a goal.

5.7.1.3 Personal Contextual Influences

The category of Personal Context captured the individualized nature of the described experiences. There were many concepts that were specific to the person. For example, the sensation experienced by moving into full tilt varied for each person. If that sensation was unpleasant or fearful it affected how they used tilt. The Personal Contextual concepts identified from participants’ experiences included the set-up of the equipment, the person’s physical abilities and the person’s knowledge related to tilt use. It is acknowledged by the researcher this may not be an all inclusive list but these are the concepts developed based on participants’ described experiences in this study. Due to the number of concepts created in this category, the concepts are summarized in Table 10. The conceptual labels are verbatim phrases used by participants to describe the contextual influence. Each main label in Table 10 is presented in a separate section below to describe each main concept including participant statements.
Table 10. *Summary of Personal Context category with associated concepts.*

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory with associated concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment set-up</td>
<td>Safety/fear</td>
</tr>
<tr>
<td></td>
<td>Stuck in tilt</td>
</tr>
<tr>
<td></td>
<td>Mechanical issues</td>
</tr>
<tr>
<td></td>
<td>Inability or limited ability to access tilt switch</td>
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<tr>
<td></td>
<td>Fear of falling</td>
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<tr>
<td></td>
<td>Falling forward if too upright</td>
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<tr>
<td></td>
<td>Tipping backwards</td>
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<tr>
<td></td>
<td>Due to mechanical or set-up issues with tilt</td>
</tr>
<tr>
<td></td>
<td>Lack of trust in the equipment</td>
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<tr>
<td></td>
<td>Sensation and affect related to using a large amount of tilt</td>
</tr>
<tr>
<td></td>
<td>Altered sense of uprightness or position in space</td>
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<tr>
<td></td>
<td>Uncomfortable to be in large tilt</td>
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<tr>
<td></td>
<td>Ability to tell how much tilt they are in</td>
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<tr>
<td></td>
<td>Mechanical issues with headrest</td>
</tr>
<tr>
<td></td>
<td>Position of headrest interferes with view</td>
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<tr>
<td></td>
<td>Headrest hits back of head when driving</td>
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<tr>
<td>Physical abilities</td>
<td>Extent of own physical movement</td>
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<tr>
<td></td>
<td>Ability to use of alternate ways to weight shift</td>
</tr>
<tr>
<td></td>
<td>Effect of gravity on body and ability to function</td>
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<tr>
<td></td>
<td>Compensations needed for limitations in physical abilities</td>
</tr>
<tr>
<td></td>
<td>Positioning for wearing bifocals</td>
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<tr>
<td></td>
<td>Modifying equipment to reduce impact of gravity on function</td>
</tr>
<tr>
<td>Knowledge and Value</td>
<td>Awareness that tilt can be used to assist</td>
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<tr>
<td></td>
<td>Knowing how to use tilt to assist</td>
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<tr>
<td></td>
<td>Acknowledgement of the benefits of using tilt</td>
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<tr>
<td></td>
<td>Value use of tilt and/or managing sitting pressures</td>
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<tr>
<td></td>
<td>Knowledge related to managing their skin</td>
</tr>
</tbody>
</table>

5.7.1.3.1 *Equipment set up.*

The set up of the power wheelchair, seating components and the tilt system were critical to supporting use of tilt. Participants described situations where they experienced
problems or were not able to use their tilt due to the set up of the equipment. In the description below, despite the knowledge and value this participant placed on using tilt, the benefit of using the tilt to address an identified need did not outweigh the benefit of not using the tilt.

Right, for example with the new chair, I can’t lean back right now, even with the pillow. And it’s not far enough forward, so all the weight is going right on my shoulder blades. So I won’t tilt. (participant)

You won’t tilt all the way back? (researcher)

No I won’t. It just hurts. (Group 1 participant)

Experiences describing fear of using tilt were often related to concerns for their own safety. They described fear of tipping backwards or falling out of the wheelchair backwards, particularly when using large amplitudes of tilt. “Were you fearful when you first got into the chair and had to go into full tilt?” (researcher) “Ya, ya. It felt like I was going to fall backwards” (Group 1 participant).

The first times, it (tilting) was always frightening. I would always park beside a table to I could grab it which is crazy because what would that do? As you get into it you figure out that those things won’t work. (Group 1 participant).

Participants also described fears of falling forward if they were too upright or if they were driving down an incline. Fear of getting stuck in tilt was also expressed, which was interconnected with the concept of drive lock out. Participants described not only being stuck in tilt but being unable to drive due to the drive lock out safety feature on the tilt system.

I think mechanical issues you know. The patient that describes, says “I got stuck back in tilt” or have that fear of being stuck back in tilt. That they again, they are reluctant to do that so they don’t get into that situation…A vulnerability yea. I’m on my own, somebody’s not coming back to check on me if I get into that position and I can’t get out then I’m stuck there. And often that means I can’t move my chair because I’m in drive lockout. (Group 2 participant)
These types of described experiences shaped how participants used their tilt based on their level of trust in the equipment. For example, one participant described a single experience of being stuck in full tilt because the control button didn’t work properly. Due to this incident the participant no longer trusted the equipment to work consistently so no longer used full tilt.

However, not all participants described experiences which lead to a lack of trust. In some cases there was an inherent lack of trust in the equipment without having a negative experience. There was fear to even try using tilt in particular ways, primarily using large amplitudes of tilt. This lack of trust in the equipment and fear of falling was not limited to Group 1 participants. Group 2 participants were also fearful of the wheelchair tipping as their client went into full tilt.

It’s amazing how many people don’t trust the chair that far back… I know I’m sitting there myself, yes I’ve actually had that and it’s like you are thinking that you want them to do that (go into full tilt) but your inner voice is going “don’t fall over, don’t fall over, please don’t let this be the one that does tip over.” (Group 2 participant)

There are certainly some who don’t like the fully tilted position, like 40-45 degrees. And I think it has something to do with the primitive reflexes, that they really feel that you know, it’s frightening to them. And that’s very understandable. I think they get back there and they just, they can’t relax back there. I think there’s sort of a righting reaction that’s coming into play and they just want to bring themselves right back up. And that’s very understandable, that there are some that quite frankly find it scary. (Group 2 participant)

Some participants described experiencing fear initially but over time got used to going into full tilt. “I’m sure that tilting back all the way would give you an uneasy feeling because you were never back that far. Now I’m used to it.” (Group 1 participant) Similar perspectives were shared by Group 2 participants however they felt the lack of trust never dissipated for a large proportion of their clients.
I think that it’s a high percentage of people that have that anxiety when they first try it (full tilt) but I would say it’s probably a smaller percent of like 20 percent that it would carry on once they had tried it, got confidence in the equipment. I think it’s pretty high that people feel like it’s not a natural position to be in and then that they’re not really that trusting of the equipment. (Group 2 participant)

The sensation experienced by participants during tilting was also described by many participants, especially for full tilt. Participants indicated fear was part of that sensation but tried to explain how the sensation contributed to the fear. Most described an altered sense of uprightness or position in space for which contributed to the fear of falling out of the wheelchair when in full tilt.

You feel as if you are going to fall so much back that your whole chair is going to go thunk and fall right backwards. It’s a concept that you have... It’s not logical but it’s a concept you can have, a picture of something. (Group 1 participant)

It feels as if you are almost heading upside down backwards. (Group 1 participant)

I know a lot of people who will tilt back and sleep in their chairs. It’s not for me. (participant)

Why is that? (researcher)

It feels unnatural to sleep laid back like that. I ya, it’s just not comfortable. (Group 1 participant)

Some participants described having difficulty telling where they were in space when tilting which made them somewhat fearful. Other participants described how they used physical cues to assist in knowing how far they were tilting.

It’s hard to judge how far back it is; uhm because my feeling, when I’m feeling it myself it feels it is a lot further back than watching somebody else do it (Group 1 participant)
Uhmm, sometimes I will put it back a little bit, or all the way then if it feels like I’m back too far, I would kind of know if it was half way or whatever, in between. (participant)
What makes it feel like its back too far? (researcher)
Well if its back all the way it’s because it stops, but before that just uhm, you know I guess how high my feet are in the air, something like that. Or how comfortable it feels. If it feels you are sitting back a little bit or back way too far, just the way it feel I guess...If I can’t see the TV in front of my feet then I know obviously it’s back too far. (Group 1 participant)

The last conceptual subcategory in this category of Equipment Set up is Mechanical Issues with the Headrest. This subcategory interacts with the concepts in the Environment Context category in which participants described how the presence of the headrest interfered with function or just caused discomfort or aggravation. In this category, the focus was how the set up and the mechanical aspects of the headrest were factors in using power tilt.

And it’s horrible when you go to the mall, and like people will be talking to you, and it’s like “Well who are you?” Because I can’t look up that far because of the headrest. You tilt yourself up quite a bit to see who you are talking to. It’s like “Well bend down so I can see who you are.” (participant)
So the headrest is what limits you for being able to look up or look around? (researcher)
Ya, it is very much. Its’ kind of annoying, but ya. (Group 1 participant)

You don’t use a head support? (researcher)
No, no. I find it a pain if I’m going over bumps it keeps banging me in the back of the head (Group 1 participant)

Because of the way it (headrest) looks and it’s constricting. I uh, you know, wanted to look over your shoulder a little bit, well it blocks your view. I don’t like it one single bit. (Group 1 participant)
As demonstrated in this section, the set up of the wheelchair and seating equipment also had a significant influence on participants’ willingness to use tilt, whether based on trust in the equipment or how it influenced their own ability to function, or influenced comfort. The set up of the equipment influenced how tilt was used, particularly large amplitudes of tilt. Outcomes from an issue with equipment set up that affected their perceived safety immediately shaped how tilt was used from that point onward.

5.7.1.3.2 Physical abilities.

The physical abilities of each individual participant also influenced how tilt was used. The following participant description highlights how her physical abilities influenced whether or not using tilt was considered as an option to changing body position. “I find that I can, like I’m lifting myself up and moving cheek to cheek just almost exercising myself. I would choose doing that over tilting.” (Group 1 participant) For this participant, tilt was not considered as a means to change body position during day to day activities because the ability to physically move was intact and valued by the participant. The decision making process did not progress to the sub process of weighing the benefit as tilt was not considered to be an option.

Other participants described using their tilt as to substitute or to augment their physical abilities. The description below demonstrates using tilt to substitute for the physical movement of her legs to address a positional issue.

I was just thinking one of the reasons I occasionally tilt is if I’m spasming a lot, my legs will kick out. If I go into super tilt, as far back as it goes, my feet will go back on the foot pedals which means they are not sticking out and I don’t break my leg like I have. (Group 1 participant)

Other participants shared experiences where the effect of gravity on their body and their physical ability to overcome gravity needed to be considered during tilt use. One such experience was presented previously in which the participant described being stuck in full tilt because she was unable to move against gravity to reach the tilt control buttons with her head. The following participant statement is a similar demonstration.
The other thing is the further back I lay the less functional my arms are. So the muscles that move my arms up and down work when I am sitting up, but when I’m laying back, if my hand moves up to my shoulder I can’t move it back down again. So. (participant)

So it changes your physical abilities as well? (researcher)

And the strength of lifting my arms up when I’m laying back, it takes a lot more effort and the muscles get tired very quickly. (Group 1 participant)

The physical abilities of the person influenced if and how tilt was used therefore were included as a construct in the Personal Context category. The participants’ physical abilities influenced each phase of the process of using tilt in daily life, defining to a large extent the parameters in which tilt was used by that participant. For example, the participant who could not reach the tilt control button in full tilt changed the range of available tilt thereby defining individual parameters of tilt use.

**5.7.1.3.3 Knowledge and value.**

The knowledge and value associated with using power tilt varied by each participant, which therefore influenced the process of using tilt differently. For this reason Knowledge and Value was labelled as a contextual subcategory in the Personal Context category. The label of knowledge was chosen as it included more than the experience and/or learning gained from the outcome of an incident as described in section 5.5. Knowledge included the accumulation of these experiences and learning as well as learning from other non-tilt experiences such that the participant was aware of the potential benefits of using power tilt. Knowledge influenced the full process at all phases of the theoretical scheme. Changing position as a strategy for managing sitting pressure is an example. If the person did not have the knowledge that changing his physical position would redistribute the sitting pressures, then the process of using power tilt did not occur as the person did not have the knowledge or awareness of the potential benefit of using tilt for this purpose.

It (referring to the interviews) has kind of opened my eyes as to why I tilt. I didn’t realize how important it was for pressure relief. (participant)
So it’s helped raise awareness for you? (researcher)
Umhm. (Group 1 participant)

Do they truly understand how serious that they (pressure ulcers) can be, that this can be, and if they don’t understand just how serious it can be, I mean perhaps we can talk to them until the cows come home and they are not going to use the tilt.
(Group 2 participant)

However despite having knowledge, if that knowledge was not valued by the participant then knowledge had little contextual influence on the process of using power tilt in daily life.

And if they have had skin issues in the past. It’s more personal to them; the doctors and team is telling me I should tilt, I will tilt. But those who are at less risk of skin issues say, well I will do it when I remind myself or when someone tells me to do it. (Group 2 participant)

OK. So I’ve had a sore and know what it feels like. When I was a patient here they had a session on like videos so there were classes to teach us about them. Uhm, the dietician also mentioned that every week she takes a mirror and went over her whole body checking so it’s education, it’s key. Now I took it very seriously because like I said it hurts (referring to having a pressure ulcer). I don’t want another one so. (Group 1 participant)

The contextual influence of both knowledge and value was required for the decision to use tilt to occur. Several participant statements presented are examples of how Knowledge occurred without value; knowing the benefit of using tilt but not valuing it resulted in tilt not being used.

How knowledge was gained in relation to using power tilt was also described by participants. Participants described gaining knowledge through learning opportunities and experience, through trial and error, and through instruction or facilitated opportunities. The above participant statements as well as the one below demonstrate
learning and experience gained through trial and error. The second statement below demonstrated learning through a facilitated opportunity.

Now when you got the tilt, do you remember, I know it was a long time ago so I’m taxing your memory, do you remember getting any instructions on how to use it? (researcher)
None at all. I remember the girls just saying it would be helpful to change your position. I said “Yah, that is kind of why I’m getting it”. But for me it was either I’m sitting up or I’m lying down. I never thought about in between things too much. But after a while just because you are uncomfortable you start to do it. So uhm,… (participant)
So you just sort of developed the techniques for how much you move it in-between on your own? (researcher)
Yes, on my own, that’s right. (Group 1 participant)

And I think one of the, there were 2 things I think that influenced me at the very beginning in terms of how much tilt I am using. And one was the provider of the wheelchair came in, was this big 6’4” burly guy, 250 pounds; he sat in my chair went all the way back and bounced up and down a few times and that made me more comfortable. I think for 2 reasons, one, it showed that I wasn’t really going to be able to push it back very easily. And 2 because it is hard to judge how far back it is; uhm because in my feeling, when I’m feeling it myself it feels it is a lot further back than watching somebody else do it. So maybe watching myself in the mirror might be helpful. (Group 1 participant)

These descriptions elucidate the interaction between the concepts in the category of Knowledge and Value and the process of using tilt. In the first example, the feedback process was primarily influenced as the participant received feedback related to the benefit of using tilt, which contributed to the knowledge gained as well as the value attributed to that knowledge. In applying this interaction to other previously presented participant experiences, if using tilt resulted in a negative experience such as getting stuck or the sensation of tipping, the value attributed to the knowledge gained would
likely support the benefit of not using tilt. In the last participant example, the Personal Context of the equipment set up as well as the Social Environment context were more controlled and supportive, influencing the knowledge gained and the value attributed to that knowledge. This interaction between context and process as contributing to Knowledge and Value was also evident in participant descriptions of the need to use different amounts of tilt for different purposes as well as how varying degrees of tilt were interpreted and communicated.

I have never had the concept of there is 10% tilt, 20% tilt. Not like I do the speed of my chair. I think about it because it has 4 speeds and it has uhm the constant increase. It can go from turtle to rabbit, that’s all adjustable on here, so I think about it that way. But tilt is just guided by comfort. I don’t think things like how far back am I right now? Na, I think things like table tops and desks kind of limit me in how far I can go. (Group 1 participant)

Because certainly when someone is sitting in the chair I don’t think they have a sense of, of just what 5 degrees is, what 10 degrees and 15 degrees is. (Group 2 participant)

To further understand participants’ knowledge about the variations in tilt, data is presented which were gathered during the first interview when participants were asked to demonstrate their perception of various amounts of tilt. Analysis of these data revealed variations for all participants between the perceived amount of tilt and the actual amount of tilt as measured in degrees using an angle measurement tool. These results are illustrated in Tables 11 and 12 for Group 1 and Group 2 participants respectively. The intent in gathering these data was to gain a sense of participants’ perceptions of different amounts of tilt to discern how closely related these perceptions were to the actual measurement in degrees.
Table 11. Comparison between requested and actual amplitudes of tilt and associated activities for Group 1 participants.

<table>
<thead>
<tr>
<th>Participant number</th>
<th>Requested amount of tilt</th>
<th>Actual amount of tilt</th>
<th>Typical activities</th>
<th>Actual amount of tilt</th>
<th>Typical activities</th>
<th>Actual amount of tilt</th>
<th>Typical activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>10°</td>
<td>5°</td>
<td>None stated</td>
<td>15°</td>
<td>None stated</td>
<td>20°</td>
<td>Resting</td>
</tr>
<tr>
<td>P2</td>
<td>No typical</td>
<td>10°</td>
<td>Getting dressed</td>
<td>25°</td>
<td>Watching TV.</td>
<td>45°-50°</td>
<td>Resting</td>
</tr>
<tr>
<td>P3</td>
<td>26°</td>
<td>15°-20°</td>
<td>At table</td>
<td>25°-30°</td>
<td>Computer Riding on Paratransit</td>
<td>40°</td>
<td>Talking to someone</td>
</tr>
<tr>
<td>P4</td>
<td>5°</td>
<td>5°</td>
<td>At table or computer Grooming, Reaching</td>
<td>15°</td>
<td>Watch TV.</td>
<td>22°</td>
<td>Getting into chair</td>
</tr>
<tr>
<td>P5</td>
<td>5°</td>
<td>2°</td>
<td>Brush teeth</td>
<td>20°</td>
<td>Watch TV.</td>
<td>50°</td>
<td>Resting Nap</td>
</tr>
</tbody>
</table>

Most Group 1 participants associated specific amounts of tilt to a functional activity, which was consistent with the findings in the journals completed by Group 1 participants. There also was consistency between these data collection sources regarding the types of activities for medium and large amounts of tilt, regardless of variations in the actual amount of tilt as measured in degrees. Activities for medium or large tilt tended to be static or stationary such as watching television and resting. Medium amounts of tilt tended to be just below the tilt position where drive lockout was activated. From the journals it was also noted that most of participants’ time was spent in small or medium...
amounts of tilt. However each participant had a unique distribution of amplitudes of tilt used throughout the day as well as across days depending on the activities and the environments in which they participated in the activities. From the journal analysis it was identified that large tilt was the least frequently used amount of tilt. One participant’s journal recordings indicated use of large tilt exclusively for getting into her chair in the morning. As evident in Table 11, variations were noted in the perception of different amounts of tilt especially for large tilt. Participants 1 and 4 perceived large tilt was actually around 20 degrees whereas Participants 2, 3 and 5 perceived large tilt was actually greater than 40 degrees.

Group 2 participants’ perceptions of tilt are compared to actual amount of tilt in Table 12, with the top row being the requested amplitude of tilt and the actual amplitude demonstrated by participant listed in the column below.

Table 12. Comparison between requested and actual amplitudes of tilt for Group 2 participants (Th), therapists who prescribed power tilt.

<table>
<thead>
<tr>
<th>Requested amplitude of tilt</th>
<th>10-15°*</th>
<th>15-20°*</th>
<th>30°</th>
<th>45°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant number</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Th1</td>
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<td></td>
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<td>Th2</td>
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<td>Th6</td>
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</tbody>
</table>

* Administration error resulting in participants being asked to indicate either 10-15° or 15-20° but not both.
As is evident in Table 12, Group 2 participants’ perceptions of varying degrees of tilt became less accurate as the requested amplitude of tilt increased. Most participants also expressed surprise at the extent of their inaccuracy in estimating different degrees of tilt. “Really! Wow I’m way off” (Group 2 participant)

In response to this part of the study, Group 2 participants expressed an appreciation of the challenge their clients must experience in determining how much tilt they are using.

So if it’s hard for us as staff to look and determine 20, 30 45 and its hard for me, it would be that much harder for someone especially in the chair, it’s hard in the chair to look down and see... I guess, it would be unfair for me to ask patients what is 20, degrees, 30 degrees, if I can’t really tell from outside, and they have limited trunk movement. (Group 2 participant)

Participants from both groups also described uncertainties in their own knowledge related to tilt use. This uncertainty in knowledge was prominent when discussion revolved around using tilt for pressure management. The first of the following two participation descriptions illustrate this uncertainty in knowledge and in the application of knowledge specific to pressure management. The second statement illustrates how feedback from experiences shaped how tilt was used for managing pressure and skin integrity.

Well, I guess that I thought I should use it more...Most of the time I’m just sitting upright like this, maybe a little more or less. But I started thinking I should use it more. (Group 1 participant)

Tell me what you mean by use it more. (researcher)

Like maybe just put it back further. I guess instead of sitting up like this all the time when I’m at home, I feel that maybe I should be putting it back more and using it. (Group 1 participant)

Why? Why do you think you should be doing more? (researcher)

It’s just because I have it, I feel I should be using it more often I guess. Like I see this guy out here and I see he has it pretty far (referring to how far back he was tilted). I see people like that and I think maybe I should be putting it back more but I don’t more. For myself I feel like I’m doing it alright. I guess I just second
guess myself. But I’m comfortable and there’s no sore and everything is fine then I guess everything I’m doing is right. (Group 1 participant)

So there’s nothing that’s suggesting to you that you need to, whether it’s thinking about pressure, whether it’s feeling discomfort, you are not sensing the need or thinking there is a need to change it? (researcher)

No, as long as things are not consistently red on my backside then no…But by having the girls continuously look and monitor, I’m asking the same questions every morning and every night; ‘how red is it?’ That’s, I’m basically basing what I do upon what they are telling me. (Group 1 participant)

These two above statement also illustrate how Group 1 participants managed their sitting pressures through monitoring their skin. To explore this concept in greater depth Group 1 participants were presented with the hypothetical situation of developing a pressure area, and asked if their use of tilt would change. All Group 1 participants indicated they would use more large tilt and remain in a large tilted position for longer. All Group 1 participants also stated having a red area or pressure sore would change their activity participation. Most stated they would not go out as much, they would remain home so they could be positioned in large amplitudes of tilt.

Well I would stop activities I imagine and make sure that I was off my butt more. Because if it did help, so I mean you would, exactly change you activities so that it would allow you to be able to be off your butt more, tilt back or whatever.

((Group 1 participant)

Uncertainty and self doubt were also described by Group 2 participant in relation to the information and training they were providing to clients related to learning to use power tilt and integrating tilt use into daily activities. The uncertainties and self doubt were related to their comfort level with their own knowledge about using power tilt in daily life. “I think I know but I would like to have support for what I am saying, yeah I think so” (Group 2 participant). Participants also indicated they felt there was a lack of guidance from the research literature as to the best way to use tilt specifically for
managing sitting pressures, thereby acknowledging a difference between using tilt for daily life and using tilt to manage sitting pressures.

So there seems to be that lack of understanding. And I think part of it may go back to when we do prescribe the tilt and provide it to them, maybe we’re not definitive enough uhm about what they should be doing. And again I don’t think there’s a lot in the literature that sort of says this is what you need to do in order to protect your skin so I think we may be a little bit wishy-washy about what they should be doing. You know, ‘once an hour just go back for a few minutes’ or something like that; that we are not definitive enough or we can’t provide it with guidelines that this is what you should be doing, to, to protect your skin as best you can. Now that said, if we did give that to them and we did have guidelines, or whatever that doesn’t mean everybody’s going to do it, not at all. (Group 2 participant)

So I would say the first thing they, they are not thinking skin right away. And I think that may be sort of us in our, I think because we jump to conclusions about people’s understanding the use of tilt and pressure management and so we are not really articulating how it should be used for that purpose right. We assume, we jump to that assumption. The other thing too is on outpatients, sometimes a lot of my people with tilt come to me with tilt. So even just thinking ok like just reviewing that education piece right. Again you jump to that conclusion that they’ve been using tilt for how many years so they know it. (Group 2 participant)

Group 2 participants also described feeling that assumptions were made regarding how much knowledge clients had related to using power tilt especially for managing sitting pressures. Several participants stated they felt that is was assumed that clients’ knew how to use tilt, that using tilt was intuitive, therefore clients would be able to determine use on their own.

I would say that overall that the practice is that people don’t articulate enough to people. We jump to those conclusions that it’s common knowledge right. I think so. Would you say that that’s true? (participant)
Well yeah but that’s why I’m doing this study. (researcher)
Oh yea! (laughter). Yeah, absolutely. I would say that we, we as clinicians think that a lot of it (tilt use) is just intuitive and common sense. (Group 2 participant)

Group 2 participants also identified the need for power tilt use to fit into daily life, to be integrated as part of day to day activities but expressed uncertainty with how to assist their clients with achieving that.

Ok. So what do you do to empower them? I guess it’s the education piece right.
It’s telling them that these are your risks uhm, (participant)
Does it work? (researcher)
I’m guessing it doesn’t, that’s what I mean, you know. You tell them about it but really it’s how it fits into their life right, like I don’t think they think about it so much I think they just use it as it, as they see fit for function. (Group 2 participant)

Sometimes I think that it’s again somebody recommended that it might be helpful for the management of the pressure sore. I don’t know if they can always translate it to. “If I frequently, consistently change my position that it is actually is truly going to benefit.” (participant)
OK. So it’s kind of that if I give you the tilt or I get a tilt chair then somehow that tilt chair is fixing my issues as opposed to its not the tilt chair it’s how you use the tilt chair that’s going to address the issue. (researcher)
It’s like the medication right? It’s the prescription, if I get the medication it’s going to make the problem go away; if I get the power tilt they’re telling me that’s going to resolve my issues, not maybe taking it that step further of how do I integrate that into my day to day. (Group 2 participant)

Overall Group 2 participants described a great deal of uncertainty related to the adequacy of their own knowledge about how to use power tilt, primarily for managing sitting pressures. They also expressed uncertainty related to how to best increase their clients’ knowledge about the benefits of using tilt for not only pressure management but also for any of the reasons for which they prescribe tilt. Group 1 participants’ expressions of uncertainty were intermingled with their fears and anxieties related to using power tilt,
especially large amplitudes. In relation to pressure management, all Group 1 participants felt their current level of tilt use was appropriate because they monitored their skin for signs of problems. All Group 1 participants indicated that if there was a problem they would alter how they used their tilt to allow more frequent position changes, and use large amplitudes of tilt to address the pressure issue.

5.7.1.3.4  Gaining knowledge.

Both participant groups identified knowledge resources and strategies that they felt would have been beneficial when receiving or prescribing an initial power tilt system as well as for ongoing use, because the users’ needs change over time. Both groups identified that the opportunity for discussion during the study interviews raised their awareness of their own practices which was important for gaining knowledge. Group 1 participants described opportunities that would have improved the efficiencies of learning to use tilt and the need to access relevant information in a format that was easily accessible to them. Group 2 participants described the need to gain knowledge for themselves related to using tilt but also to have available resources and strategies to transfer that knowledge to their clients.

The findings under the category of Gaining Knowledge do not fit into the theory directly but have implications as to how use of power tilt may be affected. The concepts developed from each participant group are presented as summaries in the following two sections.

5.7.1.3.4.1 Participant Group 1 expressed needs for gaining knowledge.

Group 1 participants expressed the need to gain knowledge at two stages; when initially getting power tilt, and after having gained experience using tilt over time. Participants varied in their expressed need for knowledge. Several felt they learned how to use the tilt by trial and error and that worked for them. Others felt having more preliminary information and opportunity to practice using tilt in a safe and perhaps structured setting would have increased the speed of uptake of tilt use and subsequently the incorporation of tilt use into daily life. Most of the suggestions for the latter point where in relation to increasing confidence in using medium and large amplitudes of tilt.
The suggestions for gaining knowledge at the inception of using tilt were very tangible, concrete suggestions which included:

1. **Opportunities to practice using tilt with guidance/support to establish trust in the equipment.**
   
   A lot of therapists talked about how their clients didn’t ever go back all the way because of fear going back. Or if they took them through full tilt they were gripping on the armrests. (researcher)
   
   Exactly, it is frightening. (participant)
   
   It’s frightening? (researcher)
   
   It is. At the beginning. If there were more just trying it out and tipping all the way back and saying, “Now how do you feel and has anything happened to you.” I really think that’s needed. (Group 1 participant)

2. **Use of pictures and mirrors to assist with instilling confidence in using tilt especially medium and large amounts of tilt.**
   
   Another suggestion is that someone takes pictures of you, it’s easy now with digital cameras, take pictures of you at each position of your tilt. And then you look at it and “You mean that’s all I am? That’s as far as I am going? That’s not bad.” But when you are in the chair it feels monumental. (Group 1 participant)

3. **Opportunity for self-exploration of tilt using trial and error.**
   
   Trial and error as far as what’s comfortable. Uhmm, the physiotherapist gave me the initial instructs; why you should be using it, to relieve pressure, pressure sores. And then from there I just did what was comfortable. I used it for, I figured things out like as far as reaching things. I thought, “Oh ok if I tilt back that makes me just inches high enough to reach something off that shelf in the store that I don’t need to go wandering around, excuse me, excuse me”, waiting for somebody, “can I help you”. Sort of look like that lost person look you know. It’s nice to feel that I can do it on my own; that I don’t have to rely on other people too much, can be independent. That’s a key factor for me. (Group 1 participant)
4. Opportunity to use tilt as part of a standard program/course to practice how to use tilt in daily life.

    Well if there was a program. (participant)
    I’m sorry? (researcher)
    If there was a thing like you have. (participant).
    Oh so something like the wheelchair course? (researcher).
    And go over bumps. Cuz those are things that even though I have tilt, I’ve had it so long that I have to make sure I pay attention, note where it goes up and down. (participant)
    So where it goes up and down, is that in relation to how much tilt you need to be in? (researcher)
    Ya. Ya. That’s right, to where you, to how much tilt you have. Because if you, going over bumps or going over curb cuts and stuff like that, when to put the tilt up and when to put it down. Like you really have to be cautious of that. (participant)
    Do you think that would have made you feel more confident in driving your chair with tilt sooner if you had something like that? (researcher)
    Ya. Probably. Ya, I’m sure it would have. Like if you go, like in the real world kind of thing, like going to a counter, then you have an idea of what to look out for. (Group 1 participant)

5. Need for written instructions or something to refer back to in the future.

    And it’s so silly, everything seems to happen so quickly that you don’t come up with all the questions. So maybe a sheet of why do I tilt, how often do I need to tilt, what happens if I don’t tilt. If that were in a guide sheet that might help. (Group 1 participant)

6. Importance of early training to improve confidence in use as well as speed up the learning process.
Should have someone present when I first start to use my tilt so I feel secure. Those kinds of things, just to speed up the getting used to it. Otherwise years go by until you get into it. It’s a waste. (Group 1 participant)

7. Need for follow-up at different time points within the first year.

I think an option to check in with the OT at the end of the year, boy would you pick up problems then. You would be able to see how I adjusted to the change in my life. (Group 1 participant)

8. Opportunities to track and then discuss how they are using tilt in their own daily life.

After a while I started to realize I have a basic routine of doing things. Before I started to do this (the 3 day journal) I never thought about how much, I think how often to tilt and so on. (Group 1 participant)

The need for knowledge for the person who has experience was not as strong as for the person just receiving the tilt technology. For the experienced person, the primary need described was having access to the right resources in a timely manner when the resources were needed. A few participants felt a refresher would be of benefit however not all participants agreed with this. Those that opposed it felt they were fine with monitoring their status themselves.

1. Easy access to resources when needed or wanted at the time they feel it is needed in a format that works for them.

I think it would be neat if you used a USB key. Anytime I encounter information and I can put it on the key, and that way I would have the information that I put on it and I know what’s on there. And then I could take it little by little. Rather than having it all and not knowing where to find it. (Group 1 participant)

2. Refresher to raise awareness of how they are using tilt in their own daily life so as to review their current needs and practices.

I remember somebody at one point telling figures but that was so long ago.
A refresher course would be good. (Group 1 participant)

It (study interview) has kind of opened my eyes as to why I tilt. I didn’t realize how important it was for pressure relief. (participant)
So it’s helped raise that awareness for you? (researcher)
Umhmmmm. (Group 1 participant)

Participants in Group 1 described the need for more knowledge related to using power tilt especially to gain confidence in using larger amplitudes of tilt when they first receive their power tilt system. Much of the need for more knowledge was in early training and intervention stages with opportunities for exploring in a safe environment and gaining an understanding of the benefit of large amounts of tilt. Potential tools to facilitate this knowledge gain were discussed, many of which were similar to those suggested by Group 2 participants. These potential tools are presented following the next section.

5.7.1.3.4.2 Participant Group 2 indentified needs for gaining knowledge.

Participants in Group 2 identified that their need for gaining knowledge was related to (a) gaining a better understanding of best practices based on the research literature, and (b) gaining knowledge about the pertinent aspects of assessment and training of tilt use so as to effectively and confidently transfer their own knowledge to their clients. Several Group 2 participants identified that their clinical practice may not be consistent, and perhaps not as thorough as they would like for each client, because they felt they did not prescribe tilt frequently enough to be comfortable with the specific details needed. Group 2 participants requested the development of guidelines or protocols to identify not only the standard practices that should be included in the assessment but also training and provision of education requirements related to power tilt.

Well I think, (pause) no I can’t say that I am confident in the information that I do give. I’m not sure that number one, that there is anything in the literature that really states, you know, sort of, are there best practice guidelines, sort of like when you are trying to educate people about weight shifting. I think even if we
had sort of some sort of *standard* best practice guidelines that we can tell patients what they should be doing, and of course those guidelines would have to be based on what there is in the literature. And maybe what’s in the literature is sketchy but there is something there that we could base some guidelines on. And as more research comes out, then we can change it. And I think that would certainly help with the educational component. Again what the client actually does with the information when they get home, there’s not much that we can do (Group 2 participant)

Participants also identified that assumptions were made about clients’ knowledge of tilt use. One such assumption was based on the likelihood that the thought processes of the therapists were not always shared with the client, therefore the knowledge transfer was not as effective as it could be. From these concerns, Group 2 participant identified the need for a teaching/education resource that:

1. Is based on up-to-date, concrete research evidence especially around the amount of tilt to use for managing sitting pressure, the duration to be in tilt especially large amplitudes, and the frequently with which tilt should be used throughout the day. Participants identified a lack of confidence in having knowledge of the best practices therefore felt a tool or resource was needed to increase confidence in their ability to individualize recommendations for clients as well as to explain and justify to clients the basis for the recommendations. They also noted that the recommendations must be reasonable to fit within the client’s daily life activities.

2. Has a standard baseline of what to do with the client for whom tilt is being prescribed, including an outline of factors to check, review, consider and monitor depending on the client’s level of knowledge about using power tilt.

3. Has a pathway or decision tree that assists in individualizing the recommendations for pressure management, not just tilt.

4. Provides a structured baseline of skills/knowledge and training to teach clients as a method of facilitating the incorporation of power tilt into their daily activities.
5. Is an easy, quick method to follow with a means of providing information to clients in an individualized package format. The information in the package must be tangible and concrete, highlighting the benefits of using tilt specific to that client.

6. Is developed and delivered by a trusted resource.

7. Uses a variety of tools and/or formats to accommodate different learning styles and different needs of individuals.

Group 2 participants also identified gaps in current practices which included training with regards to using tilt as well as follow up to assist clients with integrating tilt into their lives. Group 2 participants acknowledged that at the time of tilt prescription clients are usually dealing with many new challenges or health changes in their life, so much of the information is not carried forward into application or integration in day to day activities.

You know the reason I mentioned something about wanting something written down is that is such a, it’s a huge time in the client’s life to get a new power chair. I’ve often had clients say “Oh ...I need to get my glasses first, I can’t handle two things at one time.” And so for them, you know, we just think of it as matter of fact, you need a chair, let’s just look at power tilt but for them it’s, it’s a huge, huge issue. So by the time the chair is done, and we’ve got the back support and cushion right, some of them, I just don’t get the sense that they are able to absorb anything else. And that might not be the right time then to close the file and say good bye, but sometimes we are limited by time constraints. (Group 2 participant)

Training and follow up were felt to be important practice components but guidance and support to do so were also identified as lacking in current clinical practices.

Certainly like coming to this meeting today, I thought “Oh yes, I, you know, do a good job for my clients” (laughter) and while we talk of it and think a bit you know, it’s like “Wow I really need to do a better job I think, to encourage my clients to use tilt more”. You know, even just taking a look at it, are they at their saturation point and maybe requesting a visit 6-8 weeks after they have had it to
then pursue that as an identified goal back to the community care access centre which is my referring source. If we are looking at prescribing a chair that’s more than 10,000 dollars doesn’t it warrant 1 extra visit in 8 weeks just to make sure that they are using that portion, that significant portion of that chair. It’s not just an extra button on the chair, it is a, you know. So maybe we do need to uhm, you know give it a little more thought to that use and how, you know it’s not even, we can probably talk for a good chunk of time on how to educate someone, or how to make a training video or training pamphlet or whatever, but even just taking any time to focus on it beyond, you know, when that client has been using it initially. (Group 2 participant)

Participants in Group 2 described a more extensive and comprehensive knowledge need than Group 1 participants. Throughout the Group 2 interviews there was a sense of uncertainty from the participants in relation to how to best recommend their clients use power tilt especially for managing sitting pressures. There was uncertainty if there was adequate, definitive support from the research to support their recommendations for using large amplitudes of tilt given the associated lack of functionality and the challenges with integrating it into daily life. Expressed knowledge needs also revolved around strategies, techniques and tools to influence their clients to include tilt use as part of daily life activities.

5.7.1.3.4.3 Potential tools to aid in gaining knowledge.

As was noted in both sections above, Group 1 and Group 2 participants described tools they felt may be useful for gaining knowledge about using power tilt in daily life. Most of the tools revolve around gaining confidence in using tilt especially using a large degree of tilt. Participants described how using these tools would increase confidence through increasing knowledge, awareness and acknowledgement of the benefit of using tilt to change position. The potential tools that both groups identified include:

1. Angle goniometer to be more accurate in identifying the various degrees of tilt.

The suggestion of this tool arose out of the Group 2 participants’ surprise at their
inaccuracy in perceived angles of tilt, as well as Group 1 participants identified challenges with determining their position in space during tilting movement.

2. Mirrors and pictures to provide visual feedback related to position in space for various tilted positions. Pictures were suggested as part of an information package to influence the merging of the perceived amount of tilt image and the actual tilt image for various degrees of tilt thereby influencing the perception of position in space.

3. A tool to allow clients to be aware and monitor their angle of tilt position throughout the day. This tool was discussed by a few participants in both groups however in a very abstract manner. Several Group 2 participants identified the existence of such a tool but only on a certain manufacturer’s system due to a patent.

4. Pressure mapping to provide visual feedback related to the effects of changes in posture and pressure using different degrees of tilt. A print out of the pressure mapping image at different degrees of tilt was also suggested with the potential for it to be paired with pictures of the same tilted position as a method of reinforcing the perceived position in space image.

5. Pictures of pressure ulcers for those people who have or are at risk of pressure ulcer development. Several participants used the phrase “seeing is believing” to indicate the benefit of this tool.

6. Video to demonstrate the use of tilt accompanied with peer discussion rather than therapist. Several participants identified the benefit and need of credible mentor who was not a therapist.

7. Website for education available as a refresher which clients can access when they need it.

8. Use of a data logger for a period of a few days to assist therapist and client to identify what the actual tilt usage was in terms of frequency, duration and
amplitude. This tool was identified from both groups as a potential method to raise awareness of current tilt use patterns in relation to daily life occupations thereby opening up the discussion about tilt use especially for experienced users.

As mentioned at the start of the Gaining Knowledge section, the concepts developed under this category did not contribute directly to the construction of the theory of how the process of using power tilt occurs in daily life. Where this data contributed to understanding the process of using power tilt in daily life was in the identification of potential methods to influence (a) the feedback phase of the process, (b) concepts in the Knowledge and Value category of Personal Context and (c) other contextual factors that were described as having the potential to limit or inhibit to using power tilt. This data contributed to the second aim of the study; to determine if the knowledge gained from this study can inform clinical practice, adults who use power tilt and research related to power tilt use and pressure management.

5.7.1.4 Context: Summary of Concept Development

The primary categories constructed through concept development, related to the influence of context on using power tilt in daily life, were labelled as Function, Environment and Person. The results of the analyses from which these primary categories were constructed are extensive, therefore, they are briefly summarized here prior to proceeding to the theory construction section. The concepts in the category of Function highlighted that the ability to function was a powerful need which influenced the process of using power tilt, particularly at the decision making phase. Function often outweighed the benefit of changing position to address or resolve any other need. The tensions between using large amplitudes of tilt and function were highlighted. The concepts within the category of Environmental Context demonstrate the influences of both physical and social environments on tilt use. The influence of the social environment on using tilt was prominent, particularly related to the tensions associated with using tilt and/or the headrest in public, which limited how tilt was used when in public. The final contextual category presented contained the greatest amount of data. The Personal Context category contained subcategories of Equipment Set-up, Physical Abilities and, Knowledge and Value. The variety of concepts, relationships and interactions in each of these
subcategories was summarized in Figure 21. While these categories and subcategories were listed separately they did not occur independent of each other. The following section describes the influence of the interactions between concepts in these categories in greater detail as part of theory construction.

5.7.2 Context: Theory Construction

Corbin and Strauss (2008) define context as “…the sets of conditions in which problems and/or situations arise and to which persons respond through some form of action/interaction and emotion” (p. 88). Contextual concepts for the process of using power tilt in daily life were developed from both groups of participants from all phases of analyses. The contextual categories, as identified and detailed in the previous sections, did not influence the process as single elements. Contextual influence was the totality of the interactions between these categories, which ultimately influenced the course of action described by participants in response to the reason they needed to use tilt to change position and the value placed on those interactions. For example, the participant who never used a large degree of tilt when in public due to personal and social environmental contextual influences, did not value the potential benefit of using tilt when out in public. However when the personal context changed, such a drop in blood pressure, the participant used a large degree of tilt in public to address this issue. The interaction of between context and process shifted as the contextual influences changed based on the value of perceived benefit of using tilt to resolve the issue.

Participants described using tilt in different ways for different situations as a means to change position to enable an action. The following description highlights the interactions of contextual factors but also the influence context then has on the process of using tilt in daily life activities.

If I am on Para transit, I find it a difficult ride if I have the chair down. I need a bit of a tilt so the ride is more comfortable. So I am back a bit, more than normal, just because it takes out the bumps. Putting it so that bumps aren’t a problem when I have a got a bit of a tilt on. And if I’m at the movies, I’m usually tilted way back because I end up being at the back of the theatre and to get a better view. Then I
have quite a bit of tilt. But um if I’m at a, going out for tea or whatever with friends, it’s easy for me to tilt back just a bit so that it is comfortable. (Group 1 participant)

Different amplitudes of tilt were described in relation to enabling participation in daily life activities but also balancing that with addressing or resolving the issue of discomfort whether riding on the transportation service vehicle, being at the movies or out with friends. For each activity a different amount of tilt was used to enable participation while maintaining comfort. The participant’s knowledge about using the tilt for specific activities in specific ways was also highlighted. This interaction and interconnectedness of the contextual factors is represented in Figure 11 by the blue box on the left containing all of the contextual factors rather than as separate entities.

The relationships and interactions between context and process, such as that of the Group 1 participant above, have been described throughout the previous concept development sections as per the iterative nature of concept development and theory generation therefore will not be repeated here. The diagrammatic representation of the interaction between process and context is represented in Figure 11 by the blue bracket which encompasses the entire process demonstrating that context influences the entire process of using power tilt.

5.7.3 Summary

The results of the study exploring the process of using power tilt in the context of daily life have been presented in this chapter. From these results a diagrammatic representation of the theory that describes this process was constructed and is illustrated in Figure 11. There are however, important aspects of the theory that have been described in this chapter that cannot be fully represented in a diagrammatic representation. Neither context nor process occurs in a linear fashion or in isolation but due to the two dimensional conceptualization required for presentation, they have been diagramed as separate. Overlap between categories and concepts exist within the process phases and within context. Concepts within one subcategory may fit within another subcategory depending on the contextual factors and processes occurring as part of that incident. There is fluidity
between the concepts and categories of Process and Context so it is critical to view the diagrammatic representation in Figure 11 as fluid and dynamic. It is important to re-state that the subcategories developed from this study were not all inclusive nor were they definitive. The purpose of identifying and labelling categories and subcategories was to provide some structure to the process and context, not to definitively and exclusively identify categories. And finally, Figure 11 is a representation of a single occurrence of the fluid process. The process repeats numerous times over the course of a day whenever an incident occurs where potential exists for using tilt as a means to change position to be perceived as a benefit in order to address/resolve an identified need or enable participation in an activity. The following section titled Theory Application to Daily Life expands on this concept of repeated occurrence over the course of a day.

5.8 Theory Application to Daily Life

In isolation, the process of using power tilt in daily life appears simple: a need arises for which a change in body position is required; body position is changed using tilt thereby addressing/resolving the original need and/or enabling participation. However, the process does not occur in isolation. The complexity of this process was a result of the iterative interaction between process and context. The interviews from both participant groups as well as the Group 1 time-tilt journals provided insight into how this interaction occurred and varied for each participant over the course of their day to day lives. There was acknowledgment that tilt was used differently depending on the situation and the need. “Well, changes exactly, everybody does something different and something comes up. For me, travel for instance. That’s starting to come into play a lot” (Group 1 participant). The following description further demonstrates this iterative interaction as it occurs repeatedly through the day.

That really depends on what I am doing. If I am just sitting here watching TV I might change the tilt a maximum of 5 times in an hour. But in the morning, it depends on different things that I do. I may be using the phone so I’m on a different tilt. Then I go to the computer and need a different tilt. And then normal driving, uhm if I tilt down, if I’m in the apartment, to move around the apartment I have to put the tilt on quite low. It depends on my activities. Uhm, it really
depends. If I’m in the apartment probably not that many times. But if I go out, I uhm, I, to go down on the elevator I have to go down to pretty well straight to get on and off the elevator. And then I’m on a different tilt when I get off the elevator to go into the lounge. And then I’ll be sitting there for Para transit, for however long and I tilt up while I am waiting. I have to put the tilt down to get out of the building. I have to get the tilt down to get onto Para transit. Then once I’m on Para transit I tilt to where it’s comfortable for the ride. And then when we are done the ride we have to put the tilt down. To get off the van it has to be down quite a way. And then where ever I’m going. If I am going shopping I would probably not use much tilt while I’m in the mall or whatever until I get to a spot where we’re having coffee or whatever then the tilt goes up a bit. It goes down so I can drive around the mall again. (Group 1 participant)

This participant used tilt to enable getting on and off the elevator safely by decreasing the amount of tilt to reduce the overall length of the wheelchair and to improve the line of vision for driving into a small area, all contextual factors influencing the functional need at that point in time during the process. While waiting for transportation to arrive, discomfort became the issue to address so the benefit of using tilt outweighed the benefit of not using tilt while sitting in the lounge. This description elucidates the repetitive weighing of benefit that occurred for this particular participant as using tilt was integral to enabling participation in activities outside of the home.

The repetitive nature of how tilt was used in daily life and the fluidity of this process were also demonstrated in the time-tilt journals. The sample of time-tilt journal presented in Table 13 demonstrates the fluidity of the process but also how this process was embedded within daily life with actions as part of daily activities occurring both before and after the tilt process occurred. Also demonstrated is how tilt was used within the activities as a means to assist with physical movement or support for reduced physical ability. The time refers to the time of day that a change in position occurred using tilt. The activity describes the overall activity for which the change in position was required. The third column details both the amplitude of tilt the participant used to enable the goal of the activity, and the reason for choosing that amount of tilt. For example, the first two
entries relate to being transferred into the wheelchair at the start of the day. The first entry
reflects the starting point so the wheelchair is positioned in a large amount of tilt for
easier and effective positioning of her body, but once in the wheelchair, the tilt is changed
to a medium amount to address another postural issue.

Table 13. Sample from a Group 1 participant time tilt journal.

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Amount of tilt changed to and description of why changed</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:51 am</td>
<td>Transfer to chair</td>
<td>Large tilt – easier to position in chair</td>
</tr>
<tr>
<td>9:51 am</td>
<td>Transfer to chair</td>
<td>Medium tilt – easier to hold head up</td>
</tr>
<tr>
<td>9:52 am</td>
<td>Removing lift sheet</td>
<td>Large tilt – to not slide forward in chair</td>
</tr>
<tr>
<td>9:52 am</td>
<td>Adjusting pants</td>
<td>Large tilt – to not slide forward in chair</td>
</tr>
<tr>
<td>9:52 am</td>
<td>Putting on top</td>
<td>Medium tilt – to be more comfortable</td>
</tr>
<tr>
<td>9:58 am</td>
<td>Finishing up</td>
<td>Medium tilt – fear of falling forward (no chest strap)</td>
</tr>
<tr>
<td>10:11 am</td>
<td>Typing in journal</td>
<td>Small tilt – sore neck so moved to small tilt to be more comfortable</td>
</tr>
</tbody>
</table>

The iterative interaction between process and context is also evident in this sample.
Immediate feedback from using tilt interacts with knowledge this participant has from
years of experience and previous training. This sample also demonstrates how quickly the
process occurs as the benefit of using tilt for specific activities or actions within activities
was well known to the participant; tilt was used five times within a two minute period of
time.
Similar findings resulted from the analysis of all the journals related to how tilt was incorporated within daily life. Several participants noted their surprise in how tilt had become embedded or ingrained within many of their routines.

After a while I started to realize I have a basic routine of doing things, Before I started to do this (referring to the 3 day time-tilt journal) I never thought about how much I think of how often to tilt and so on. (Group 1 participant)

The journals provided additional insight into not only the frequency with which tilt was used but also the variability both across participants as well as for the same participant across days. There also was variability in the total number of times tilt was used in a day as well as the amplitudes of tilt used each day. This variability in use of tilt is consistent with study results identified in the scoping review from Chapter 2 where variability was also noted across participants and for the same participant across days.

The purpose of Table 14 is to illustrate this variability in how tilt was used for each participant based on small, medium and large amplitudes of tilt. The occurrence of forward tilt for some participants was also highlighted in the journals. In the interviews participants described tilting to a forward position to facilitate reaching activities. A forward position was identified by Group 1 participants as tilt that was smaller than their small range. Typically this would be close to an upright sitting position. The length of time spent in their wheelchair and whether the participant went out of their home that day was also provided in Table 14 for contextual comparison.

The frequency of tilt use varied between participants based on the total number of times tilt was used but also the range of amplitudes used. Variability was also noted across days for some participants. This summary of tilt use based on the time tilt journals provided further insight into the how frequently each Group 1 participant used tilt in their daily life. Coupled with the associated activities in which tilt was used, the journal analysis further confirmed and supported the dynamic nature of this process.
Table 14. *Summary of number of separate incidents where tilt was used across the three day recordings from the time-tilt journals.*

<table>
<thead>
<tr>
<th>Group 1 Participants</th>
<th>Locations where tilt used</th>
<th>Number of times tilt used per day (T).</th>
<th>Number of hours in wheelchair per day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of small (S), medium (M), large (L), forward (F) tilts used per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td>Participant 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1 Home/outing</td>
<td>78</td>
<td>23</td>
<td>38</td>
</tr>
<tr>
<td>Day 2 Home only</td>
<td>50</td>
<td>10</td>
<td>31</td>
</tr>
<tr>
<td>Day 3 Home only</td>
<td>72</td>
<td>18</td>
<td>44</td>
</tr>
<tr>
<td>Participant 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1 Home/outing</td>
<td>49</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>Day 2 Home/outing</td>
<td>79</td>
<td>33</td>
<td>31</td>
</tr>
<tr>
<td>Day 3 Home/outing</td>
<td>37</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Participant 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1 Home only</td>
<td>5</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Day 2 Home/outing</td>
<td>10</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Day 3 Home/outing</td>
<td>12</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Participant 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1 Home only</td>
<td>13</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Day 2 Home only</td>
<td>14</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Day 3 Home/outing</td>
<td>15</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Participant 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1 Home only</td>
<td>10</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Day 2 Home only</td>
<td>11</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Day 3 Home only</td>
<td>12</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>
5.9 Summary

The iterative approach to concept development and theory generation used in this study resulted in the identification of the study’s overarching core concept, around which the substantive theory was constructed. The theory, guided by the post-positivist grounded theory philosophical underpinnings of human behaviour, was created through examining the interplay of actions, interaction and emotions related to using power tilt, which occurred in response to issues/problems/situations that arose during the course of daily life but were also influenced by the context at that point in time during the day (Corbin & Strauss, 2008). The theory in this study was constructed around the core concept: the process of deciding to use or not to use power tilt as a means to change body position. One of the primary analytic techniques used for concept development and theory generation was diagram drawing. Using this technique resulted in the diagrammatic representation of the substantive theory that describes how power tilt was used in daily life.

A critical influence in the construction of the theory was that early in the data collection phase it became very apparent that participants from both groups did not and could not easily describe how power tilt was used to manage sitting pressures without describing the interplay with all other ways tilt was used in daily life; power tilt was embedded within daily life activities. For this reason the purpose of constructing this theory shifted to include clarifying the process of how power tilt was used within the context of daily life, elucidating the interactions between process and context as well as specific elements that had significant influence on these interactions. This expansion of the study facilitated the development of a key conceptualization that framed the theory. This foundational conceptualization framed power tilt as the means by which the action of changing body position was realized rather than framing tilt as the primary action. Therefore to understand how power tilt was used to manage sitting pressures, the composition of complex interactions between contextual influences, actions and identified needs was necessary to gain greater clarity in understanding how using power tilt for managing sitting pressures occurred within the context of the unique composition of an individual’s daily life.
Even though participants expressed the viewpoint that using tilt for pressure management could not be separated, many conceptual differences between using tilt for managing sitting pressures and other concepts were constructed from their shared experiences. Using tilt for managing sitting pressures was described as more cognitive than tacit. Use of large amplitudes of tilt tended to be associated with managing sitting pressure but was also identified as not being intuitively functional. Participants identified many contextual limitations to using large amplitudes of tilt within daily life. Group 2 participants specifically expressed uncertainties over the pragmatics of recommending the use of large amplitudes of tilt for managing sitting pressures to their clients. These participants felt that greater clarification was needed to guide clinical practice especially the provision of more concrete evidence around the parameters of frequency, duration and amplitude, as the implications of these parameters on daily life were identified as significant. Group 1 participants described how they monitor their skin as part of a skin management regime and employed using large degrees of tilt in their daily life if a red area developed. A disconnect between these two groups related to implementation of tilt use in daily life was evident but also acknowledged by participants.

Consistencies between groups were also identified. Both groups identified contextual factors which limited the use of large amplitudes of tilt, such as the mechanics of the equipment, functionality of large tilt, issues around using the headrest which impacts the ability to use large amplitudes of tilt, and the acceptability of using tilt both from a social environment context as well as a personal context. However, both groups also identified that there were opportunities to maximize the use of tilt especially for large amplitudes of tilt. These included influencing the level of awareness of the benefit of using tilt, influencing knowledge about how to use tilt in daily life situations, providing opportunities to experience tilt use in safe and controlled settings to increase confidence in using tilt through its full range but particularly into large amplitudes of tilt.

The discussion chapter further expands on the process and contextual factors that influence the use of power tilt within the context of daily life specific to pressure management. The theory and concepts from this chapter will be discussed in relation to managing sitting pressures.
Chapter 6

6 DISCUSSION

This study has advanced knowledge related to the use of power tilt in daily life, particularly for the purpose of pressure management. The theory generated in this study describes the process-context interactions of how power tilt is used in daily life. The basic process of using power tilt as a means to change position was found to be similar for all identified needs: a need was identified that required a change in position; a decision was made to use or not use tilt to change position; the action of changing body position occurred, enabling (a) the need to be resolved/addressed, and/or (b) participation in an occupation. The diagrammatic representation of this theory provided an avenue for understanding how power tilt was used as a single occurrence for a single need. Presenting how power tilt was used in daily life as singular occurrences availed opportunity for the components of pressure management and its interrelationships to be examined in depth. The examination of the components and interrelationships was essential to elucidating that contextual differences existed between using power tilt for pressure management and the other identified needs. Since the primary aim of this study was to gain insight and understanding of how power tilt was used in daily life for the purpose of managing sitting pressures, this will be the primary focus of the discussion in this chapter.

Pressure management was one of many needs identified that required tilt use as a means to change body position. All needs that required a change in body position were situated within the context of all other daily life needs, including those that did not require a change in body position. All participants in this study identified the critical need for power tilt use to fit into daily life. Describing this theory in the full context of daily life presented challenges due to the complexity and variability of the process-context iterative relationships that occur in the course of a day, as well as the propensity for multiple needs to occur simultaneously, creating competition. It is proposed that this broader perspective of daily life is what participants’ meant in their reference to power tilt needing to fit into daily life, especially for pressure management.
The foundational constructs of this substantive theory are used to guide this discussion of how power tilt use for pressure management fits within this broader context of daily life. The first discussion is brief but necessary to locate where, within daily life, power tilt use fits, based on the foundational conceptualization of the basic theoretical scheme. This discussion leads into the larger discussion of how the core concept of deciding to use or not use power tilt affects the fit of pressure management in daily life vis-a-vis the process-context interactions. This discussion related to the core concept revolves around two constructs generated from the examination of the components and interrelationships that elucidated contextual differences between using power tilt for pressure management and for other identified needs. These constructs significantly influenced the core concept particularly related to pressure management. The first construct is the conceptual relationship between using power tilt for pressure management and the conceptual category of Knowledge and Value. This relationship was foundational to advancing the understanding of the process of using power tilt for pressure management in the context of daily life particularly in the decision making phase. The second construct discussed is the association of pressure management exclusively with use of large amplitudes of tilt. This association is consistent with existing literature (Lacoste et al., 2003; Ding et al., 2008; Sonenblum et al., 2009). As such, the discussion elucidates how large tilt affected, and was affected by, the process-context interactions. These constructs that influence use of large tilt have provided opportunity for a more in-depth understanding of power tilt use for pressure management. During this presentation, consistency with the theoretical underpinnings of post positivist grounded theory will be highlighted. As a result of peer debriefing, additional theoretical considerations were discussed. As a result, the congruencies with occupational science and transactionalism will be discussed as they appear to offer potential to substantiate and add depth to the constructs of this study’s theory.

6.1 Foundational Conceptualization of the Basic Theoretical Scheme and Fit of Tilt in Daily Life

The examination of how this theory of power tilt use fits within the context of daily life begins with revisiting the foundational conceptualization of the basic theoretical scheme.
The conceptualization of this study’s theoretical scheme was based on the theoretical underpinnings of post positivist grounded theory that human behaviour is shaped by actions, interactions and emotions (Corbin & Strauss, 2008; Hocking, 2000; Cutchin, Aldrich, Bailliard & Coppola, 2008). The conceptualization is as follows: tilt was used as a means to change body position resulting in an action which enabled (a) the need to be addressed or resolved and/or (b) participation in an occupation. This conceptualization was created from the conceptual relationship that tilt was not the action but, as an assistive technology, it augmented the ability to physically change body position which enabled actions. Details of the development of this conceptualization are in the results chapter. This conceptual relationship is critical to understanding how tilt use fits within daily life as it changes the focus from how tilt is being used, to the action that is being enabled by using tilt.

From the participants’ descriptions it was evident that the actions enabled by using tilt enabled further actions. For example, using tilt to change body position enabled reaching, which further enabled grocery shopping, or using tilt to change body position to improve the line of vision enabled social interaction. These subsequent actions always resulted in an ability to participate in their daily life occupations. During the course of a day, other needs, such as discomfort, would arise; however the link to participation in an occupation always remained. There was either an interruption in participation so as to address or resolve the other need, or the occupation was altered or changed. For example, when out shopping with friends, if a sudden change in blood pressure occurred, participation was interrupted by using tilt to change position until the need was resolved, after which time participation in the occupation resumed. Where interrupting participation was not possible or adequate, then the method of participation changed by altering the occupation or by changing to another occupation. For example, the participant who played scrabble changed her method of participation by alternating between a position of comfort and a position of function, thereby enabling her to continue to participate in an occupation that held meaning for her. The participant, for whom fatigue affected participation such that she could no longer work at the computer, stopped use of the computer and changed occupations to watching television. She chose an occupation that matched her body position needs. No participant described tilting without an ascribed purpose linked to an
occupation. This is believed to be why using large tilt in daily life was challenging; the position assumed in large tilt fostered participation in very few occupations, typically only resting or napping.

The foundational conceptualization of this theory is congruent with the occupational science constructs of occupational performance. These occupational performance constructs can add depth of understanding to this key conceptualization. As described in Chapter 2, an occupation is comprised of tasks and activities (Harvey & Pentland, 2004; Law et al., 1996; Polatajko et al., 2007a). For example, one of the participant’s occupations was playing computer games with friends, which was comprised of a variety of tasks and activities such as getting under a table, reaching the gaming controller and interacting socially. Not all tasks and activities required a change in body position but for those that did, using tilt provided a possible means to enable the action and thereby participation in the occupation. This congruency with occupational science suggests that the concept of action, as depicted in this theory, may be expanded to the task-activity-occupation relationship described in Chapter 2. This relationship could advance the understanding of how using power tilt fits in daily life by identifying the role of tilt within the task-activity-occupation relationships, that is, for any component of this relationship that requires a change body position, there is a potential for power tilt to be used as a means for this change.

Another critical relationship in the foundational conceptualization of this study’s theory was that participating in an occupation was of utmost importance. The strength of the need to participate in the occupation was so strong that participants often endured discomfort or fatigue so as to continue participation. Studies related to wheelchair use also found that the personal meaning attributed to an occupation could be so intense that it overrides typical barriers to engagement, such as shoulder pain or environmental barriers, such that the person continues to engage in that occupation despite the barriers (Jedeloo et al., 2002; Samuelsson et al., 2004).

The importance placed on participating in occupations is also congruent with occupational science’s perspective that it is the meaning the person attributes to engaging
in an occupation that provides an understanding of human behaviour, the how and why people engage in different occupations (Harvey & Pentland, 2004; Wilcock, 2006, Whalley Hammel, 2004). The meaning attributed to occupations offers potential explanation of the variability noted in the studies of power tilt use in the scoping review. The variations in range and frequency of tilt use could potentially be explained by the need to change body positions as part of engaging in occupations. This relationship implies there are choices in whether or not power tilt is used to augment engaging in an occupation. As presented in the background chapter, an occupational science perspective positions choice and control as important elements in the attribution of meaning to engaging in occupations. Knowledge was also described as having an important influence on choice and control. The element of knowledge, as it pertains to tilt use for pressure management, is described in greater detail later in this chapter. In relation to pressure management, the limited functionality of using large tilt inherently reduces the choices for and control over altering, modifying or changing the occupation to address this identified need. This effect on choice and control is also influenced by the specific parameters recommended for pressure management, such as, large tilt for 2-3 minutes once per hour. Choice and control are also influenced by the environmental context, which is elaborated in the next section.

The final congruency with occupational science is the need for an individual approach, which is consistent with all power tilt and wheelchair use literature. The person-centred approach is a central construct in occupational science, which allows the focus of inquiry to remain on the person and how she chooses to engage in occupations (Polatajko et al., 2007a) rather than shifting the focus to the mobility technology. By focusing on the person and her occupations, an understanding of how the relationships between the contextual factors of person, environment, occupation and mobility assistive technology are connected can be gained. The connection is identified through understanding from the person’s perspective why occupations are chosen and the meaning attributed to those occupations thereby advancing the understanding of why and how an individual uses their mobility assistive technology since mobility assistive devices facilitate involvement in daily life.
6.2 Core Concept: Deciding to Use or Not Use Power Tilt to Change Body Position

The foundational conceptualization of this substantive theory located participating in occupations at the centre of daily life. This conceptualization was crucial to understanding the relationship between the decision making process and how power tilt fit into daily life as not all reasons for using tilt were included in every participants’ repertoire. The decision making process itself was described in detail in the results chapter of this manuscript. The focus of this section is on the iterative relationship between the decision making process and the use of power tilt when multiple competing needs exist, as this relationship has been proposed to define the fit of power tilt use into daily life.

The iterative relationship between context and process of using power tilt, as previously described, continued to be crucial to understanding the fit between using large amplitudes of power tilt and participating in daily occupations. In this study, the contextual concepts were categorized as person, environment and function. The categories are fluid, with concepts within the categories influencing, and being influenced by, other contextual concepts as well as by the process of using tilt itself. This process-context relationship is consistent with the position of post positivist grounded theory that behaviour is shaped by (a) how people act in their environments and (b) how the environment shapes how people act (Corbin & Strauss, 2008).

6.2.1 Key Constructs That Affected Use of Large Tilt For Pressure Management

To discuss the fit of using large amplitudes of tilt for pressure management within daily life, the two key contextual constructs that had the most significant influence are discussed. Presented first is the contextual influence of Knowledge and Value on the process of using power tilt for pressure management. This discussion compares the differences in concept characteristics between pressure management and the other identified needs to demonstrate the influence on the process, particularly the decision making process.
The second key construct is comprised of the contextual influences that affected the use of large tilt for pressure management. Consistent with the literature, the findings from both participant groups in this study indicated that small and medium amplitudes were used frequently throughout the day, whereas large amplitudes of tilt were identified as being used with less frequency (Sonenblum et al., 2009; Lacoste et al., 2003; Ding et al., 2008). The challenges of using large amplitudes of tilt in daily life have implications for power tilt use to address the need for pressure management.

6.2.1.1 Contextual Influence of Knowledge And Value on Using Power Tilt For Pressure Management

The concepts within the contextual category of Knowledge and Value were essential prerequisites to the process of using tilt to change body positions for pressure management. At the need identification phase, knowledge about pressure management was required to identify that a need to manage sitting pressures even existed. Also required was the knowledge that a change in body position may be beneficial to address the need to manage sitting pressures. However, if either of these knowledge prerequisites were present but not valued by the person, then the process for using power tilt for managing sitting pressure was still not initiated. The identification of the need for pressure management was dependent on the person who uses power tilt not only gaining and retaining knowledge related specifically to how power tilt is used for this purpose, but also valuing that knowledge. This knowledge-value relationship was not exclusive to pressure management but is critical for understanding the implications of the differences in the characteristics of the knowledge gained, retained and valued specific to pressure management.

For all identified needs, an iterative relationship existed between knowledge, anticipated benefit of using tilt and the realized benefit of using tilt. Concrete, tangible benefits from changing body positions were realized for resolving needs such as discomfort, dropping blood pressure, fatigue or for function. These concrete, tangible benefits also contributed to shaping the anticipated benefits that influenced future use of tilt. It was critical that the knowledge gained via realizing benefits was valued for it to contribute to shaping how
power tilt was used in future situations. Concrete, tangible benefits solidified that knowledge-value relationship for that associated need in context.

However, for pressure management the iterative relationship between knowledge, anticipated benefit of using tilt and realized benefits was based on abstract concepts. The benefit of changing body positions to redistribute pressures on the sitting surface was an abstract concept which provided abstract, not tangible, concrete, feedback. Also the understanding that a change in body position will affect seat pressure and therefore reduce risk of pressure ulcer development is based on abstract knowledge that produces abstract feedback. Therefore both anticipated and realized benefits for pressure management are based on abstract knowledge. To value the knowledge and subsequently the anticipated and realized benefits, trust in the knowledge was essential. A concrete, tangible benefit was easier to trust than an abstract concept with assumed benefits, as occurs with preventing pressure ulcers. Since the realized benefits for pressure management are abstract, knowledge is not easily gained through trial and error as it is with concrete, tangible benefits realized from the other identified needs. These interrelated relationships between knowledge, value and trust and their influence on anticipated and realized benefits, are primary differences between pressure management and the other identified needs for using power tilt.

To add to the complexity of the abstract nature of pressure management, the fit between pressure management and daily life was affected by the identification of the need for pressure management being dependent on the person recalling this need regularly throughout the day. As described in the results chapter, identifying the need for pressure management was not a tacit reaction to a physical need such as discomfort, or to a subconscious thought, such as needing to reach for an item to enable function. Changing body position for pressure management, in the absence of an indicator to initiate the process, required conscious effort. To initiate the process for pressure management, two elements were required each time this need was to be addressed throughout the day, as per the recommended parameters: (a) recalling the need through cognitive, conscious thought and; (b) valuing the need as well as the anticipated and realized benefits. Neither a physical nor a functional incident was associated with pressure management. Both
Knowledge and Value were critical at this initial need identification phase, as the combination of recall and value were required to trigger the intentional cognitive thought. For people who had sensation, feeling pressure may trigger tilt use but the participants in Group 1 of this study related tilt use for pressure to a physical need to address discomfort, not to manage sitting pressure. Several of these participants questioned if the benefit of managing sitting pressures would be realized if they waited until pressure was felt before changing position.

If the prerequisites for need identification were present and the process of using power tilt for pressure management was initiated, the process then flowed into the decision making phase. The contextual concepts of Knowledge and Value, including the above discussed relationships, continued to be prerequisites to considering tilt as a means to change body position for managing sitting pressures. Knowledge and Value also influenced how the benefits of using or not using tilt were weighed once tilt was a consideration. In this phase of the process, the anticipated and realized benefits for pressure management were not only abstract but also delayed, as opposed to the immediate, concrete, tangible benefits for the other identified needs. In the context of daily life, the benefit of using tilt to change position was also weighed against other competing needs that were occurring at that point in time. In this competition, the abstract benefits of pressure management were weighed against the immediately experienced concrete, tangible benefits of the other needs. Considering that pressure management is abstract, requiring cognitive effort to trigger and sustain the use of tilt, it becomes more evident why tilt use for pressure management is low.

The interplay of these Knowledge and Value relationships and concepts in relation to pressure management is illustrated in the following case example, using the theory as a guide. Mr. M. has been sitting in his power tilt wheelchair for a period of time. He recalls that he needs to tilt into a large amount of tilt regularly throughout the day to manage his sitting pressures and hasn’t done so recently. He knows shifting his weight is important for his skin health and he doesn’t have an alternate means of changing his body position to do so. He had a pressure ulcer in the past so he values managing his sitting pressure. He recalls the instructions from the therapist who saw him in relation to his pressure
ulcer, that tilting into large amplitudes was beneficial to healing and maintaining his skin. He identifies that he needs to tilt now to meet the guidelines suggested for managing his sitting pressures. For Mr. M, using tilt as a means to change his body position is a consideration based the value he placed on his knowledge about pressure management and tilt.

Mr. M weighs the benefits of using or not using tilt, given his current competing needs and context. He is watching television in his home, he is not expecting visitors, he has the telephone on his lap and he has his headrest in place. He knows he can continue to watch television while in large tilt. He decides the benefits of using tilt outweigh the benefits of not using tilt at this point in time. He uses his tilt to position himself in a large amount of tilt for the suggested duration of time, trusting that the benefit for his skin health will be realized.

This simple case illustrates, the interplay of knowledge, value and trust with anticipated and realized benefits as contextual elements influence the process of using power tilt for pressure management. In the current study, the personal knowledge each participant had related to using power tilt to manage sitting pressures shaped how they used tilt for pressure management in the context of daily life. Specific knowledge related to pressure management included (a) how they perceived pressure management, (b) their understanding of different degrees of tilt, and (c) other contextual influences affecting the use of large tilt. This knowledge shaped how tilt was used to manage sitting pressure especially in different contextual situations, which resulted in variations across participants. These individual variations elucidated the importance of the contextual influence of Knowledge and Value on the process of using power tilt to manage sitting pressures for each person.

6.2.1.2 Contextual Influences Affecting Use of Large Tilt For Pressure Management

The relationship between using large tilt and managing sitting pressures expressed among participants in this current study was consistent with the results in the studies by Ding et al. (2008), Sonenblum et al. (2009) and Lacoste et al. (2003). Also consistent with these
studies was that despite knowing that using large tilt can benefit the management of sitting pressures, actual use was low.

In this current study, contextual elements that influenced the use of large amplitudes of tilt in daily life were identified. Conceptual relationships were primarily those that inhibited the use of large tilt, with few identified that enabled its use. These primary concepts that influenced the use of large tilt were conceptualized as functionality, trust, social environment and influence of the wheelchair headrest.

6.2.1.2.1 Functionality.

Large amplitudes of tilt were identified as having limited functionality, creating a situation where the person’s body was in a position in space that was not conducive to participating in a meaningful occupation. There were many contextual relationships that contributed to this lack of functionality. The inability to drive the wheelchair when using large tilt due to the drive lock out feature was one such contextual relationship. The effects of drive lock out on function were described in the results chapter. The body position associated with large amplitudes of tilt also reduced the ability to be actively engaged in daily life occupations, thereby limiting use of large tilt to solitary and/or stationary occupations. The primary activities enabled through use of large tilt identified by Group 1 participants were functionally based but limited to resting, napping and getting positioned well into the wheelchair.

Group 2 participants voiced this lack of functionality as frustration and concern related to a lack of fit between using large tilt for managing sitting pressures and daily life function. Group 2 participants acknowledged that their clients used large tilt for the above described purposes but identified their primary reason for prescribing power tilt was for pressure management. Group 2 participants acknowledged this discrepancy between the reason for prescribing and actual client use, attributing it to a lack of fit between large amplitudes of tilt and being able to function. Group 1 participants also acknowledged this discrepancy but less directly. They described a lack of fit through numerous accounts of experiences where they could not or did not use large tilt in their daily life because it impeded function. The number of these shared experiences suggests there was an
underlying need to justify why they did not use large tilt. The lack of fit between large amplitudes of tilt and being able to function was further reinforced as all Group 1 participants indicated that large tilt would be used more often throughout the day if they developed a pressure area on their sitting surface. However, they also indicated they would reduce their participation in occupations, particularly outside of the home.

6.2.1.2.2 Trust.

Participants in both groups expressed a variety of issues around trust with using large tilt, from a lack of trust that the wheelchair would not tip over when in full tilt, to trust in their own knowledge about using large tilt properly for managing sitting pressures. Fear and/or anxiety of mechanical failure, of inability to reach tilt controls when in large tilt or of tipping over backwards were also described in relation to factors that impede use of large tilt. Trust issues influenced personal knowledge and the value attributed to that knowledge, such that actions were modified or changed because using large tilt could not be completely trusted. For example, in the results chapter it was described how a participant modified the available range of her large tilt to prevent getting stuck in that position again. The use of full tilt was no longer an option for consideration following the resultant modification, ultimately influencing her ability to manage sitting pressures. Another participant described how she always has someone behind her when going up her van ramp, despite her skill in driving. This was due to a single experience eight years previous when she fell backwards, ascending a ramp when in a tilt position. The contextual relationship between knowledge, trust and the sensations created by large tilt, whether anticipated or realized, influenced the process of using power tilt for pressure management particularly at the decision making phase. Due to issues with trusting the use of large tilt, it may no longer be a consideration in relation to an identified need to change body positions due to these past experiences, or the influence is such that the benefits of using large tilt may not outweigh the benefits of not using it.

6.2.1.2.3 Social environment.

Perceptions of social acceptance also had a strong relationship with using large amplitudes of tilt, particularly in public. Participants expressed that the image conveyed
when using tilt was that of being perceived as more disabled. Appearing vulnerable was also expressed, which compromised feelings of safety, especially since driving in large tilt is not possible due to the drive lock out feature. However, the social appropriateness using large tilt in public was the greater issue. Using large tilt was equated to lying down to have a nap or rest, or as a substitute for returning to bed. Any of these activities were perceived to be inappropriate to do in public or with others present when at home. In specific environments, where positions of rest or relaxing in a reclined position were acceptable, such as in a darkened movie theatre or on the train, large tilt could be a consideration. If large tilt was used, it was predominantly at home and when alone or with very familiar people. In weighing the benefits of using or not using tilt, these perceptions were concrete and tangible, weighting the decision towards not using tilt. These perceptions contributed to the knowledge attained related to tilt use that influenced the next decision making process when the next situation arose.

6.2.1.2.4 Influence of the headrest.

The strength of the influence of the wheelchair headrest on using large tilt was surprising to many Group 2 participants, as well as the researcher. The most salient example of influence of the headrest is the described experience in the results chapter where the participant’s day was orchestrated around whether the large or small headrest was in place, with appointments being cancelled if the small headrest was not in place. The headrest was strongly associated with similar social perceptions as with using large tilt. Being perceived as more disabled, less intelligent or child-like, as well as being more vulnerable or not looking normal, prevented participants from using their headrest, again more so in public than when at home. Iterative interactions also existed between this relationship and the above relationships in that the headrest affected the ability to use large tilt. Typically a headrest is required to tilt beyond 30 degrees and sustain that position for even a few minutes. Unlike tilt though, the choice to not use the headrest meant it was removed from the wheelchair by another person and usually left at home for the day. For some participants there was less choice in whether to use the headrest or not, typically for those participants who were more dependent on the headrest for physical support and function.
As a Personal Context, the headrest influenced tilt use. The position of the headrest interfered with viewing to the sides or behind. This interference made functional vision difficult, creating safety issues with being able to check all views when driving. The interference with viewing also created social issues with looking around the environment to interact with other people. The noise created by the headrest and being hit in the back of the head by the headrest when driving also produced concrete, tangible feedback and subsequent knowledge that influenced the decision to use the headrest, thereby influencing the ability to use large tilt.

For those participants who had greater choice in headrest use, the ability to move the headrest in and out of place independently was raised. Participants felt if they could control moving the headrest in and out of place, they would use it more as it would always be on the wheelchair but out of the way, depending on the social situation. Subsequently they felt they would use large tilt more. This preference suggests choice and control over the headrest issues were important, potentially altering the fit between large tilt use and daily life. This is consistent with the study by Harris et al. (2010) in the scoping review, where choice and control over when to tilt and how to use the virtual coach were identified as important.

6.2.1.2.5 Perceptions of large tilt.

The final construct related to the influence of large tilt use was the variations in perceptions related to large tilt use. The first variation is based on the results presented in Chapter 5 related to actual versus perceived tilt. The variation identified was that regardless of participant group, the perceptions of large tilt were different than actual large tilt. When compared to actual tilt, as measured in degrees, most participants’ perception of large tilt, or tilt past 30 degrees, was underestimated with actual tilt being closer to a medium and in a few cases, a small amount of tilt (refer to Tables 11 & 12). The implication of this finding is that participants are not reliably moving into a large amount tilt, even when they perceive they are doing so. The amount of tilt actually being used is uncertain but is likely not more than the recommended 30 degrees. Thus the effectiveness as a pressure management strategy is compromised. This misperception between perceived and actual tilt also has potential to compromise the effectiveness of
communication between the person using the power tilt and other service providers such as therapists or vendors.

A second variation in perception was related to differences between participant groups in how power tilt for pressure management should fit into daily life. All Group 1 participants indicated they monitored their skin daily, increasing their use of large tilt if signs of pressure are noticed. Subsequently, they also reduce their involvement in occupations because being in a large amount of tilt was not a position of function. This approach suggests that these participants value using power tilt for pressure management but they modified how it was used, based on their knowledge, so it fit with their daily life.

Group 2 participants identified that they recommend to their clients to use power tilt to change their position at regular intervals for a specified length of time throughout the day to redistribute and manage pressure. Similar to Group 1 participants, Group 2 participants also acknowledged that this approach of using a standard guideline of frequency, duration and amplitude does not fit well in daily life. Group 2 participants recognized the need to individualize recommendations for parameters of tilt use for pressure management (i.e. frequency, duration, amplitude), as each person’s life is a unique composition of occupations in which use of tilt needs to fit. However, these participants felt they lacked access to adequate knowledge and experiences to achieve individualization. They reported that implementing research evidence related to best use of tilt for managing sitting pressures into clinical practice was challenging. Part of this issue may be related to the tendency for study results to be presented as averages and ranges of variability which limits the ability to individualize recommendations related to frequency and amplitudes based on the research. The lack of adequate experiences voiced by Group 2 participants stemmed from the frequency of clients returning with skin issues. Group 2 participants questioned if they have a skewed perspective of the effectiveness of using power tilt as only those clients experiencing issues are seen again. To add to this issue, follow up was not readily supported by funders of service provision unless the client was having difficulties, therefore feedback related to successful power tilt use and fit into daily life was limited.
6.3 Fit of Power Tilt For Pressure Management With Daily Life

Understanding how power tilt was used for managing sitting pressures has been described in relation to the process that occurred and the various contextual influences on that process. Congruencies with occupational science have been discussed, adding greater depth to the concepts in this study’s theory, primarily for understanding the interplay between multiple and/or competing needs that occur in daily life. The interactions between the occupational constructs of choice, control and knowledge in relation to meaningful engagement in occupations has the potential to broaden this theory’s foundational conceptualization to affect not only the understanding of how using power tilt fits with daily life but also implementation of strategies or methods to influence that fit.

There are also congruencies with the occupational science construct of human behaviour as being shaped by the dynamic interactions between occupation, person and environment (Polatajko et al., 2007a); however the relationship between these constructs are conceptualized differently. The theory and knowledge generated in this study have situated person, environment and function as contextual constructs with the transactive relationship between these contextual constructs as well as between context and process being central conceptual relationships in this theory. In contrast the occupational science perspective described previously conceptualizes the characteristics of occupation, person and environment as existing independently therefore can be evaluated and affected independently, suggesting a linear cause-effect direction between characteristics (Law et al., 1996; Aldrich, 2008). The assumption of a dualistic nature of the relationships inherent in this conceptualization does not capture the transactive nature of the relationships, which are critical to the constructed theory resulting from the current analysis (Dickie, Cutchin & Humphry, 2006; Aldrich, 2008; Cutchin & Dickie, 2012).

Recent occupational science literature suggests that the action-based theory of transactionalism may assist to advance the understanding of the relationships between the constructs of person, environment and occupation. The central construct of transactionalism is that “phenomenon do not merely interact as separate forms; they move through one another and transact as co-constituted entities” (Aldrich, 2008, p 151).
Transactionalism assumes interdependence between person and environment with the occupation, or action, being the focus of the transaction of person and environment (Dickie et al., 2006; Cutchin et al., 2008; Cutchin & Dickie, 2012; Aldrich, 2008). The elements of person and environment are continually related, or “functionally coordinated”, such that elements of person and environment are co-constituted through this mutual relationship to the action or occupation (Cutchin & Dickie, 2012; Aldrich, 2008).

This theoretical position of transactionalism is congruent with the generated theory in that the understanding of how power tilt was used in daily life was embedded within the occupations of daily life but the process by which occupational engagement occurred was coordinated through the transaction of the mutual elements of person and environment. The decisions to use or not use power tilt were based on the transactions occurring at that point in time between the contexts of person, environment and functional needs. The intent of the conceptualization of the contextual construct of Functional Need at that Point in Time, is similar to the constructs of transactionalism. The concepts in this construct represent the transaction between the need to engage in the occupation in its current form, and the personal as well as environmental contexts. Functional Need at that Point in Time was identified as a separate construct due to the importance placed on function in the participant descriptions.

The overlap and transaction between the three contextual constructs of this substantive theory is also integral to understanding how context influences the process of deciding whether or not to use tilt to augment engagement in the action, or occupation. In relation to using power tilt to augment engagement, the decision making phase of the process is transactive. Anticipated and realized benefits are the result of contextual transactions, which are considered or weighed, shaping the decision to use or not use tilt to augment engagement in the occupation. If the decision to use tilt is made, the contextual transactions also shape how the tilt is used in relation to amplitude and duration so as to enable engagement in the occupation.
This congruency between the substantive theory generated in this study and transactionalism is preliminary. Further examination of transactionalism in relation to understanding how power tilt is used in daily life is limited due to the scope of this study and this manuscript. However, congruency at this level is indicative of the need to further explore the potential for transactionalism to broaden the current theory and knowledge related to understanding the fit between using power tilt for pressure management and daily life.

This discussion chapter has focused on the implications of the results of the current study on using power tilt in daily life for pressure management, highlighting its complexities. The categories of Knowledge and Value are influential in shaping future use of large tilt through the transaction with other contextual influences such as the social environment and the use of the headrest. Knowledge related to using tilt for pressure management provides the foundation for how and when to use tilt to change positions for managing sitting pressures. Knowledge was influenced by the abstract nature of pressure management in that concrete indicators related to anticipated and realized benefit were lacking, which influenced the perceived functionality as well as confidence in using large tilt. A lack of trust in using large tilt was pervasive throughout the study, which reinforced the benefits of not using large tilt rather than the benefits of using it, thereby influenced tilt use for pressure management. If experiences are strongly negative, then the likelihood of tilt use being modified or discontinued is high, as the trust and therefore the value in the benefit of using large tilt is diminished or destroyed. Despite the potential for negative associations with using large tilt, participants in both groups were eager to share thoughts on how the potential for these negative associations could be reduced or affected, suggesting that using large amplitudes of power tilt as a pressure management strategy was valued. The value of using power tilt to affect other needs for changing body position as they arise throughout the day was never questioned in this study; however, the substantive theory generated in this study provides a clearer conceptual understanding of process and contextual influences. The perspective of occupational science offers potential to clarify some of the complexities of using power tilt in daily life for pressure management, as does the theory of transactionalism. As a preliminary theory, further work to substantiate it is needed, with the goal of advancing knowledge research in the
field of wheelchair technology, particularly power tilt use, as well as the clinical field of pressure management.
Chapter 7

7 CONCLUSION

The current study contributes to the advancement of knowledge related to understanding how power tilt is used in daily life, particularly for pressure management. The substantive theory constructed from the study results provides a means to conceptualize how the contexts of person and environment transact, influencing the process of using power tilt in daily life occupations. The determination of whether or not tilt was used at any point in time during the day was a result of the influence of the contextual transactions of person and environment on occupational engagement. The enablement of engaging in occupations was the central construct of daily life. This theory and its associated concepts have provided insight into how power tilt is used in daily life, thereby achieving the first objective of this study.

The process of using power tilt as a means to enable engagement in occupations was similar for all identified needs; however there were differences in the contextual elements that influenced the use of power tilt to address the need for pressure management. Consistent with the scoping review, pressure management was associated with the need to use large tilt, but use of large tilt was infrequent in comparison to small and medium tilt. In this study, participants attributed low use of large tilt to the lack of fit of between the position of the body when in large tilt and engaging in daily life occupations because the ability to function in this position was limited.

The findings from the study analyses advanced the understanding of power tilt use in daily life in that the process of using power tilt for pressure management was primarily cognitive in nature. Cognitive thought was required to initiate the process as well as during the decision making phase. Cognitive thought was influenced by personal and environmental contextual concepts, often inhibiting the use of large tilt for pressure management, particularly when based on negative experiences, or the anticipation of negative experiences. These negative experiences of large tilt use provided tangible feedback to support the benefit of not using tilt, outweighing the abstract, delayed
benefits of using tilt to manage sitting pressures and prevent pressure ulcer development. Due to the abstract, cognitive nature of using tilt for pressure management and the delay in realized benefits, its use was primarily dependent on having knowledge about the benefits of use but also on having trust in, and valuing that knowledge. Despite these challenges of using large tilt in daily life, participants suggested methods for gaining knowledge related to this use, indicating the potential and the need to affect some of the contextual elements that influence use of large tilt. These findings give rise to the potential capacity to influence knowledge related to power tilt use for pressure management, thereby the potential to influence the fit of the process of using power tilt for pressure management in daily life.

7.1 Clinical Implications

One of the aims of this research study was to determine if the knowledge gained could inform clinical practice thereby informing adults who use power tilt. The clinical utility of the knowledge gained is grounded in the finding that to foster an understanding of the complexity of power tilt use in daily life, the focus of practice needs to expand from the technology to how engagement in occupations of daily life is influenced or enabled by using power tilt.

Study findings specific to using power tilt for pressure management have potential to inform clinical practice particularly related to the contextual constructs that influence use of large tilt. The elements identified that inhibit use of large tilt, such as fear of use, can be influenced through the translation of concrete types of knowledge. In this way the contextual constructs in the category of Knowledge and Value that influence the cognitive, abstract process of using tilt for pressure management are optimized including the attribution of value for that knowledge. Clinically, the theoretical framework can be used to ground these individual contextual elements to the process. The person using power tilt will still exercise choice and control, and the meaning of the occupation will continue to influence whether or not tilt is used during the in-the-moment situations; however, by providing opportunities to influence the individual elements in the construct of Knowledge and Value, the potential to decide to use power tilt could be optimized.
Clinical utility is also noted for study findings related to the constructs which have the potential to confound the attainment of knowledge related to tilt. These constructs include: (a) the disconnection between actual and perceived amplitudes of tilt by participants in both groups; (b) the differences between participant groups in defining the parameters of using large tilt for pressure management, in that participants who used tilt increased use of large tilt when signs of pressure appeared, whereas therapists’ perspectives were that it should be used at more regular intervals through the day for prevention; and (c) a lack of trust in participants’ own knowledge about using tilt as a pressure management strategy. The need for advanced knowledge related to the benefits of using power tilt as a pressure management strategy, whether for use of large tilt, or related to the potential benefits of small or medium tilt use more frequently, was expressed by both groups but more intensely by Group 2 participants.

7.2 Theoretical Implications

The parallel between research related to use of power positioning assistive technology, including power tilt, and wheelchair use research was highlighted in the background chapter. Mobility metrics used in studies for both technologies resulted in similar findings, including the identification of a lack of depth of understanding related to the influence of context on tilt use, which contributed to an incomplete understanding of how technology was used in daily life. Some wheelchair use literature used a person-centred approach which focused on the relationship between person, environment, occupation and technology. This person-centred approach is consistent with many of the dominant theoretical models of assistive technology use, such as the Matching Person and Technology (MPT) by Scherer (2002) and the Human Activity Assistive Technology (HAAT) by Cook and Miller Polgar (2008). These models conceptualize the components of person, environment and occupation as separate interactive constructs, with assistive technology having the ability to affect that dynamic interaction. However, this current study challenges this theoretical idea particularly in regards to the dualistic nature of the interactive relationship between components of person, environment, occupation and assistive technology to describe technology use.
Based on the findings from this current research study, this researcher suggests that the constructs of transactionalism may aid in a more complete understanding of assistive technology use. In this study, the components did not act as independent systems as is suggested in these dominant models, but they transacted, constantly coordinating and co-constituting each other, shaping and being shaped by the action and the meaning attributed to that action (Aldrich, 2008; Cutchin & Dickie, 2012). Person-environment transactions are evident throughout the participants’ descriptions of how they used power tilt. The results of this study suggest that moving the theoretical models of understanding assistive technology use towards a transactional understanding of the relationship of components would advance understanding of technology use. Doing so could foster greater understanding of how daily life is “functionally coordinated” (Cutchin & Dickie, 2012, p.27), and how and when assistive technology, as a means to the action, is used or not used to enable those daily life occupations. The theory generated from this study has potential to offer a framework by which elements of tilt use can be examined within a transactive process-context relationship of engaging in daily life occupations (Law et al., 1996, Aldrich, 2008). This potential can be realized through further development of this theory using constructs from occupational science and transactionalism.

7.3 Future Directions

As a preliminary theory, this study’s theoretical framework needs to be implemented in practice and then evaluated to determine extent of clinical transferability (Parahoo, 2009; Bhattacharyya, Reeves & Zwarenstein, 2009). The depth of triangulation of data from multiple sources using multiple methods in this study has contributed to the credibility, dependability and confirmability of the results of this study and the substantive theory; therefore there is confidence in the transferability of results to clinical practice for adults experienced with using power tilt. Further exploration is needed to determine if variations exist in the theory for people new to using power tilt, for people with existing pressure ulcers, for people under the age of 18, for people with different diagnoses, or for people who use large tilt regularly throughout their day. In doing so, the transferability of the results from this study would be strengthened. It is anticipated that the contextual
influences in the substantive theory would expand, providing a broader perspective of the context-process transactions that influence the decision to use or not use power tilt.

Complementary to advancing the substantive theory from this study, the parameters of power tilt use as a pressure management strategy require further research. The ability to integrate current parameters into daily life is limited and participants identified a lack of confidence in the evidence based knowledge related to the current parameters. Trust in the knowledge is paramount if tilt use for pressure management is to be an integral part of a pressure management repertoire. Broadening options of tilt use to allow individualization in application of the strategies to daily life needs also has potential to optimize integration. Knowledge gained from this study related to potential tools and strategies to influence the contextual elements in the category of Knowledge and Value identified to inhibit tilt use, particularly large amplitudes of tilt, provides an additional direction for research. The influence of addressing these Knowledge and Value elements on actual tilt use is a future direction for research, not only in relation to the translation of the knowledge but also the best implementation methods to optimize the regular power tilt use within the context of daily life occupations.

A future research direction proposed relates to theoretical advancement of occupational science as this study and the theory generated demonstrate congruencies with occupational science and transactionalism. It has previously been proposed in this manuscript that occupational science, particularly the relationship between person, environment and occupation, may be advanced through using a transactional approach. The foundation for this proposed future direction for advancement has been discussed in Chapter 6, in relation to the fit of power tilt with daily life.

The use of large amplitudes of power tilt has been established in the literature as an effective pressure management strategy. However recent research has demonstrated that the integration of this strategy into daily life has been limited. The current study has contributed to the advancement of knowledge related to how power tilt is used in the context of daily life. The theory generated from this study, provides a preliminary avenue for examining the complex relationships of person, environment, technology and
occupation. This theory positions occupation as the action through which process and context elements transact, constantly coordinating these complex relationships in relation to the engagement of occupations throughout the day. Power tilt, as an assistive technology, augments the actions within these complex relationships. In using power tilt for pressure management, contextual elements related to large tilt use, and the elements in the Person Context categorized as Knowledge and Value, appear to offer the greatest opportunity to understand as well as influence if, how, and when large tilt is not only used for pressure management but also coordinated across the various occupations that comprise daily life. The theory framework provides the avenue by which interventions to affect these elements in the complexities of daily life can be grounded. Further clinical and theoretical advancement through research is required to gain a more comprehensive understanding of the broader perspectives of how assistive technology is used in daily life and to continue to explore the potential for transactionalism to expand theoretical constructs in this substantive theory as well as in occupational science.
References


Georgia Institute of Technology, Georgia, Mobility Rehabilitation Engineering Research Centre. (2010). *Draft of Clinical Recommendations for Use of Power Tilt Systems*


Registered Nurses’ Association of Ontario (2007). *Assessment and Management of Stage I to IV Pressure Ulcers (Revised)*. Toronto, Canada: Registered Nurses’ Association of Ontario.


Appendix A

Ethics and Letters of Approval for Study

Figure 12. Western ethics approval February 17, 2011.
Figure 13. VHA research ethics committee approval letter May 15, 2011.

May 15, 2011
Laura Titus, OT
PhD Candidate
Graduate Department
University of Western Ontario

Dear: Laura Titus,

This letter is to confirm that VHA’s Research Ethics Committee is pleased to approve the Research Project: What are the barriers and facilitators to daily use of power tilt for managing sitting interference pressure as perceived by adults who use power tilt wheelchairs and therapists who prescribe this technology?

This project is approved for a one year period, commencing May 15, 2011. If there are any amendments to the project during this time, they must be submitted to the Chair in writing for approval by VHA’s Research and Ethics Committee prior to their implementation.

We will require a progress report at the end of six months following the initiation of the project and a final report at the completion of the project. These reports are to be submitted to the Chair of the Research and Ethics Committee.

If you have any questions related to the project they should be directed to the Chair, Research and Ethics Committee.

Sincerely

Carey Lucki
Co-Chair, Research Ethics Committee
Manager, Client Services

Sandra McKay, PhD
Co-Chair, Research Ethics Committee
Coordinator, Research & Program Evaluation
Figure 14. Community Care Access Centre and Saint Elizabeth Health Care letter of approval for study May 26, 2011.

May 25, 2011

Saint Elizabeth Health Care, South West Delivery Centre
1100 Dearmess Drive
Unit 15
London, ON N6J 1N9

Attn: Eileen Cunningham and Laura Titas

Dear Eileen and Laura,

This letter of support is to endorse the research project proposed by Laura Titas, PhD candidate titled: “What are the barriers and facilitators to daily use of power lift for managing sitting interface pressure as perceived by adults who use power lift wheelchairs and therapists who prescribe this technology?”

The University of Western Ontario’s Ethics Approval document and the Letter of Intent form were reviewed. The outcome of this research project will benefit future SW CCAC clients, as it will contribute to promoting a higher quality of life for this client population.

Please feel free to contact Hardeep (Nuprac) Sarna, Regional Quality Manager at [contact information] regarding this research project.

All the best,

Sandra Coleman
Chief Executive Officer

Ontario
Figure 15. Western ethics revision to expand study to include recruitment at Parkwood Hospital June 23, 2011.

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Comments</th>
<th>Western Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised Protocol</td>
<td>Protocol has been updated with new recruitment for this study.</td>
<td></td>
</tr>
<tr>
<td>Letter of Introduction &amp; Consent</td>
<td>Parkwood Hospital</td>
<td></td>
</tr>
<tr>
<td>Letter of Introduction &amp; Consent</td>
<td>Health Care Agency</td>
<td></td>
</tr>
<tr>
<td>Letter of Information &amp; Consent</td>
<td>Therapists - Parkwood</td>
<td></td>
</tr>
<tr>
<td>Letter of Information &amp; Consent</td>
<td>Therapists</td>
<td></td>
</tr>
</tbody>
</table>

This is to certify that the University of Western Ontario Research Ethics Board for Health Sciences Research involving Human Subjects (UWO REB) has reviewed and authorized the study as per the ethical principles set forth in the United States Department of Health and Human Services regulations and the applicable laws and regulations of Ontario's human subject protection guidelines. The study was approved by the UWO REB on June 23, 2011, and the study was conducted in accordance with the UWO REB's guidelines and procedures. The study was conducted in accordance with the UWO REB's guidelines and procedures. The study was conducted in accordance with the UWO REB's guidelines and procedures.

The Chair of the UWO REB is Dr. Joseph Gilbert. The UWO REB is registered with the U.S. Department of Health & Human Services under the IRB registration number 926-0000940.

Ethics Officer in Charge for Further Information

[Signatures]

This is an official document. Please retain the original in your files.
Figure 16. Western ethics revision to expand recruitment by removing participant upper age limit of 64 years of age.

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Comments</th>
<th>Western File</th>
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</thead>
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<tr>
<td>Revised US RE Protocol</td>
<td>The eligibility criteria for participants has been revised to include those over 64 years of age.</td>
<td>20140321</td>
</tr>
<tr>
<td>Revised Letter of Information &amp; Consent</td>
<td>Turtles</td>
<td>20140322</td>
</tr>
<tr>
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<td>Adults</td>
<td>20140322</td>
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<td>Parrots</td>
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</tr>
<tr>
<td>Amendment</td>
<td>Amendment Information for Participants</td>
<td>20140322</td>
</tr>
</tbody>
</table>

The revised protocol, submitted to the University of Western Ontario Research Ethics Board, demonstrates the commitment to ensuring the ethical treatment of participants. This revision was approved by the Research Ethics Board, and all procedures involving human subjects adhere to the tenets of the Declaration of Helsinki. The revised protocol includes additional safeguards for participant well-being and privacy.

As the ethical approval for this study, the revised protocol provides necessary information to potential participants about the study, including the purpose, procedures, and potential risks. Participants are informed that they have the right to withdraw from the study without any consequences.

The revised protocol ensures that all necessary safeguards are in place to protect the rights and welfare of the participants. The University of Western Ontario Research Ethics Board is committed to upholding the highest standards of ethical conduct in research involving human participants.

Please contact the Ethics Office for further information.

Ethics Office: 519-661-3030  E-mail: ethics@uwo.ca  www.uwo.ca/ethics

The University of Western Ontario

Office of Research Ethics
Figure 17. Western ethics approval to extend the study to June 30, 2012 for further recruitment.
Appendix B

Group 1 Interview 1 guiding questions and knowledge descriptors

Guiding questions for semi-structured interview

1. Describe how you use tilt during the day.
   Probes: What reasons do you use power tilt?
   Are there particular activities or situations that you find limit or hinder your ability to tilt?
   Are there particular activities or situations that you find allow you to tilt?
   Do you feel that you are using your power tilt to its fullest benefit? Please explain

Questions related to identifying amplitudes of tilt used by participant

1. Please show me what your usual sitting position is. At this point the researcher will measure the amount of tilt in degrees using an angle measurement tool (goniometer).
2. What other tilt positions do you use and for what purpose?
3. Could you show me what you think a small amount of tilt would be?; a medium amount of tilt would be?; a large amount of tilt would be? The researcher will measure the amount of tilt in degrees for each of the demonstrations.

Knowledge descriptors:

1. Age,
2. Gender
3. Where do you live? (urban/rural; house/apartment)
4. Diagnosis
5. Do you have a pressure ulcer currently; in past; since getting power tilt?
6. How many years have you been using power tilt?
7. How much time do you spend in your power tilt wheelchair?
8. How much time do you spend outside of your home?
9. What types of activities do you participate in outside of your home?
   Probes: paid work, volunteer work, leisure activities, personal care activities such as grocery shopping.
Appendix C

Group 2, Interview 1 guiding questions and knowledge descriptors

Guiding questions for semi-structured interview

1. Please describe how and why clients use their tilt
2. How do you feel that you role as the prescriber influences how a client uses their tilt?
3. Please describe the reasons you prescribe power tilt
4. Please describe what you tell clients about using power tilt for managing risk of pressure ulcers? (directions for use provided; reasons for use)
5. Do you feel confident in the education/information is meeting client’s needs. Please describe.

Demonstration of different amplitude ranges of tilt

1. Can you show me how much is 15 to 25 degrees of tilt; 30 to 40 degrees of tilt; 45 to 50 degrees of tilt

Knowledge descriptors

1. How long have you been working as a therapist?
2. How long have you been prescribing power tilt wheelchairs?
3. On average how many power tilt systems do you prescribe in a year?
4. For what diagnostic populations do you most frequently prescribe power tilt wheelchairs?
5. What is the age range of clients for whom you prescribe power tilt?
6. Where do your clients for whom you prescribe power tilt live? (urban/rural; living accommodation; assistance)
Appendix D

Sample of the Group 1 Time-Tilt Journal

Instructions: This is a journal in which you will record for 3 days each time you use or thought about using your tilt and what activities or situations were happening in your day at that time. You will be asked to estimate if you used a small, medium or large amount of tilt for each recorded tilt. The purpose of this journal is for me to gain some insight into how you use you tilt throughout your day and understand what influences your choice to tilt or not to tilt. Please feel free to add comments, thoughts or ideas about using tilt to the journal.

If you have issues with the equipment or with completing this part of the study, please contact Laura at

*Reminder that the small tilt is the same as what you call regular amount of tilt

<table>
<thead>
<tr>
<th>The time when you thought to tilt</th>
<th>What was going on at that time? Activity/task/event</th>
<th>Chose to Tilt</th>
<th>Chose not to tilt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>How much?</td>
<td>Why?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:15 am</td>
<td>Having breakfast</td>
<td>S M L</td>
<td>Didn’t tilt because I’m having breakfast – can’t tilt when I’m under the table</td>
</tr>
<tr>
<td>10:45 am</td>
<td>Getting ready to go out – tilted when I was putting on my coat.</td>
<td>S M L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Easier to put on my coat</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S M L</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E

Group 1, Interview 2 Guiding questions

What advice would you give someone who was getting or using their first power tilt? What would you tell them?

How did you figure out what the right amount of tilt was to be using?
- discomfort without an environmental cue
- what helps you decide

How did you get to the point of integrating it into your daily activities?

If you developed a pressure ulcer on your buttock, would it change how you used your power tilt? If so, how?

If you could go back to when you first received your tilt or when you were trying it out, what type of information and/or opportunity would you want to be given, knowing what you know now? Do you think any of the issues you had could have been avoided?

Content
Timing
Where to get info
Method of obtaining
- Face to face, internet, CD
Would regular reviews/refresheres be helpful?

What was your experience in doing the journal? Or the interview? Did anything surprise you?
Appendix F

Group 2, Interview 2 Guiding questions

There was an overall theme that most people are not using their power tilt effectively. How do you define or differentiate between a person who uses their tilt effectively and a person who doesn’t? How do you define/identify effective use of power tilt?

What is ‘at risk’? How would you define it or determine who is at risk in relation to pressure management? Is there ever a time where managing pressure is not a use for tilt?

An overarching theme that emerged was that therapists feel they don’t provide enough information and/or training for power tilt especially for pressure management. What are your thoughts on this?

One of the themes that came out very strongly is that tilt needs to ‘fit’ or be ‘integrated’ into daily life for it to be functional therefore used well.

Do you think people can integrate tilt use into their daily life on their own?
Are there ‘things’ they need to be able to do this? What factors contribute to integrating tilt into daily life?
Do you feel you have a role in fitting tilt into daily life or can have an influence on it? How or why not?

Another concept that emerged was that effective intervention for power tilt is related to clinical experience. What are your thoughts on that?

How do you get clinical experience – what are the factors that contribute to clinical experience? (how do new therapists then gain the ability to assess and prescribe power tilt – how or can we equalize that knowledge level more)

Evidence based practice values both clinical knowledge and experience as well as research evidence-how do you pair your clinical evidence with research evidence? (how do you get your research evidence; what would you need to improve this).
Curriculum Vitae

Name: Laura C. Titus

Post-secondary Education and Degrees:

- University of Western Ontario
  London, Ontario, Canada
  1984-1988 BSc (OT).

- University of Western Ontario
  London, Ontario, Canada
  2009-2013 PhD

Work

- Clinical Occupational Therapist
  Hospital and community settings
  London, Ontario, Canada
  1988 to present

Honours and Awards:

- Province of Ontario Graduate Scholarship
  Revision list
  2011-2012

- Province of Ontario Graduate Scholarship for Science and Technology (OGSST)
  Revision list
  2010-2012

- School of Occupational Therapy Excellence in Teaching Award
  Western University
  London, Canada.
  2009-2010

- Caregiver Recognition Award
  South West Community Care Access Centre
  London, Canada.
  2008

Related Work Experience

- Teaching Assistant
  Western University
  2009-2013

- Part time limited duties teaching appointment
  Western University
  2009-2010
Member Expert Panel
Canadian Best Practice Guidelines for the Prevention,
Assessment and Treatment of Pressure Ulcers in People with
Spinal Cord Injury.
London, Canada
2011-2012

Reviewer
Special assistive technology issue
Canadian Journal of Occupational Therapy
2011

Study Collaborator and Research Associate
CanWheel Research Study Projects 2 & 5 London Site
London, Canada
June 2011 to present

Canadian Co-coordinator
AusCan Risk Assessment for Sitting Acquired Pressure Ulcers
Canada
October 2011 to present

Co-investigator
AusCan Risk Assessment for Sitting Acquired Pressure Ulcers
Canada
May 2010 to present

Publications:

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Canada: Rick Hansen Institute.

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