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CURRENT TRENDS IN SPLINTING THE HAND FOR CHILDREN WITH NEUROLOGICAL IMPAIRMENTS

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OPERATIONAL DEFINITIONS

Neuroplasticity: The ability of the brain to make use of intact neurons in order to create new pathways through facilitation, stimulation and practice so as to regain functional ability (Woodsen, 2008:1034).

Neurological impairment/disorder: A condition where there has been an insult to the developing or developed central nervous system of the foetal, infant (Rosenbaum et al, 2006: 480) or child's brain resulting in motor, cognitive and or perceptual impairments (Fairhurst, 2012:2).

Paediatric: Any child below the age of 18 years (Mandal, 2014).

Pre-writing skills: The skills that are needed before writing can be effective: stability at the shoulder and wrist; the ability to scribble (Exner, 2005:288).

Neuromotor readiness: The ability of the central nervous system to communicate with the muscles of the body to allow for effective and voluntary movement (Ter Schegget, 2002:39).

Splints

Thermoplastic / Hard: Thermoplastic material that can be moulded through heat in order to support or protect a joint (Coppard & Lohman, 2008:29).

Soft: Material such as lycra or neoprene can be used in order to support or protect the joint whilst allowing for more movement (Coppard & Lohman, 2008:374).

Splinting practices: The OTs choice of whether or not they construct or issue pre-made splints to children with neurological impairments.

Cast: The use of plaster of paris wrapped around joints to normalise tone and lengthen muscle through prolonged pressure (Lockhart, Margallo and Russell, 2010:1).

Clinical Reasoning: This is the ability of a therapist to justify their reason for splinting, through applying theory to individual patients, based upon previous clinical experience (Dutton, 1995).

Client factors: This refers to the client's diagnostic characteristics including body and cognitive functions (AOTA, 2013: 1)

Personal factors: This refers to the reasons that the therapist takes into consideration when splinting. These include knowledge of the condition, therapist's experience with splinting, and their feelings of competency (Shafaroodi et al, 2014: 5), resources available and time.

LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
ATNR	Asymmetrical Tonic Neck Reflex
BoNT-A	Botulinum toxin-A
CIMT	Constraint-Induced Movement Therapy
CNS	Central Nervous System
CPD	Continuing Professional Development
HPCSA	Health Professional Council of South Africa
INSTOPP	Governing Body for Private Practitioners
NDT	Neurodevelopmental Theory
OTASA	Occupational Therapy Association of South Africa
ROM	Range of motion
SANDTA	South African Neurodevelopmental Association
SASHT	South African Society of Hand Therapists
StatsSA	Statistics of South Africa
UNICEF	United Nations Children's Fund

Please note that for the purposes of this report the child will be referred to in the masculine form and the researcher will be referred to in the feminine form.

ABSTRACT

Aim: *The study aimed to explore the current splinting practises as used as a method of intervention for improving hand function in children with neurological impairments within the South African context.*

Methodology: *A quantitative cross-sectional design using an electronic self-administered questionnaire was utilised in order to address the objectives of this study. The sample included Occupational therapists working within the paediatric neurological field in South Africa. The study sample was collected through convenience and snowball sampling in order to target therapists specifically working in the area of paediatric neurology.*

Results and Discussion: *Forty therapists completed the survey in its entirety. Therapists splint for various reasons and are in agreement that splints can be effective in neurological cases. The 3 most prevalent splints are the functional resting, thumb abductor and anti-spasticity splint with therapists mainly splinting to maintain or improve ROM.*

Conclusions: *This study provides an insight into the splinting practices amongst occupational therapists who work with neurologically impaired children. It shows that therapists do choose to splint despite the controversy that surrounds splinting in neurology and that many factors are considered during the decision-making process.*

Keywords: *Splinting, paediatrics, neurology, occupational therapy*

CHAPTER 1. INTRODUCTION

1.1 INTRODUCTION

Research findings in the field of neurological rehabilitation in the past years have recommended that all therapists base their practice on scientific evidence (Sandin, 2012:1 and Girard, Rochette & Fillion, 2011:60). In the past, therapists have focussed more on compensating for impairment in clients with neurological impairment, but due to the increasing knowledge of neuroplasticity, they are encouraged to rather focus on minimising impairment and increasing function through the training or retraining of activities of daily living (ADL) (Sandin, 2012:1).

Neurological impairments is a term used to describe conditions where there has been an insult to the central nervous system (CNS). As stated in Fairhurst (2012:122), the CNS is mainly developed during pregnancy until five months post-natal, with this period posing a danger due to the immature brain being more vulnerable to malformation, infection, damage and disruption. The types of insults that result in an encephalopathy are generally referred to as cerebral palsy. Other conditions that can result from neurological insult include genetic conditions, pervasive developmental disorder, degenerative conditions, traumatic brain injury and HIV related conditions.

Splinting for children or adults with a neurological impairment has often been considered a controversial area of practice amongst occupational therapists within a neurophysiological approach (Neuhaus et al, 1981:86 and Langlois, 1986 as cited in Langlois, Pederson and MacKinnon, 1991:18). Due to the minimal

scientific literature on the clinical benefits and efficacy of splinting in neurological conditions for both adults (Pitts & O'Brien, 2008:466) and children (Blackmore et al, 2006: 8), therapists commonly need to use their past experience to justify its use when with the neurologically impaired (Lohman & Aragon, 2008:353).

1.2 BACKGROUND TO THE STUDY

Updated statistics on children with chronic disabilities in South Africa are hard to find, and are often inaccurate (The Child Health Policy Institute of South Africa, 2001:4). In a survey done in 1999 by The Child Health Policy Institute of South Africa (2001:6), it was found that approximately 2% (70 000) of children in South Africa have a disorder that affects motor function. More recently, the Statistics South Africa (StatsSA) Annual General Household Survey (2009), as cited in Department of Social Development, Department of Women, Children and People with Disabilities and the United Nations Children's Fund (UNICEF, 2012:6), reported that 11.2% of the child population had a disability. Robertson (2006:259) also reported that seven out of 1000 children were diagnosed with a seizure disorder, and that 70% of these children suffered from neurological impairment. Regarding the Australian population, Saleh et al (2008:60-80) found that these children with neurological impairments formed a large percentage of the paediatric population being treated by rehabilitation therapists, including occupational therapists.

Although there are a range of neurological disorders, as mentioned, this study focuses on the disorders that result in motor impairments, specifically that of increased tone. It must be noted that while each neurological disorder may have

been caused by a different insult to the brain, the physical clinical signs are similar. Cerebral palsy is described in more detail, as it is a type of head injury that shows similar signs and symptoms to that of a traumatic brain injury and a paediatric cerebrovascular accident.

Children with cerebral palsy display many typical signs, and will present with developmental delays, most commonly delayed motor milestones, which is usually influenced by abnormal tone and abnormal reflexes (Shiel, 2012:1). This can present as increased tone, where the muscles become tight and tendons may shorten, which can lead to a limitation in their range of motion (ROM), and if not treated, can advance to contractures, where the joints can no longer be moved. In the presence of decreased tone, the child appears floppy and all joints are easily moved. Dystonic cerebral palsy is often characterised by involuntary movements that are caused by fluctuations in tone, from increased to decreased and vice versa (Fairhurst, 2012:125). It is often found that children with abnormal tone also have decreased voluntary movement, leading to abnormal motor patterns. Abnormal movement patterns often lead to limited activity participation, particularly if the child's hands are affected (Rosenbaum et al, 2006:12).

Children with cerebral palsy may also have sensory processing difficulties, this being the inability to process information received from the sensory systems (visual, tactile, gustatory, auditory and olfactory), as well as misinterpreting proprioception, stereognosis and vestibular functions. This may lead to abnormal sensation being experienced due to CNS damage, as first described by Ayres (1989:11) in relation to sensory integration theory. If the child is unable to interpret

the stimuli in the environment, this can lead to decreased hand use and therefore decreased interaction with the environment.

“The child who has a disability affecting hand skills has less opportunity to take in sensory information from the environment and to experience the effect of his or her actions on the world.” (Exner, 2005:304)

Cognitive and perceptual impairments are also typical co-morbidities of cerebral palsy. Due to inattention and decreased task concept, the child is unable to attend to an activity, is unable to understand what must be done with an object or how the upper limbs should interact with the object. As perception is the ability to integrate cognition and sensory information, a perceptual impairment limits the child in what activities are undertaken (Rosenbaum et al, 2006:10).

Neuromusculoskeletal deficits, cognitive and perceptual delays, as well as sensory processing difficulties all affect how the child with a neurological impairment uses his hands to interact with the environment. Occupational therapists often work with children with cerebral palsy or other neurological impairments in order to improve or maintain function. An occupational therapist makes use of many therapeutic techniques to achieve the goals for each individual patient (Skold, Josephsson & Eliasson, 2004:417). One of these techniques is splinting of the upper limb, which therapists do for a variety of reasons, as indicated in research and text books. These include: to maintain, restrict or increase the range of motion; promote independence through increasing function; protect new wounds or weak structures; prevent or correct deformities; decrease pain and

inflammation, as well as increase muscle strength and stabilise joints (Lannin & Ada, 2011:22).

Only one study conducted in Canada focussed on splinting for the paediatric neurologically impaired population. Reid (1992:26) concluded that the use of splints for children with neurological impairments was sporadic. It was also reported that many therapists did not make certain splints due to a lack of knowledge about their design, limited resources and whether therapists had received postgraduate training in this area.

A study was recently done in South Africa by Chazen (2013:1-13) by means of a focus group that explored the splinting practise of therapists with at least five years of clinical experience in adult patients with neurological injuries. It was found that due to the minimal scientific literature on splinting, many of the participants relied on their personal experiences, as well as the knowledge and skill that they had developed in their years of practice.

1.3 PROBLEM STATEMENT

Research indicates that the use of upper limb splints in neurological impairment is often not based on scientific knowledge due to the lack of experimental studies (Lohman & Aragon, 2008:308; Lannin & Ada, 2011; Stevens, 2014; Jackman, Novak & Lannin, 2013). Studies have reported that the use of splinting in children or adults with neurological impairment was irregular, and that therapists would often base their decision on their own clinical reasoning and personal experience (Reid, 1992; Chazen, 2013; Adrienne & Manigandan, 2003; Kilbrade et al, 2013).

Although there is current literature stating what splints are being prescribed within South Africa (Chazen, 2013), as well as the reasons behind these decisions, this is based on an adult population with neurological impairments. There is no literature within the South African context describing the splinting trend for the paediatric population with neurological impairments. This may pose difficulties for inexperienced therapists when deciding what splint is suitable, or whether their clinical decision-making is appropriate in the prescription and construction of splints in this population.

1.4 RESEARCH QUESTION

What are the current hand splinting practices amongst occupational therapists in South Africa for children with neurological impairments?

1.5 AIM AND OBJECTIVES

To explore the current splinting practices of occupational therapists within South Africa in hand function interventions with children with neurological impairments.

1. To determine how often occupational therapists who work with paediatric clients with neurological impairments construct and issue splints during therapeutic management.
2. To describe the types of splints or casts that occupational therapists construct and issue in interventions with children with neurological impairments.
3. To describe the client factors that may influence therapists' decision-making when splinting children with neurological impairments.

4. To describe the personal factors that influence therapists' decision-making in splinting children with neurological impairments.

1.6 TYPE OF STUDY AND METHOD

A quantitative, cross sectional survey was conducted nationally among occupational therapists in South Africa registered with the Health Professional Council of South Africa (HPCSA). This study focused on current splinting practices with the intention of also describing factors taken into consideration when choosing to splint or not to splint. Therapists' knowledge and opinions (Radhakrishna, 2007:1) on splinting practices in managing children with neurological impairment in relation to experience and confidence levels were explored.

As this study was targeted specifically at occupational therapists who splint the paediatric neurologically impaired hand, and with the issue of no records of non-private practitioners working in specific fields, sampling procedures had to be amended. Convenience and snowball sampling (Trochim, 2006) was thus used in order to reach as much of the sample size needed as possible.

1.7 SIGNIFICANCE OF THE STUDY

This study will contribute to describing and exploring the current trends in splinting for the child with neurological impairments in South Africa. This will assist in filling a gap in literature as this information was not formerly known in the South African context.

It is important to identify the splints being prescribed to the paediatric population and the clinical decision-making of therapists within South Africa in order to recommend further experimental research on specific splints, as well as discovering the needs of both the newly qualified and more experienced therapist, which may show similarities to Chazen's (2013) research.

This study differs from the previous surveys mentioned, as South Africa is considered a developing country (Burger & McAravey, 2014:1), which may affect the materials and methods used. It is also important to note that as adult and paediatric treatment are different due to the increased neuroplasticity in a child's brain (Kolb & Gibb, 2011:265), a different decision-making process should be applied in each case. This therefore shows the importance of doing a similar study in order to explore these similarities and differences.

One of the objectives of this research was to discover the different decision-making processes of occupational therapists across South Africa in relation to splinting the paediatric neurologically impaired hand and to determine the need for greater learning opportunities. The reasons for splinting were therefore explored in this study, which may be of interest to individuals or professional bodies organising continuing professional development (CPD) programmes as well as a more effective mentor system.

As this was a survey on what the current trends are in splinting the neurologically impaired paediatric hand amongst occupational therapists, it is intended that therapists can use the results to reflect and be enlightened on what is being used

elsewhere. It is not an experiment to test the effectiveness of each splint, and this study can therefore recommend that therapists use this information to perform future experimental research or assist in the formation of related clinical guidelines.

1.8 OUTLINE OF THE STUDY

The thesis contains the following chapters:

Chapter 2: Literature Review. This explores the development of the hand as well as the current splinting practices globally. This is aimed at explaining the past empirical literature relating to specific splints and their outcomes, while also comparing studies of a similar nature in order to compare the results after data analysis.

Chapter 3: Methodology. This describes the rationale for the use of a cross-sectional survey design, and the choice of sampling based on the target population. The method for the development of the survey is discussed as well as the use of a pilot study for refinement. The data collection process is outlined and includes both the consultation and implementation phase. Methods to ensure validity in addition to ethical considerations are discussed.

Chapter 4: Results. The data was analysed descriptively, and is presented under five headings in relation to the objectives: 1) Demographic and professional experience, 2) Background on splinting experience (objective 1), 3) Types of splints being provided (objective 2), 4) Client factors affecting decision-making (objective 3) and 5) Personal factors affecting decision-making (objective 4). An overview of the therapists' demographics is given to provide

context to the study. This is followed by visual graphs that provide an overview of the findings of this study.

Chapter 5: Discussion. This chapter describes the findings of the study and is set out in the same order as Chapter 4. It is also linked to Chapter two in that it compares the study findings with those established by others. The chapter follows the same format as the results chapter in order to allow for easier cross-referencing.

Chapter 6: Conclusion. This chapter concludes and summarises the study's findings and discussion, highlighting the main trend that was noted through the results. It further examines the significance of the study and how it could contribute to the occupational therapy profession. Limitations are noted and detailed, and suggestions for future research are stated.

1.9 SUMMARY

Splinting the neurologically impaired client, whether adult or paediatric, is a controversial area of practice. Although surveys on the use of splints have been conducted, this has never been explored for the South African paediatric population. This study aimed to describe the current trends for splinting the neurologically impaired hand whilst identifying the views and feelings of therapists within this area of practice. It is hoped that the study will make a significant contribution to the formation of adapted curriculums, mentorship programmes, CPD activities and guidelines for paediatric splinting practice in occupational therapy.

CHAPTER 2. LITERATURE REVIEW

2.1 INTRODUCTION

The literature review will begin with a description of the typical development of hand function in order to show the complex thought process that needs to be followed when working with children, and how this may impacts on the type of splint being constructed or issued. This includes how the various systems in the body, namely cognition, sensory functions, sensory processing, perception and the neuromusculoskeletal system play a role in development, and thus a child's hand function cannot be seen in isolation.

This is followed by a short description of how a neurological impairment can impact on the development of hand function and therefore what the occupational therapist's role in this type of diagnosis is, specifically with regard to splinting for the neurologically impaired hand. The chapter concludes with the process of decision-making in clinical practice and how this is significant when intervening with neurologically impaired children, especially with a technique such as splinting, which is often seen as controversial.

2.2 VALUE AND IMPORTANCE OF HAND FUNCTION

The use of the hands is critical to explore the environment as well as perform everyday activities with ease (Exner, 2005:304). Hands are responsible for the prehensile grasp and manipulation of objects and as the enabler of multiple tool functions (Henderson & Pehoski, 1995: ix). Fine motor skills are developed and

refined in the early stages of life in order to allow for the grips and grasps that are needed for everyday functioning (Case-Smith, 1995: 113).

With the presence of upper limb dysfunction, ADL activities are often limited (Nichols-Larsen et al, 2005:1480). Dysfunction can cause impairments such as weakness, uncoordinated movements, incomplete finger fractionation and spasticity+ which can therefore hamper performance in ADL (Eliasson et al, 2006:1227). Although upper limb impairments can present differently in each individual, they still impact on functioning (Henderson & Eliasson, 2008:1048), and have been noted to be the main contribution to poor ADL performance (Fedrizzi et al, 2003:85).

Hand therapy can thus be considered an important part in the treatment of children with neurological impairments, as they often present with upper limb limitations. It is important that occupational therapists have adequate knowledge about childhood and fine motor development, performance components that affect hand function as well as clear decision-making processes based on scientific evidence in order to plan and implement appropriate treatment techniques (Exner, 1990 as cited in Li-Tsang, 2003:99).

2.3 NORMAL DEVELOPMENT OF HAND FUNCTION

Children with cerebral palsy often display deficits in many areas, such as motor (Shiel, 2012:1), cognitive and perceptual delays, as well as sensory processing impairments (Rosenbaum et al, 2006:10). For an occupational therapist to evaluate the development of hand function or hand skills, the following would need

to be taken into consideration: sensory functions, sensory processing, cognitive and perceptual development, neuromusculoskeletal functions as well as the specific principles of movement development, including gross to fine motor movement and proximal to distal motor development as is outlined below (Exner, 2005:278).

2.3.1 Sensory Function

In terms of sensory function, as the child develops visual control, this assists the child in coordinating and reaching for an object, and is integrated with perceptual development (Exner, 2005:279). Discrimination begins early in the child's life and leads to a one year old being able to discriminate between two different objects (Eliasson, Gordon & Forssberg, 1995:43).

Tactile input becomes vital to allow the child to discriminate between surfaces and shapes. This in turn allows for sensory input to assist regulating muscles that are needed during manipulation and grasping objects (Eliasson, Gordon & Forssberg, 1995:42). Exploring the environment can only be done through finger manipulation, wrist rotation and bilateral hand function (Eliasson, Gordon & Forssberg, 1995:43). It is therefore clear that normal hand development and sensory function are interlinked. Other functions, such as visual perception and cognitive development, also progress simultaneously with hand skills, as this is what guides the child to interact with objects (Exner, 2005:277). Tactile input is important for in-hand manipulation function as well as being able to recognise objects through touch (Exner, 2005:277).

2.3.2 Sensory Processing

According to Ayres (1980), an intact or well-functioning tactile system is often viewed as a sign of sensory integration, as this system assists in contributing to visual perception and all the other sensory functions. Posture affects the tactile sensitivity of a child, and thus shows the link between all functions within a child to achieve normal development.

The vestibular system has the ability to detect motion and gravitational pull, and assists the body in recognising whether any sensory input (visual, tactile or proprioception) is due to movement of the body or to circumstances in the environment. This system has a big influence on motor output and is needed for %light, fight and simple quadruped ambulation+ (Ayres, 1980), being important in the motor movement needed for upper limb protective extension.

2.3.3 Neuromusculoskeletal Function

Limitations in range of motion (ROM) of the joints of the upper limb can cause limitations in how a child makes use of his hand and whether grasp is possible. Full movement in the upper limb allows the child better reach, and the ROM in the child's hand affects this ability to grasp larger items or use more refined movement for finer grips. Restrictions at the arches can impact the child's ability to flatten his hand, which is used when stabilising toys or objects (Exner, 2005:307).

Muscle function is essential, as without effective mobilisation, this can affect stability and the ability to make use of the hand. Muscle strength is needed in order to initiate grasps and to be able to hold an object. Children with weak muscle

strength are unable to achieve the necessary patterns for thumb and interphalangeal function due to weakness in controlling the intrinsic muscles of the hand (Exner, 2005:307). Tone also affects hand function, as this can impact on the ROM as well as voluntary controlled movement and stability. Tone can either be increased, decreased or fluctuating and often has a significant impact on hand function. (Exner, 2005:277). This is often the main performance component affected when dealing with children with neurological impairments, and splinting has been noted by therapists to have an effect on tone, depending on the splint design (Chazen, 2013:5).

2.3.4 Perceptual and Cognitive Function

“Hands are a perceptual system that participates in the infant’s construction of knowledge” (Hatwell, 1987 as cited in Stilwel & Cermak, 1995:56). A therapist can never examine hand function in isolation, as cognitive and motor developments are often linked (Exner & Henderson, 1995:93), all these functions being assessed during a child’s neurological screening. Perception allows a child to recognise objects, their texture and weight, as well as their spatial orientation (Stilwel & Cermak, 1995:58-59). A combination of cognition, visual input and manipulating objects contribute to the development of perceptual skills (Stilwel & Cermak, 1995:60) in order to allow for proper functioning of the upper limb. New motor skills can only be developed if a child is able to attend to and focus on the object (Exner & Henderson, 1995:96). This is also affected by memory, as this will allow the child to remember past experiences with an object (Exner & Henderson, 1995:97). This highlights the important link between perceptual and cognitive development in the development of hand function.

2.3.5 Movement Development

The development of hand function is critical in everyday activities, and a sound knowledge of hand development and its principles is important to diagnose developmental delay, assess functionality and measure progress against (Svesson, 2009:7). As stated by Bobath and Bobath (1987:9), it is important to note that development is not a linear succession, but rather that one activity does not need to be mastered before facilitation of other motor patterns.

An infant begins to make use of active movement from an early age in order to interact with his environment. This is facilitated by primitive reflexes such as the Asymmetrical Tonic Neck Reflex (ATNR), which is influenced by the child turning his head, as well as making use of developing visual- and head-control. Primitive reflexes are present at birth and exist as automatic movement patterns that are influenced by stimuli and position. These reflexes are reintegrated upon maturation of the CNS, and can be used as a diagnostic tool by therapists to assess for CNS impairments (Zafeiriou, 2004:1-2). By three months of age, voluntary movements are more noticeable, which allows the infant to regard his own hands (Ter Schegget, 2002: 41).

At four months of age, an infant should be able to support his body using his upper limbs. The infant's grasp is elicited from a palmar grasp reflex, also one of the primitive reflexes. If an object or digit is placed in the infant's hand, this will elicit a fist around the object (Zafeiriou, 2004: 3) and allow the child to grasp big objects against his body (Bassini & Patel, 2007:486). This sensory input, both tactile and proprioceptive, is important in the development of grasp (Case-Smith, 1995:114).

Grasps are also described as advancing from the ulnar to radial side and therefore an infant will only be able to grasp an object that is given from the ulnar side (side of the little finger) and the grasp will consequently not involve the thumb. This is the beginning of fractionation, whereby the child can use separate fingers instead of in a mass grasp (Case-Smith, 1995:115). Another characteristic of four months is that the infant usually uses both hands symmetrically, resulting in the infant mirroring the action of a grasp in his non-grasping hand, mainly as they are unable to cross the midline (Ter Schegget, 2002:41). Midline crossing is when a limb is able to actively cross over the vertical centre of the body to perform a movement. This is instrumental in allowing right and left hemisphere communication, and is later important for processing motor and sensory information (Vaughn, 2011:1).

Once the infant is able to grasp an object from the ulnar side of the hand, it is important to note that grasp function also advances from proximal to distal. The infant's grasp will therefore progress to a proximal palmar and midpalmer grasp at five and six months respectively, which involves flexion of all fingers around the object except for the thumb to allow for increased grip against the midpalm, which is the proximal two-thirds of the palm (Bassini & Patel, 2007:486).

Development further advances as transferring an object takes place in the midline, but is poorly coordinated with large objects still being needed. Transferring of objects is impacted by the infant's inability to cross the midline. ATNR should be fully integrated by six months and therefore allow for more voluntary movement from the child (Case-Smith, 1995:113). The child also begins to make adjustments in grasping objects through both tactile and visual input (Case-Smith, 1995:115).

The radial palmar grasp develops around seven months, and the child is now able to make use of the thumb to hold an object in the radial palm. It is during this stage that the child moves from reflexive to purposeful release of objects (Case-Smith, 1995:119), although influenced by the transferring of objects between hands. It can also be noted that grasp develops from mass to finer movements. At eight months, the child makes use of a raking action to bring an object into the palm (Ter Schegget, 2002:43). This involves the extension of the metacarpophalangeal joints with successive flexion of the proximal and distal interphalangeal joints, with the child flexing more as the object is drawn closer, the movement looking like a garden rake raking up leaves. The child is now able to better supinate, can thus explore objects more through his mouth and has better transference between hands (Case-Smith, 1995:115).

After nine months, a child begins to make use of opposition, starting with a radial digital grasp (Case-Smith, 1995:117). Opposition is the ability to rotate the thumb in order to touch or oppose the tips of each of the fingers. This shows the development of palm to finger grasp (Case-Smith, 1995:117). The ability to touch the thumb and index finger is necessary in order to develop dexterity grasps, such as the tripod grip due to increased control, which is reached in conjunction with effective eye-hand coordination (Psychology Dictionary, 2013).

As noted, a tripod grip can only be achieved through opposition, which develops around ten months. This type of grip is considered functional, as the digits used for dexterity purposes (thumb, index and middle finger) are the primary control. Finer grips begin between nine and ten months, with the grip progressing from a pincer

to a neat pincer grasp (Bassini & Patel, 2007:485), allowing the child to interact with smaller objects between the tip of the thumb and index finger in preparation for feeding and fine motor tasks. This is achieved without forearm stabilisation, thus allowing for greater manipulation of the object (Case-Smith, 1995:117). While the infant still has difficulty voluntarily releasing an object, there is greater control of finger extension (Ter Schegget, 2002:44).

According to Ter Schegget (2002:44), a child's control of an object slowly improves from one year of age. They are able to adjust the grasp depending on the size of an object, this being dependent on visual perceptual development. Movement of the forearm becomes even more coordinated, wrist extension improves, as does the subsequent stability in grasping. This stability allows for developing pre-writing skills, including the ability to hold a crayon and scribble on paper (Schneck & Amundson, 2010:556) at around fifteen months. The child also shows an increased degree of effort when holding more than one object. They will also begin to be guided by the object's function in terms of how the object should be handled (Case-Smith, 1995:114). This allows the child to explore an object more at approximately 18 months, assisting in the perceptual recognition of objects (Case-Smith, 1995:118).

These skills are further developed during the second and third year of life as the child begins to develop asymmetrical bilateral integration. This allows them to make asymmetrical movements with both hands on either side of the body, for example, they will be able to use one hand to perform an activity, such as scribbling on paper, while the other hand is used to stabilise the paper. Thus the

movements are no longer mirrored, which would not be possible without appropriate cognitive development. This is due to the attention and concentration needed for a bilateral task (Exner, 2005:277). The child's pre-writing skills also advance to attempting to imitate horizontal, vertical and circular lines (Schneck & Amundson, 2010:556).

While having made use of symmetrical movements before asymmetrical movements, as mentioned above, this was done automatically. Voluntarily using symmetrical hand movements is learnt during the third and fourth years of life. Midline crossing is still difficult, but a child begins to show preference for one hand, while the wrist becomes better stabilised during scribbling, with no fixation at the shoulder joint (Ter Schegget, 2002:45).

The above skills are improved upon during four to five years of age, but midline crossing starts to develop. Tripod grip on a pencil is defined (Ter Schegget, 2002:45), with better grip between the thumb and index finger, and the crayon resting against the middle finger with the web space beginning to open more during scribbling (Buck & Fick, 2010:1). Pre-writing skills can also advance to writing select letters and numbers, which progressed during the sixth year of life to being able to copy letters (Schneck & Amundson, 2010:556).

It has been found that a normal development of grips and grasp can only progress if there is neuromotor readiness (Ter Schegget, 2002:39), which must be in conjunction with appropriate cognitive functioning (Bassini & Patel, 2007:487). This is the state where the child's overall CNS ability is working simultaneously

with the neuromuscular system to provide voluntary movement (Goddard Blythe, 2011:18). It is thus important to note the difference between a neurotypical child and one with a neurological impairment in order to ensure effective treatment.

2.4 DEVELOPMENT OF HAND FUNCTION IN NEUROLOGICAL CONDITIONS

As stated by Exner (2005:304), *“the child who has a disability affecting hand skills has less opportunity to take in sensory information from the environment and to experience the effect of his or her actions on the world.”* This will therefore result in poor development of hand skills and possibly require therapy from a therapist with a good knowledge base of both normal and abnormal hand development. A child with neurological impairments often displays the following problems: motor, sensory and/or cognitive and perceptual deficits (Rosenbaum et al, 2006:10), and will affect the factors that influence the development of their hand skills. Levitt (2010:8) states that a child with cerebral palsy will have a lack of sensory experiences due to the paucity of motor repertoire. It is thus important to note that all senses need to be stimulated in a child with neurological conditions in order to teach motor control (Levitt, 2010:8).

Due to children with cerebral palsy having problems with tactile stimulation and gravitational insecurity, Fisher et al (1991:370) suggests that a sensory integrative disorder may be present with the motor deficits. It has been found that children who are immobilised for long periods of time have decreased tactile stimulation, which can lead to emotional and perceptual disturbances (Ayres, 1980), thus affecting their functioning, including that of hand skills. Hand skills cannot be seen in isolation, as these have limited value if the cervical spine, shoulder and elbow

are not stable, which is usually developed early on in infancy. There is also a need for an intact sensory system in order to allow for accurate movement (Ter Schegget, 2002:39).

It is important to consider that a child who has had an assault to the CNS will continually be affected in acquiring hand skills that allow for everyday function due to the many performance components that affect their capabilities, as already mentioned. Therapists, however, must also take into account that the ~~pl~~plasticity and immaturity of the child's systems+ can have negative consequences if treatment intervention is inappropriate (Granhaug, 2006 as cited in Gabriel, 2008:354). Thus a good knowledge base of both normal and abnormal hand development in conjunction with overall development allows therapists to shape their clinical reasoning in order to ensure good practices.

2.5 OCCUPATIONAL THERAPY INTERVENTION IN PAEDIATRIC NEURO-REHABILITATION

Therapeutic intervention is usually based on the therapists' ability to integrate theory and practice, and thus make use of clinical reasoning (Jung et al, 2006:16). As mentioned, the field of neurological rehabilitation, whether for adults or children, is constantly evolving (Sandin, 2012:1). It is therefore important for occupational therapists to keep up to date with the current research, as well as to provide evidence-based practice in their clinical settings.

In terms of practice trends, current hand function interventions, such as the use of splinting, would be imperative to address improved overall functioning in addition

to the pre-functional components. When treating children with neurological impairments, it is important to base management on a framework in order to assist with treatment decisions, the one most commonly taught at South African universities being the neurodevelopmental theory (NDT) (Freeme, 2011:58).

This framework outlines the principles to be used in neurological impairments, such as weightbearing, but if greater in-depth knowledge and postgraduate training is wanted, a therapist is required to attend an 8 week course hosted by the South African Neurodevelopmental Association (SANDTA). A therapist's level of education and knowledge on neurological frameworks and techniques is likely to affect their choice of intervention when making clinical decisions about a child.

2.5.1 Splinting in Neurological Rehabilitation

Splinting for children or adults with a neuromuscular dysfunction has been a controversial area of practice amongst occupational therapists within a neurophysiological approach (Langlois, Pederson & MacKinnon, 1991:18). Due to the minimal scientific literature on the efficacy of splinting in neurological conditions, in terms of improving physical deficits, this leaves therapists to justify their reasoning for splint application when working with the paediatric population (Lohman & Aragon, 2008:308).

Upper limb dysfunction caused by a neurological insult to the CNS can result in a tightness of muscles distally, usually leading to fisting of the hand. Functional limitations are often also noted, and are caused by ROM limitations and weakness of the muscles (Boenig, 2005:9). In order to prevent further disability in the child, it

is important to address these limitations, with therapists often using splinting to assist in addressing them.

Three similar studies were conducted in Ireland (Adrienne & Manigandan, 2003:1-12), United Kingdom (Kilbrade et al, 2013:559-566) and in Canada (Reid 1992:16-25). The former two focussed on adult splints and the latter focussed on paediatric splints, all for the neurologically impaired client. In the Canadian and Irish studies, data was collected through a survey of occupational therapists, while the United Kingdom study included occupational therapists and physiotherapists.

Adrienne and Manigandan (2003:1-12), and Kilbrade et al (2013:559-566) investigated the use of splints in the adult stroke population, concluding that one of the main aims for its use was to reduce soft tissue contractures. Both studies stated that therapists would make use of their own critical thinking when choosing whether or not to splint. Kilbrade et al's (2013:564) study also identified the therapists' need for better guidelines in making these decisions.

The HPCSA does not offer a register of specialisations or special interests for occupational therapists as opposed to the Occupational Therapy Association of South Africa (OTASA), the Governing Body for Private Practitioners (INSTOPP) and the South African Association of Sensory Integration, who keep records of its members' special interests. Occupational therapists are not obliged to become members of the above mentioned associations, making it difficult to estimate how many occupational therapists, both in the public and private sector, currently work with children, including those with neurological impairments.

2.5.1.1 Reasons for Splinting

Splinting in neurorehabilitation is typically justified through what therapists have found to work best for the following: (i) to decrease tone in order to prevent or correct contractures, (ii) to increase function within the affected arm through improving movement while protecting the integrity of the joint and (iii) to decrease pain (Lannin & Ada, 2011:22).

In a study conducted by Adrienne and Manigandan (2003:7), it was postulated that although there was little research evidence to suggest that splinting in neurorehabilitation will achieve the general aims, the majority of therapists continued to recommend splints. The authors suggested that this may be due to splints not being researched in terms of complications or positive qualities, with the therapists making use of their clinical experience and judgment. Two similar studies, both conducted in the United Kingdom, focussed on splinting trends for a client with a stroke. Khatri et al (2013:1) found that the most popular reasons for splinting included ~~im~~ improving hygiene, improving functional needs, maintaining muscle length, preventing deformity and preventing contractures+.

Therapists identified that increasing range of motion (ROM), decreasing abnormal tone and preventing or reducing contractures were the main goals when making use of splinting in therapy, and are often seen in practice as secondary aims. Occupational Therapy is often associated with functional aims, with the main goals reflecting a decision-making process not in view with occupational therapy practices. A study done in South Africa (Chazen, 2013) however, showed that

therapists only suggested splinting if active movement was involved in order to promote function.

Although relating to treating stroke patients, Dobkin (2005:1678) stated that splints are also used for low tone to preserve joint alignment, to prevent overstretching or shortening of the tissues, as well as to prevent injury and to reduce inflammation. Therapists have also stated that they use splints in order to decrease pain through splinting in a comfortable position. This was refuted by Lannin et al (2003), who found that there was no significant impact on the decrease of pain by using splints. Langlois, Pederson and MacKinnon (1991) studied the effects of different splinting regimes on spasticity in the stroke population. The sample size consisted of eight clients, thus limiting the generalisability of the study, all of whom had a diagnosis of stroke. The researchers' findings reflected that there was no significant difference in tone reduction and that splints could increase the tone, which was influenced by the amount of wear. As was stated in Adrienne and Manigandan (2003:2), there is *"an increased urgency to assess splinting efficacy, but also necessitates a better understanding of the therapists' current splinting practice, to draw up clinically meaningful treatment options."*

2.5.1.2 Types of Splints Prescribed in Neurological Rehabilitation

There is currently no readily available literature indicating what splints are being used in South Africa for the paediatric population with neurological impairments. This is a global problem, as can be seen by the survey done by Reid (1992:16-25) in Canada. According to Gabriel (2008:355), splinting for the paediatric population involves considering many factors and is not simply adjusting an adult-size splint.

It may also be necessary to create more than one splint design, as its use may cause impairment of function resulting in two different splints being alternated (Gabriel, 2008:353), for example a functional resting splint. This is a volar based splint that has been positioned as follows: wrist in 20-30° extension, metacarpophalangeal joints in 35 - 45° flexion, proximal interphalangeal joints in slight flexion and the thumb in 45° palmar abduction. This splint may be suitable for night wear, as it impairs finger function if the child has voluntary digit movement, with a different splint being used during functional activities. This shows the need for therapists to make use of clinical reasoning to support decisions, making it important to identify current practices in SA and how these types of decisions are influenced. .

Due to the neurological impairments these children face, many reasons have been suggested as to why specific splints are needed. These relate to the problems faced, one of these being children exhibiting abnormal tone, with splints being prescribed to prevent contractures, this being one of the most important reasons for splinting (Gabriel, 2008:356).

A functional resting splint, as mentioned previously, has been indicated for hands that have moderate to severe increased tone and severely decreased tone. This is used to prevent contractures and for hygiene purposes, as it allows for an open hand, thereby preventing excessive moisture and trapped dirt (Gabriel, 2008:356). The hand is usually placed in a position of thirty degrees of extension at the wrist, fifty degrees flexion in the metacarpophalangeal joints and ten to thirty degree flexion at the interphalangeal joints (Mediroyal, 2010). Although there was a lack of

a control group, the study by Pizzi et al (2005:1857), found that the use of functional resting splints on 40 subjects with a stroke were beneficial. There was a significant difference in passive wrist extension and spasms were reported to have decreased.

The wrist extension splint has also been used in patients with neurological impairments. In a study by Lannin et al (2007), they found that patients wearing a neutral wrist splint were more compliant than those wearing a wrist extension splint. No significant impact on function was noted due to the lack of generalisability of the study. The use of this splint was also seen in a case study done by Takami et al (1992), but it was concluded that the single case was not sufficient to base any results on.

Other prominent splints that have been mentioned in the literature include the weightbearing splint. This splint positions the wrist in approximately ninety degrees of extension with appropriate digit extension, but is usually used during tasks requiring weightbearing (Gabriel, 2008:368).

Chazen (2013:47) found that therapists working in adult neurology stated that the anti-spasticity splint is most effective, as allows for the extension of the wrist with finger and thumb abduction achieved by finger troughs. The properties thought to contribute to its effectiveness included placing the hand in a functional position, improved hygiene and providing prolonged stretch.

The serpentine splint (Gabriel, 2008:376) wraps around the thumb from just below the distal palmar crease on the hypothenar side, and across the dorsum below the metacarpophalangeal joints in order to wrap around the thenar eminence through the web space. This was designed to minimise adduction contractures of the thumb, but as there is wrist movement, it assists in stabilising the thumb during activities (Darcera, 2012:19). In a randomised-controlled trial, Boutner et al (2008:36) found that a dynamic splint, when prescribed for children with neurological impairments, showed a better post-splint grip and fine motor skills as opposed to a static splint. The above-mentioned splints are typically made using thermoplastic material. More recently, the use of neoprene or lycra, known as soft splinting, has also become a method of splinting intervention. A soft splint is seen as advantageous as it provides prolonged stretch to the muscles to normalise high tone while not limiting movement (Fedrizzi et al, 2003:85). However, none of these splints have displayed significant scientific evidence in order to prove their effectiveness in treating children with neurological impairments, and it is uncertain whether they are being used in South Africa.

2.5.2 Casting in Neurological Rehabilitation

Serial and inhibitive casting has also been described in the literature as an alternative to the above-mentioned treatment (Tona & Schneck, 1993:902). Inhibitive casting is the use of plaster of paris to position the limb in order to reduce tone rather than lengthen muscle+(Lockhart, Margallo & Russell, 2010:1), whereas serial casting allows for increased length, although many adjusted plaster of paris moulds do minimise load stress (Lockhart, Margello & Russell, 2010:1). Tona and Schneck (1993:902) investigated casting and reported that a significant

positive change was noted in an affected upper limb of a child with cerebral palsy when the arm had been casted. It was also found in a study done by Steer (1989:69) that casting was beneficial in improving passive range of motion.

Lockhart, Margello and Russell (2010:2) recommended that research examines casting and splinting as a combined therapy, based on Yasukawa et al. (2008) research, whereby he stated that casting needed to be followed by splinting in order to achieve greater ROM gains. According to Scholtz (2013:1), the age of the child is a determining factor in whether or not to splint or cast, although the specific age was not stated. This would be an important aspect to explore with therapists, and to establish whether this has been adopted within South Africa for neurological conditions.

2.5.3 Other treatment techniques used with Neurologically Impaired Children

Many other treatment techniques have been developed and researched over the past two decades. One of the most prevalent theories mentioned in the literature is that of Neurodevelopmental therapy (NDT), which requires postgraduate training (Freeme, 2011:2-3). The theory states that in order to achieve normal movement, our automatic postural reactions need to be normal. The approach aims to be holistic by addressing sensory-motor difficulties with developmental delays, which result in social, functional, perception and cognition impairments (Bobath, 1980; 1990). The occupational therapist will therefore take into account the child's motor coordination and postural control. Analysis is done of the child's movements in order to identify missing components that could lead to limitations in functional activities. Although a therapist will guide a child's movement through normal

movement sequences during intervention, this is always in combination with the child's own active movement (Howle, 2002 as cited in Case-Smith, 2005:75). This theory, despite the research done, has not proven to be effective for children with CP, but like splinting, it remains an important approach in neurorehabilitation (Case-Smith, 2005:75).

Children with disabilities may require the developmental facilitation of an occupational therapist in order to meet developmental demands so that they can achieve independence in activities of daily living (Case-Smith, 2005:76). Case-Smith (2005:77) described developmental approaches, as proposed by Gilfoye, Grady and Moore (1990), as having an adaptation process with four components that involve receiving sensory stimulation (assimilation), which is followed by the motor response to the external stimuli (accommodation). The brain then needs to relate these experiences back to past responses (association) and thereafter uses this response for future needs (differentiation), which allows the child to modify their behaviour dependent on the situation.

As previously mentioned, many children with cerebral palsy may display signs of a sensory processing disorder that leads to sensory dysfunction. Sensory integration theory was first developed by Ayres, with the associated therapy usually being performed by an occupational therapist with relevant training. The aim is to allow the child to perform activities in a sensory-rich environment in order to elicit the appropriate sensory responses. The activities are usually fun, but assist the child to be successful and behave in a functional way (Sensory Processing Disorder Foundation, 2015).

Constraint-Induced Movement Therapy (CIMT) has shown to be advantageous in both the adult and paediatric population. According to Dromerick, Edwards and Hahn (2000:2984), CIMT aims to move away from compensation and encourage use of the affected arm, or more affected arm, by constraining the functional arm. The use of Botulinum toxin-A (BoNT-A) has also been seen to be effective in conjunction with a modified CIMT (Hoare et al, 2010:20). BoNT-A is described as being used in cerebral palsy, particularly in the spastic type, to produce selective reduction in muscle spasticity+ (Hoare et al, 2010:20). This allows for therapy to take place in a background of temporary muscle relaxation.

According to Grunert-Pluss et al (2008:4), mirror therapy is considered a relatively new treatment technique in neurology for improving hand function. It is unclear whether these treatments are being used in conjunction with splinting to improve function or whether they are the sole treatment techniques applied during therapy, and what the reasons for these practices are.

2.6 THERAPIST'S DECISION-MAKING

According to Pitts and O'Brien (2008: 456), in order for a therapist to provide the correct splint, one must hone evaluation skills, clinical reasoning, and problem-solving skills+. This was reinforced by Bennett and Bennett (2000:171), who stated that in order for occupational therapists to provide the best service it is important for them to base their practice on the most recent research.

2.6.1 Client Factors Influencing Decision-Making

Client factors affecting decision-making relate to the diagnosis being treated, the client's strengths and weaknesses, as well as the impaired performance components and the reason for providing a certain treatment (Kuipers, McKenna & Carlson, 2006:112). Sackett et al (2003:3) stated that in order for a clinical question to be answered, the following needs to be taken into account: the client or problem; the treatment planned; the ideal outcome and a comparison with the norm. As a client is never seen in isolation within an occupational therapy context, the client's needs, wants and own context should be considered, as these may impact on their compliance of the splint regime.

A therapist, in order to provide effective treatment, must therefore have current literature on treatment methods so that clinical decision-making is led by evidence-based practice (Girard, Rochette & Fillion, 2011:60). In a study by Chazen (2013:3), when researching splinting trends for adult stroke patients, it was stated that although there is little evidence about splints reducing contractures, this was the main reason that therapists chose to splint. Sackett et al (2003:3) stated, however, that decision making can only be significant if integration occurs between evidence and the therapist's personal clinical experience. This is in contrast with Naylor (1995:841), who suggested that a therapist should critically reason when there is a lack of scientific evidence.

2.6.2 Personal Factors Influencing Decision-Making

According to Embrey et al (1996:21-22), clinical decision making is made up of: knowledge of a condition, improvisation versus formal decision analyses, being

socially responsive to a patient and lastly partaking in self-monitoring. It has been found that competence, knowledge and confidence are inextricably linked (Holland, Middleton & Uys, 2012), which will impact on how a therapist is able to clinically reason. This suggests, as noted by Kuipers, McKenna and Carlson (2006:106), that personal factors include the therapist's own knowledge of self, experience, treatment preferences, confidence and personal convictions and beliefs, as well as the treating environment.

In order to investigate current practices, it is also important to understand the justification of a therapist's treatment approach or use of modalities, such as splinting. It had been noted that goal attainment is the starting point to a successful programme outcome and will help to guide intervention (McLaren & Rodger, 2003:216). In order to achieve this, knowledge about a condition is needed. This was confirmed in a study by Saleh et al (2008:60-80) in Canada, who found that therapists were requesting more information on Cerebral palsy in order to inform practice.

It has been found that a lack of support can lead to decreased confidence (Steenbergen & Mackenzie, 2004:164), which may be the feeling amongst less experienced therapists. It was noted that new therapists feel more confident when being mentored, as this helps to develop feelings of confidence that ultimately impacts on their decision-making process (Steenbergen & MacKenzie, 2004:163). Experience may thus impact upon a therapist's decision to splint a child with a neurological impairment. It was also noted that making decisions about splinting does not only involve the patient's condition, but also age, family and caregivers

as well as the patient's context (Chazen, 2013:6). This was also seen in a report by Bennett and Bennett (2000:172), in which they stated that each clinical decision needs to be made involving both the client and caregiver.

2.7 SUMMARY

It is therefore important for a hand therapist to understand both the normal development of the hand, the problems that may arise with neurological impairment, as well as the basic principles of splinting. The research appraised suggests that there have been no significant evidence-based studies that concluded that splinting is effective or beneficial in the neurologically impaired client. Similar studies that also made use of surveys, however, show that therapists use splints based on their own personal experience and observation, which is important for the decision-making process. As there have been no studies on the South African paediatric neurologically impaired population regarding the current trends in splinting, the literature review supports the study in identifying similar themes and recommendations that might influence the therapists.

CHAPTER 3. METHODOLOGY

3.1 INTRODUCTION

In order to achieve the aim of exploring the current splinting practices amongst occupational therapists when managing a child with neurological impairments, it was important to choose a research design that allowed for wide data collection. The sample size was determined by the specific target group of therapists working with children with neurological impairments. The data collection tool selected allowed for easy distribution to the sample as well as an exploration of opinions. The following chapter explores the research design chosen, the specific sampling method and preselected sample criteria and the design and development of the questionnaire. Upon completion of the data collection, analysis and data management was undertaken. This process is further explained in this chapter.

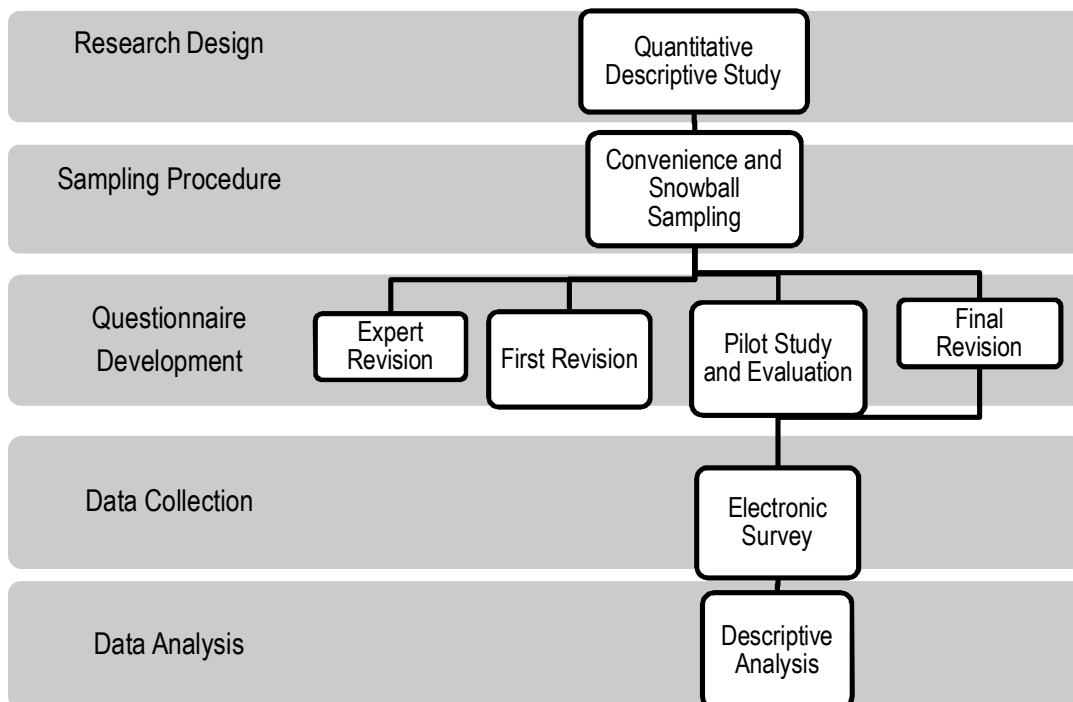


Figure 3.1: Flow Chart to outline the process of Research Design

3.2 RESEARCH DESIGN

In order to obtain data from the population of occupational therapists within a specific period of time (Mack, 2005), a quantitative non-experimental descriptive cross-sectional survey design (Appendix 1) was used. This was administered electronically. The main purpose of this study was to explore the splinting practices amongst South African-based Occupational therapists in relation to the neurologically impaired paediatric hand. South Africa is considered a developing country and practices may impact on the resources and methods used in splinting (Burger & McAravey, 2014:1). A quantitative study was chosen in order to describe the current knowledge and views of therapists (Trochim, 2006) when making a decision to splint the upper limbs for the neurologically impaired child.

Quantitative studies usually involve a large sample size (Anderson, 2006) and as this study aimed to explore the splinting trends nationally, a survey allowed for a more widespread data collection throughout South Africa. As therapists may have had different training backgrounds and different experiences with splinting, a national survey allowed for a more varied collection of opinions. The use of an electronic survey also allowed for a greater ease of distribution as well as a higher rate of accessibility for therapists. This is due to certain associations, such as South African Society of Hand Therapists (SASHT), making their members' email addresses available online, the Occupational Therapy Association of South Africa (OTASA) distributing emails pertaining to research to their members for a fee as well as many therapists using email more regularly as a preferred form of communication as opposed to posted letters. The electronic survey would thus allow for a greater number of therapists to be reached, and allowing for the

maximal sample size. As the survey was electronic, it would cause less inconvenience to therapists as they would not need to post their answers.

The descriptive research design allowed the researcher to describe factors that may influence therapists when splinting a child with a neurological impairment (Baltimore County Schools, 2010:1) without suggesting correlation or describing causality (Brink, 1999:110). These factors included experience, related client and personal factors.

Upon reviewing the literature, the survey was designed to allow for expansion on similar studies that had been conducted on the research topic (Reid, 1992:16-25, Kilbrade et al, 2013:559-566, and Adrienne & Manigandan, 2011:1-12) as well as expanding upon the information done within the South African context (Chazen, 2013:1-13).

3.3 SAMPLING PROCEDURE

3.3.1 Sampling Population

The population of occupational therapists within South Africa who are registered with the HPCSA totalled 4000 (HPCSA, 2014).

The target population (N) for this study included all occupational therapists working in the field of paediatric neurological rehabilitation in South Africa. There was, however, no prior knowledge of how many of the population of therapists worked specifically with neurologically impaired children, as there were no complete statistics available. INSTOPP provided statistics on the number of private therapists working with neurologically impaired children, but there was no record on the number of government employees who did the same. Although the number

of hand therapists could be accessed on the Internet, this was not accurate as not all therapists would work with children and not all hand therapists are necessarily registered on SASHT. Due to these reasons, the target population's number was unable to be ascertained, affecting the calculation of the sample size.

3.3.2 Sample Size

Freemee's study (2011:49), which was also based in South Africa, experienced a similar difficulty and thus she chose to create a sample size through a cluster of occupational therapists. This was also a similar problem in Kilbrade et al's (2013:560) study as their databases did not allow them to identify which therapists splinted and thus they made use of a pragmatic blanket approach to recruitment (Kilbrade et al, 2013:560).

As the questionnaire was aimed at therapists working with children with neurological impairments, an unknown population size, the researcher made use of convenience and snowball sampling (Trochim, 2006). Through sampling a specific group of occupational therapists, this allowed the researcher to gain a greater descriptive knowledge of the current trends in splinting the paediatric neurologically impaired hand (Brink, 1999 and Dane, 2011). The sample was defined by the inclusion and exclusion criteria (McMillan & Schumacher, 2010), which appeared in an emailed information sheet to each therapist.

The sample was formed through collecting contact details through different occupational therapy associations and provincial forums within South Africa. This was in an attempt to achieve a representation of the practice trends in splinting the

paediatric neurologically impaired hand and to increase the rate of response (Bruce, Pope & Stanistreet, 2008:160).

OTASA was contacted and the researcher paid R350.00 for the email to be forwarded through their professional body according to their policies in order to ensure confidentiality of its members. Due to a small response after three months, OTASA was re-contacted and asked to resend the survey link to its members to assist in increasing the response rate. An additional fee of R350.00 was paid.

It was found that SASHT had contact details for their members on their website and the South African Neurodevelopmental Therapy Association (SANDTA) members details were accessed through a previously emailed survey link. As these details were found on an open domain the lists were printed out and their therapists contacted electronically with the information sheet, informed consent sheet and survey link.

These associations were, however, not a complete representation of occupational therapists in South Africa as occupational therapists are not obliged to join any of the above mentioned organisations. This therefore created a selection bias, but assisted in contributing to the sample size.

To increase the possibility of suitable participants being contacted, the KwaZulu Natal occupational therapy forum mailing list was utilised to send out the electronic survey. Universities around South Africa, offering Occupational Therapy as a course of study, were emailed and requested that the survey be forwarded to their contact list as per departmental policy.

Therapists who were contacted through the above procedures assisted in the process through snowball sampling. They were asked within the email to forward the email to other interested parties or in some instances sent the researcher contact details for hospitals that would have suitable participants or contact details of other therapists that have access to their provincial occupational therapy forum emailing list. Suitable participants were determined through the information leaflets included within the email as an attachment. They were further requested to answer whether they were registered with the HPCSA within the survey itself.

Due to the survey being self-administered, there was a potential for a non-response bias, as there were therapists that chose not to respond to the questionnaire (Baltimore County Schools, 2010:1). After four months of the survey being open, a total of 72 responses were collected, although not all therapists completed the survey. The survey, in its entirety, was completed by 40 therapists.

3.4 SELECTION CRITERIA

Therapists were included who met the following criteria:

- were registered as community service or independent practice with the HPCSA.
- had undergraduate and postgraduate degrees in Occupational Therapy.
- were currently working with children with neurological impairments at least twice per week.

Therapists were excluded who had completed the survey for the pilot study (cf. Section 3.5.1.3).

3.5 DATA COLLECTION INSTRUMENT

Information was obtained through the use of a self-administered questionnaire (Appendix 1). This questionnaire was sent out electronically via SurveyMonkey to occupational therapists across South Africa as indicated in the sampling section of this chapter (cf. Section 3.3). SurveyMonkey is an electronic tool which assists a researcher in compiling surveys through tips and online professional help. The Select package was chosen as this allowed for one thousand responses per month. This would allow for the maximal number of responses in order for the optimal sample size to reply (Survey Monkey, 2003).

The researcher used themes taken from questionnaires designed for previous studies in Canada (Reid, 1992:27), Ireland (Adrienne & Manigandan, 2011:4-6) and the United Kingdom (Kilbrade et al, 2013:559-566). The themes included the frequency of splint use for children with high tone, the reasons for the certain types of splints and treatment goals associated with splinting. Themes and questions were adapted and assisted in shaping the layout and content of the study.

Elements, such as types of splints used were altered to suit the South African context, which had been observed as being common in different hospitals as well as through the study done by Chazen (2013:47). The researcher thus expanded on the similar studies previously indicated as well as including elements relating to current practices based upon current literature. The expansion of information included questions that investigated factors that influence decision-making for splinting children with neurological impairments as well as explored what

therapists view as their needs in this area in terms of further information or practical experience.

The survey included biographical data, without identifying particulars and made use of close-ended questions with an 'Other' response where necessary as well as multiple-choice questions (Domholdt, 2005:228). Nominal data about splinting practices as well as feelings of competency was therefore generated so as to gather data on factors that influence therapists' decision-making. Ordinal data was also generated through asking for years of experience as well as making use of scales, such as likert scales to investigate the reasons for splinting, reasons for not splinting, factors that are taken into consideration and skill and knowledge on neurological splinting (Domholdt, 2005:228). SurveyMonkey generated data into an Excel spreadsheet in order to make data analysis more efficient.

3.5.1 Questionnaire Development

According to Benson & Clark (1982:790), the first phase of questionnaire development is planning. This was done by identifying the reason for the questionnaire, and was based upon the study objectives as well as a review of the literature. . The questionnaire comprised of five sections:

- A. Biographical Data: including postgraduate training, years of experience and which sector the therapists work in.
- B. Background on splinting experience: their experience in neurological rehabilitation and amount of children treated (Objective 1).
- C. Types of splints being prescribed: the materials used, types of splints prescribed as well as what influenced their choice of material (Objective 2).

- D. Client factors that influence decision-making: involved exploring the most common neurological diagnostic groups, which splints were prescribed for, and the reasons for splinting (Objective 3).
- E. Personal factors that influence decision-making: the factors that therapists take into consideration such as their confidence, skill and knowledge when splinting for neurologically impaired children (Objective 4).

Once the questionnaire was drafted, the procedure was followed as described by Domholdt (2005:233-235), that it needs to undergo expert review. This was done by two of the researchers' colleagues, both having post-graduate Masters Degrees with an interest in paediatric research. This was to check for content validity in terms of questions being easy to understand and that all important aspects relating to splinting had been addressed to ensure content relevancy. This review created the sections for the final questionnaire, and was followed by the first revision being based on the experts' comments (Domholdt, 2005:234).

3.5.2 Pilot Study

A pilot study was conducted in order to refine and develop the data collection instrument. Non-probability sampling procedures were used (Mack et al, 2005:9). In order to find therapists working in the paediatric neurological and/or research field, purposive sampling was used. The preselected criteria included therapists who specifically work with paediatric neurological disorders either from public hospitals, special centres within the province or private practices who see children on a regular basis as well as therapists who have experience with research (Trochim, 2006).

The survey was piloted on ten occupational therapists. Therapists at tertiary or regional hospitals, well-known private practices as well as the University of Kwa-Zulu Natal were contacted, to ensure that all therapists had treated children previously. The aim of the pilot study was to check the usability of the questionnaire and whether the questions were both relevant and grammatically correct. The pilot study allowed for the therapists to comment and edit the survey in terms of format and relevancy (Naidoo, 2013:13). This was done through a feedback form (Appendix 2), and assisted in ensuring the most accurate data was collected (Domholdt, 2005:234-235). The researcher emailed an electronic template of the survey (also on SurveyMonkey) to each therapist with a request to participate. The therapists were asked to review the survey and make comments and thereafter email the feedback form back to the researcher. The pilot study also assisted in determining the response rate and thus allowed for evaluating the reasons of non-response. It was also useful to examine any patterns that emerge, for example, if the therapists made large use of the option of ~~Other~~ which may have indicated too limited responses (Domholdt, 2005:235). This appears in Table 3.1.

Table 3.1 Pilot Study Feedback

Aims of Pilot Study	Question	Feedback Received	Amendments
1. To ensure that the questionnaire was easy to understand	All questions	100% of the participants found it easy to understand	None
2. To ensure that the format allowed for easy completion	All questions	100% of the participants stated that it was quick and easy to fill out	None
3. To ensure that the content was relevant	All questions	90% of the participants stated that they would not change the content of the questionnaire 10% suggested that age of the children being splinted should be included in order to assess when intervention is being provided	None. As only a small percentage of the participants suggested this and as the researcher felt that this would not contribute to the research, this amendment was not made.
4. To ensure the proper use of grammar	Questions 10, 14, 15, 17, 19, 25 and 26	10% of the participants suggested to change the use of “please tick all that apply” to be more specific	This was adapted to read “Please tick all boxes that apply”
5. To ensure that there was not an	Questions 6, 7, 10,	Only two participants made use of the ‘Other’	None. It was felt that the responses given

excessive use of the 'Other' option	11, 14, 15, 16, 17, 19, 27, 28 and 32	response box for two separate questions.	were not warranted to be added to the options already listed.
6. To determine the response rate	N/A	The pilot study was initially sent out to 10 therapists, of which 3 replied. A reminder was sent out and another 2 replied. It was necessary to send the pilot out to another 10 therapists, with 5 returning the feedback form.	This had to be taken into consideration when sending out the survey for the final study. It was necessary to send out regular reminders and thus an emailing list was generated for easier emailing as well as regular contact with OTASA

3.5.3 Final Revision

The results of the pilot study were analysed and thus a final correction was done before the survey was emailed to the target population (Domholdt, 2005:235).

The corrections included the following:

- Examining questions that could be used for therapists who work with children with neurological impairments, but who do not necessarily use splints as a treatment intervention. This resulted in a change of question sequence. Questions 25 (~~What~~ other treatment techniques do you use during intervention with a child with neurological impairments?) and question 27 (~~What~~ are your reasons if you choose not to splint the paediatric neurologically impaired hand?) were moved to Section B. If therapists did not splint, they could leave the questionnaire at this point.
- Question 13 (~~How~~ many hand splints for children with neurological impairments do you make per month?) was adjusted to allow therapists to choose ~~0~~ This also allowed for an exit point for therapists.
- The question ~~How~~ long, on average, have you been working with neurologically impaired children was added to Section B to collect data on neurologically specific experience.

3.6 DATA COLLECTION PROCEDURE

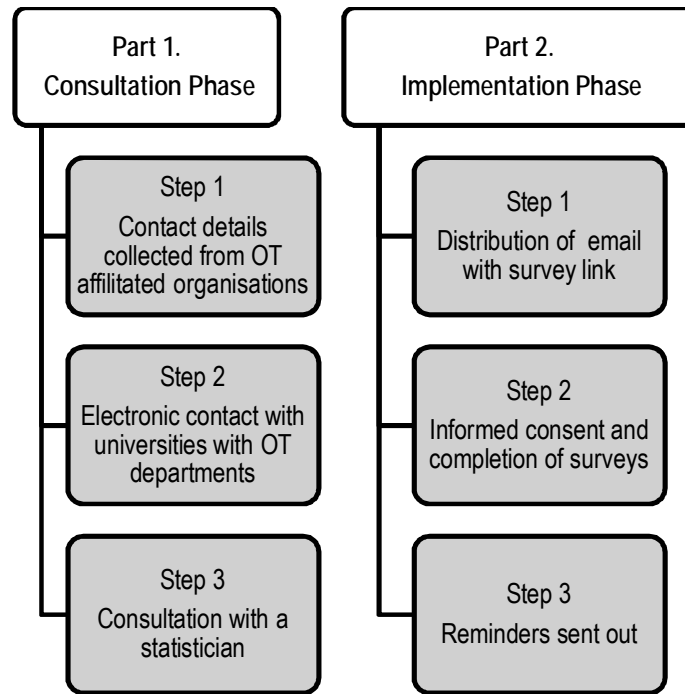


Figure 3.2: A flow chart to outline the phases in data collection

3.6.1 Part 1: Consultation Phase

Step 1: The researcher viewed the SASHT website, which provided contact details for their members. The emails were saved on the mailing list. OTASA was contacted for the survey link to be emailed to its members whilst retaining its members personal contact details. The emails of SANDTA members were collected from a previous email that was sent for a different research study. These were also saved on the mailing list.

Step 2: The researcher contacted the occupational therapy departments at the Universities across the country and requested that they forward the survey to their academic mailing list. Although this created duplicate emails to some therapists, it helped to increase the number of participants.

Step 3: A statistician was contacted and consulted in order to suggest any final changes to the questionnaire before it was sent out. This was to ensure a variety of data measures were collected and to allow for easier data analysis.

3.6.2 Part 2: Implementation Phase

Step 1: The email was sent out electronically by the researcher to the organisations, individual therapists and universities. The body of the email contained a summarised introduction to the research. The email had the following attachments: An information leaflet (Appendix 3), an informed consent letter (Appendix 4), a copy of the Ethical approval (Appendix 5) given by the University of Kwa-Zulu Natal and the online link to the survey that had been designed on SurveyMonkey.

Step 2: The therapists showed implied informed consent through the completion of the first question of the survey (Chambliss & Schutt, 2010:57-58). This was detailed in the informed consent letter so as not to place extra burden on the therapists through signing and scanning the letter.

Step 3: The participating therapists all completed the online survey anonymously. A reminder was sent out every three weeks to the mailing list, as described above, to encourage therapists to participate in the survey. OTASA was contacted again after two months and the survey link was resent to its members as a reminder.

3.7 DATA MANAGEMENT

During the research process, the data was kept secure on a personal, password protected laptop. This data was not accessible to any person not involved in the

research study. All data collected will be stored at the University of Kwa-Zulu Natal in a lock-away area in order to assist in the maintenance of confidentiality. This will be stored for a period of at least five years according to the University of Kwa-Zulu Natal guidelines

3.8 DATA ANALYSIS

A purposive sample was taken of Occupational therapists across South Africa making use of various professional associations to gather contact details. This was done through use of inclusion criteria (cf. Section 3.4). The SurveyMonkey (1999-2003) site generates Excel spreadsheets which can be exported in order to be used during data analysis. The summary data was exported from the site onto an Excel spreadsheet using words. In order to allow for easier analysis, the data was changed to numeric values where needed and appropriate. For example, if a participant responded *yes* this was changed to 1 and if the response was *no* this was changed to 2. A statistician linked to the Faculty of Health Sciences at the University of KwaZulu Natal was contacted, and consulted in order to assist the researcher in the analysis of the quantitative data. The SurveyMonkey generated excel data sheet was emailed to the statistician with a copy of the survey as a key. The data was analysed descriptively by the researcher. The data was arranged into nominal (for example age, years of experience, work sector) and ordinal data (likert scales). The main findings were organized and depicted as graphs, either bar or pie charts. The likert scale data was analysed for central tendency and summarized with a mode (Mogey, 1999).

3.9 VALIDITY TESTING

Face validity was ascertained through the use of individuals not trained within the occupational therapy profession. They were asked to review the survey before the expert review was conducted in order to assess for grammatical errors as well as understanding of questions (Litwin, 1995). Content validity was tested through both the expert review (cf. Section 3.5.1.1) and the pilot study (cf. Section 3.5.1.3). In order to ensure reliability, it was important to ascertain that there was no ambiguity so that each question would be answered in the same manner (Bruce, Pope & Stanistreet, 2008:173). This was done through conducting the pilot study of the survey, where editing was done based on the feedback received.

3.10 ETHICAL CONSIDERATIONS

Ethical clearance was first obtained through the Biomedical Research Ethics Committee (BREC) of the Faculty of Health Sciences at University of Kwa-Zulu Natal (UKZN) (Appendix 5). Provisional approval was initially granted pending a response to the recommended suggestions. The proposal was resubmitted and the committee stated that the study would remain provisional dependent on changes to the information leaflet. The information leaflet was edited and resubmitted to the committee. The study was thereafter accepted and full ethical approval granted (BREC Ref: BE319/14). Once permission had been granted, the study commenced. According to Mack et al (2005:9) and with this type of research design, the core ethical principles in research include respect for persons and justice.

3.10.1 Respect for Persons

As splinting is viewed as a controversial area of practice in neurology, the use of a survey would allow for anonymity and thus decrease the chance of the therapists being influenced by others. In order to ensure respect for persons, it was necessary to obtain informed consent from all participants. The information leaflet and informed consent form (Appendix 3 and Appendix 4) included the purpose of the study, what the study would be used for, what the possible benefits for the participant and occupational therapy population would be, what was expected of the participant and how confidentiality would be maintained (Mack et al, 2005). Informed consent was collected through a yes/no response on the survey. These documents also explained that the participants were voluntarily participating and could thus choose not to participate or to withdraw at any time (McMillan & Schumacher, 2010:118). Confidentiality was maintained through not asking for personal details on the surveys as well as making use of an online survey design through SurveyMonkey. This was to ensure that no personal emails, that may give away identity, were seen by the researcher.

3.10.2 Justice

The principle of justice was upheld by ensuring a sampling method that did not force therapists to participate, which was also influenced by the informed consent. Justice was also ensured in that all participants would receive equal benefit from the research, which will be done through publication of the research results in a national occupational therapy journal which has the readership of the therapists who were involved in this study.

3.11 SUMMARY

The researcher made use of a quantitative cross-sectional study design. The target population included occupational therapists working with children in the field of neurology. As this was a difficult sample to define, convenience and snowball sampling was used in order to achieve the necessary sample size. An electronic survey was chosen as the most appropriate method to ensure anonymity, ease of distribution and allowing therapists to forward the survey to other interested colleagues. The survey explored the types of splints being prescribed by therapists, the reasons for these specific splints and the personal and client factors that influence their decisions in terms of splinting. Data was analysed descriptively and depicted with the assistance of bar graphs and pie charts. To abide to ethical rules, each therapist was required to show their informed consent through answering the first question of the survey. The results are reported in Chapter 4 and are further discussed and analysed in Chapter 5.

CHAPTER 4. RESULTS

4.1 INTRODUCTION

This chapter presents the findings from data collected through the use of a questionnaire (Appendix 1). The survey was divided into five parts, namely, demographics and professional experience (objective 1), splinting experience (objective 1), types of splints prescribed (objective 2), client factors related to decision-making (objective 3) and personal factors related to decision-making (objective 4). The findings are presented with an overview of the sample population's demographics as well as the therapists' background in terms of experience and additional qualifications in order to contextualize the findings. This is followed by a written and pictorial description of the data collected to meet the four objectives. The data was descriptively analysed with the use of graphs and charts.

4.2 DEMOGRAPHIC AND PROFESSIONAL EXPERIENCE OF THERAPISTS

While a total of 72 participants consented to participation in the study, this changed, as therapists skipped questions or exited the survey due to the questions being irrelevant to their current scope of practice. Natural exit points were at question 9 if therapists weren't working regularly with neurologically impaired children and question 15 if they did not splint children with neurological impairments. A total of 40 participants completed the full questionnaire. **Figure 4.1** depicts the response rate over the course of the questionnaire.

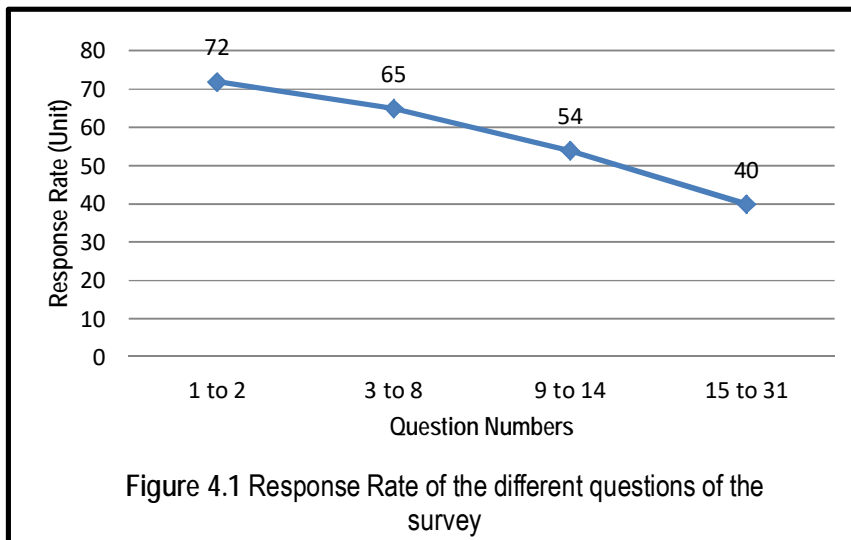


Table 4.1 depicts how the different sections of the survey were answered. The numbers correspond well to the exit points of the survey. Missing data is noted for question 13 and 14, where one and two therapists did not respond respectively.

Table 4.1 Number of Therapists responding to different sections of the survey

Section Title of the Survey	Related Question Numbers	Number of Therapists that Responded
Demographic and Professional Experience of Therapists	3 – 8	65
Demographic and Professional Experience of Therapists	9 – 11	54
Background on Splinting Experience	11 – 12	54
Background on Splinting Experience	13	53
Background on Splinting Experience	14	52
Types of Splints being Provided	15 – 24	40
Client Factors affecting decision-making	25 – 27	40
Personal Factors affecting decision-making	28 – 32	40

Figures 4.2 to 4.6 illustrate an overview of the participants demographic data in terms of age (Figure 4.2) and years of experience (Figure 4.3 and Figure 4.4), area of work (Figure 4.5) and province (Figure 4.6) where therapists were based.

From Figure 4.2 the majority of therapists were within the 26 to 30 year age range (33.8%) with the least amount of therapists in the 51 . 60 year age range.

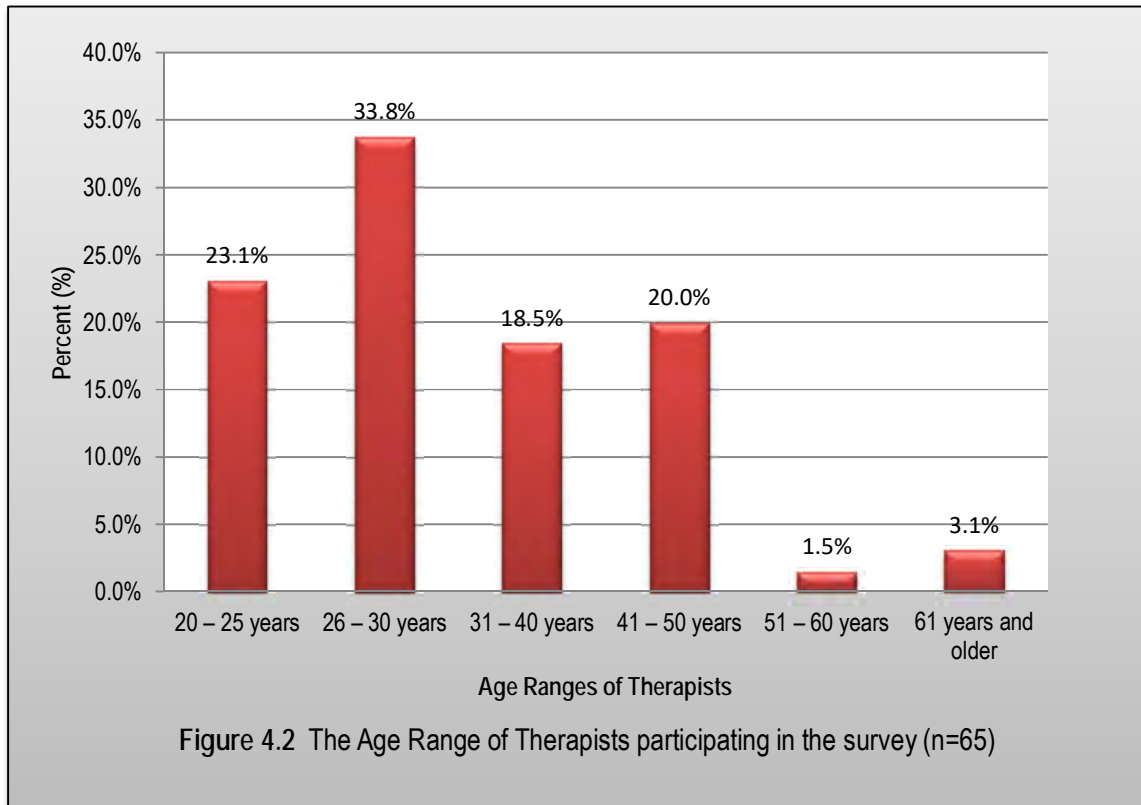


Figure 4.3 depicts the therapists experience as a graduated occupational therapist (n=65). The years of experience ranged from 1 to more than 20 years with the majority of the therapists (45.5%) only having 1 to 2 years of experience.

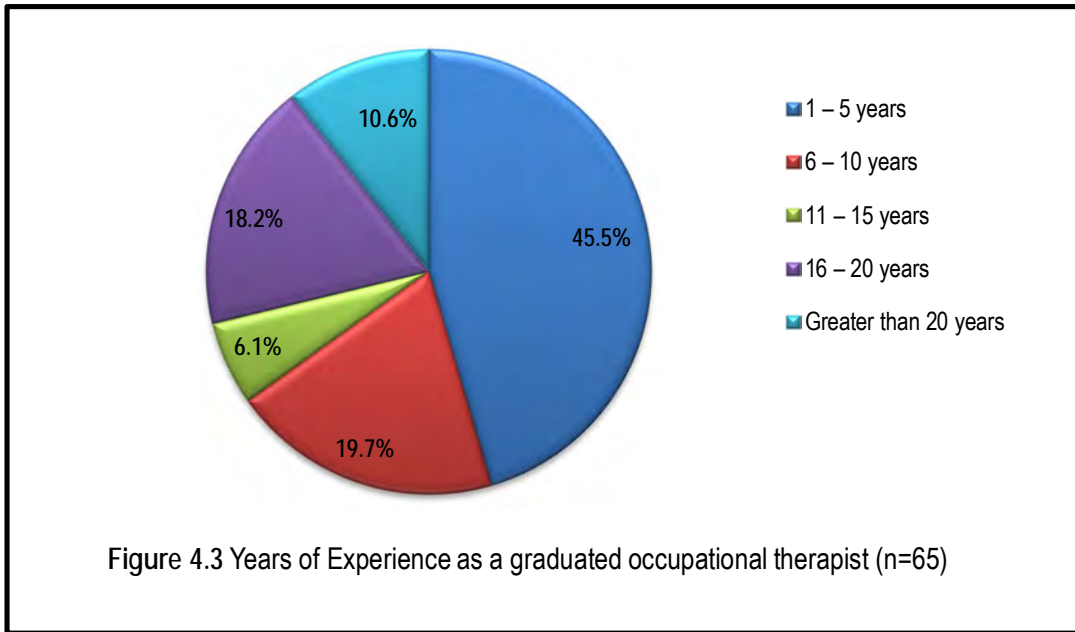
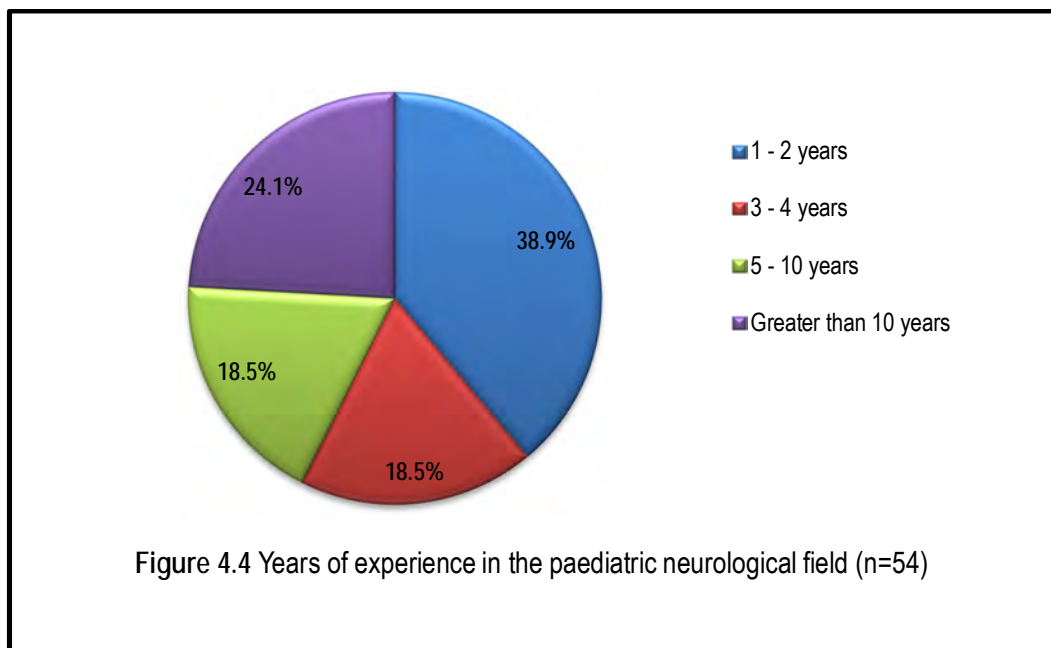


Figure 4.4 depicts the paediatric neurological experience of the therapists (n=54). The majority had only been working with children with neurological impairments for a period of one to two years (38.9%). This was followed by 24.1% of therapists with more than 10 years of experience.



The responding therapists were from a variety of working sectors (**Figure 4.5**), with over half (52.3%) reporting to work in an acute public hospital setting. This was followed by 29.2% working in private practice and the remaining 18.4% being minimally represented in other working sectors.

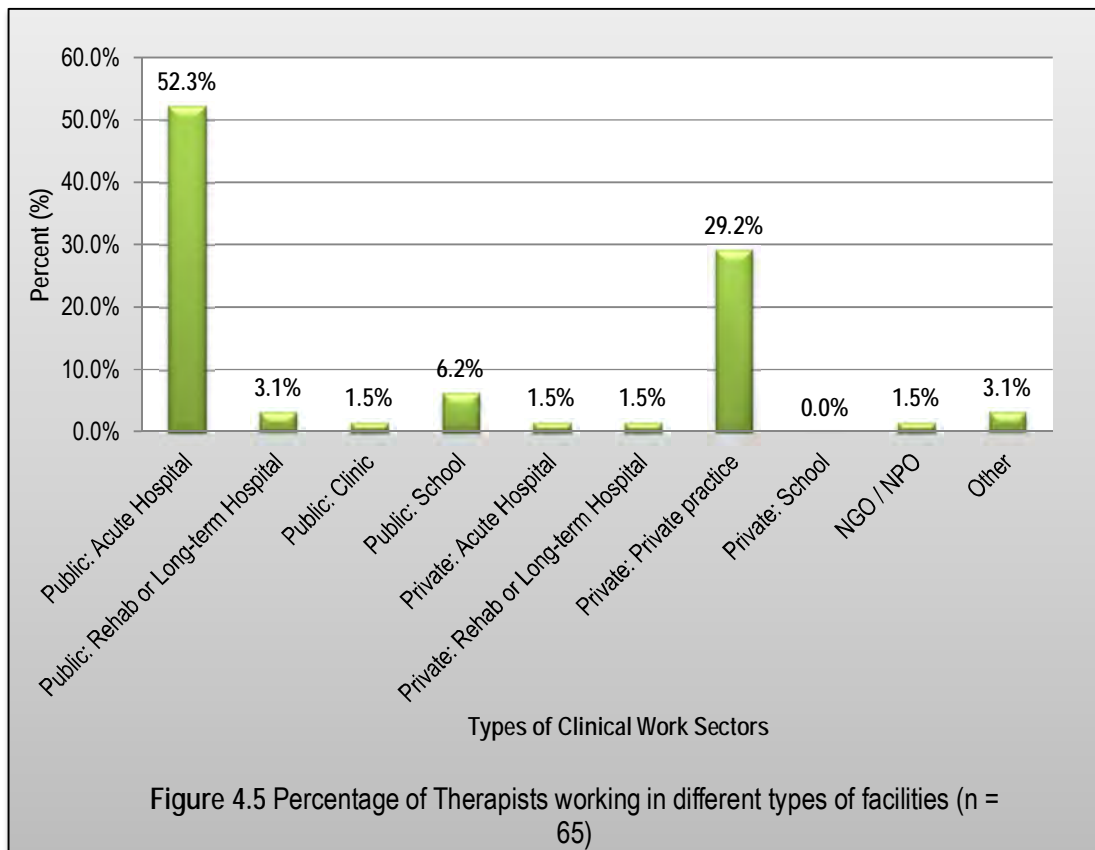
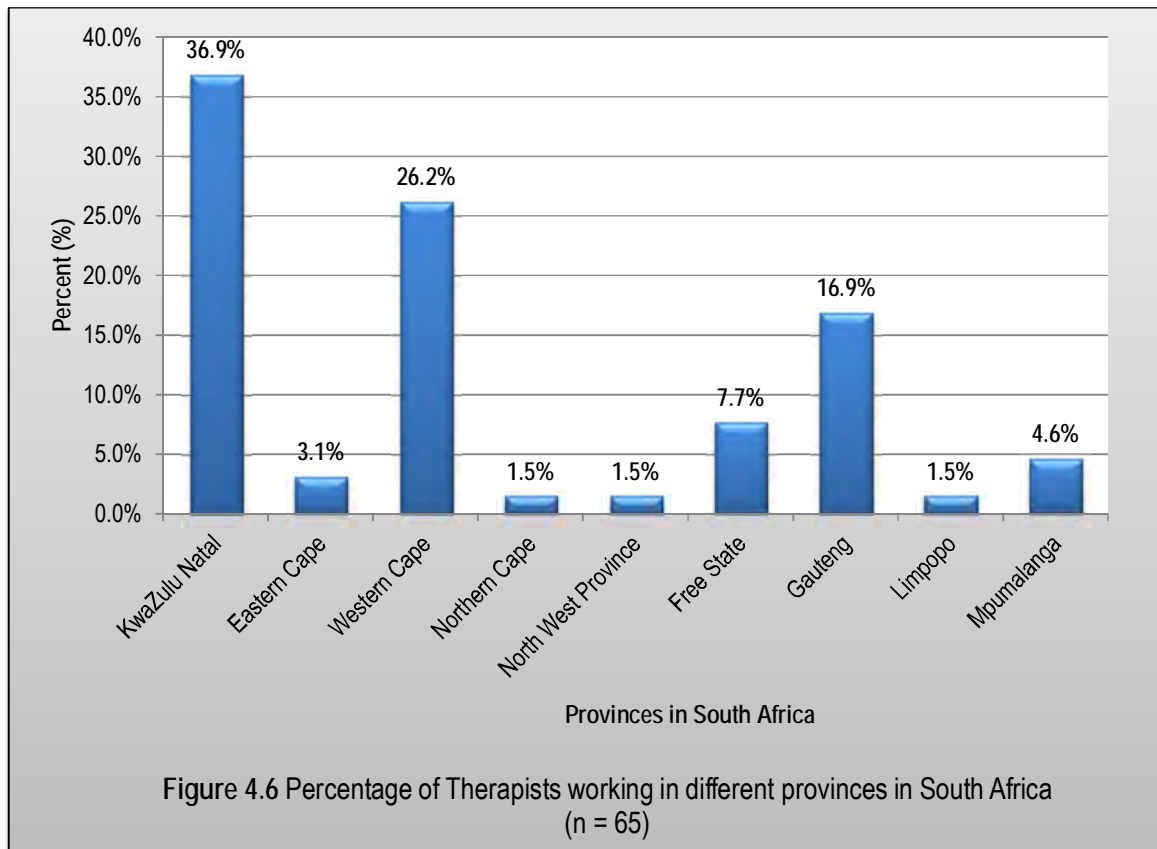
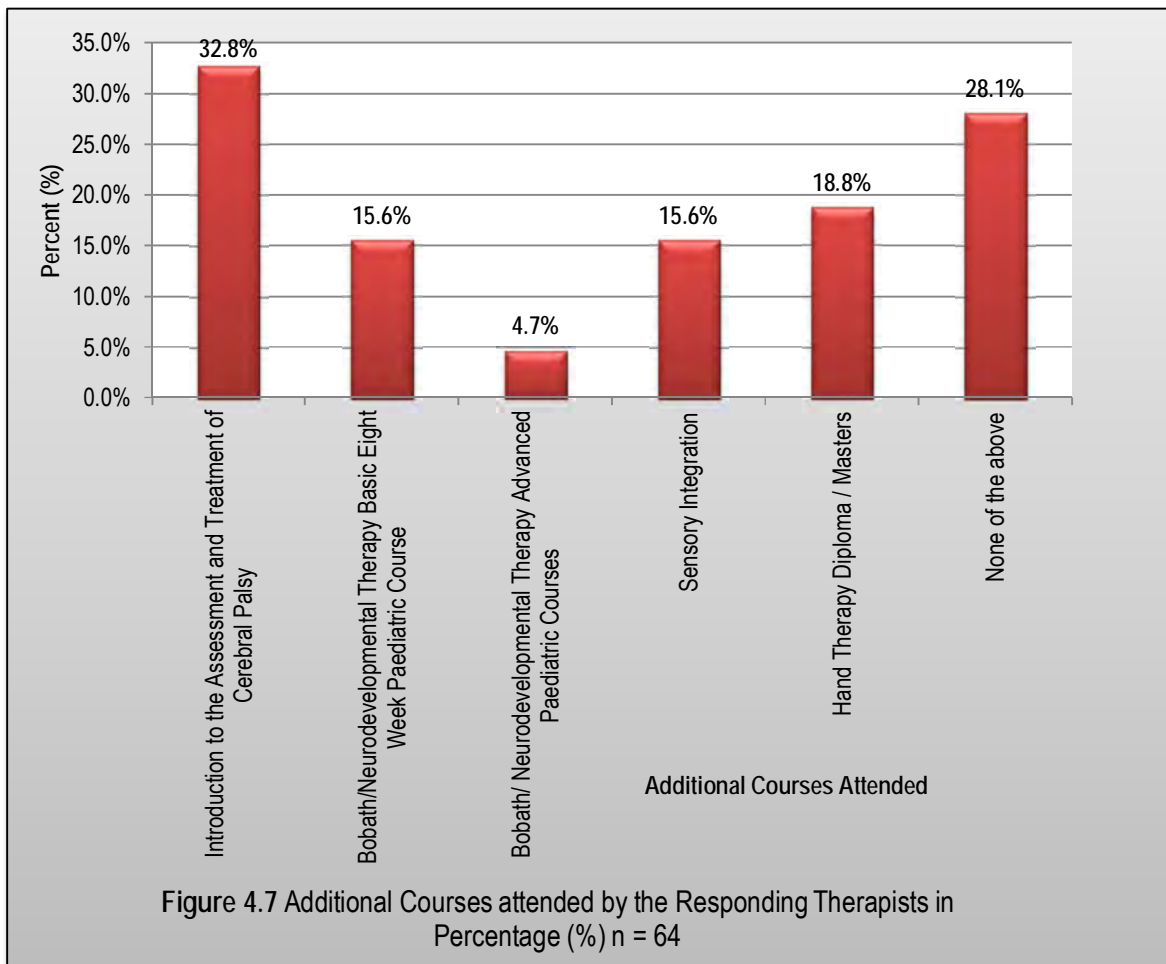


Figure 4.6 illustrates the therapists demographics in terms of province, the majority who answered the questionnaire being based in Kwa-Zulu Natal (36.9%) and the Western Cape (26.2%), followed by 16.9% from Gauteng. There was only a small representation of therapists from the North West Province, Northern Cape and Limpopo.



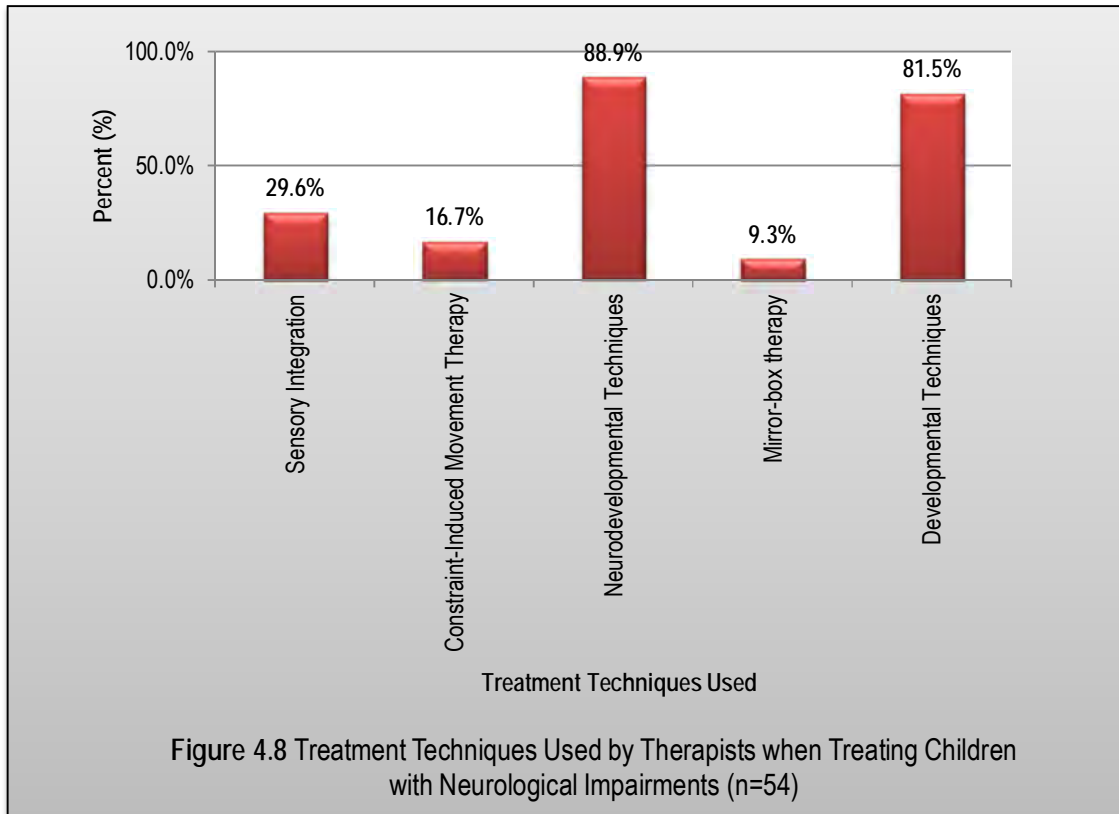
All therapists, as a result of the selection criteria, held undergraduate degrees, with the majority (69.2%) not having any further qualifications. A post-graduate diploma was held by 20% of the respondents and a Masters degree by 10.8%. Many of the therapists had embarked on Continuous Professional Development (CPD) courses to further their knowledge as per requirements set out by the HPCSA.

Figure 4.7 indicates therapists who have attended courses with a paediatric basis, neurological background or specifically relating to hand intervention. The highest number of therapists (32.8%) had attended an introduction to Cerebral Palsy Course. This was followed by 15.6% who attended the basic paediatric NDT course, with only 4.7% following up the basic course with the advanced paediatric one. A hand therapy diploma or masters was achieved by 18.8% of the therapists, suggesting a greater theoretical knowledge on hand interventions.



Therapists were shown to make use of their qualifications and techniques taught at university during therapy (**Figure 4.8**). Neurodevelopmental techniques were used by 88.9% of therapists with 81.5% using developmental techniques, suggesting an overlap of methods (cf. Section 2.5.3). Although only 10 therapists (n= 64) had completed their sensory integration training (Question 6), 16 therapists (n=54) or 29.6%, use sensory integration principles or techniques during their interventions (Question 10). This was similar in terms of NDT, as only 13 therapists (n=64) had completed their paediatric NDT course, as answered in Question 6, (7 therapists completed the adult course), however, 48 of 54 respondents (88.9%) used NDT techniques during interventions (Question 10).

Questions 6 and 10 were from different sections of the survey, which resulted in a different n-value (cf. Table 4.1).

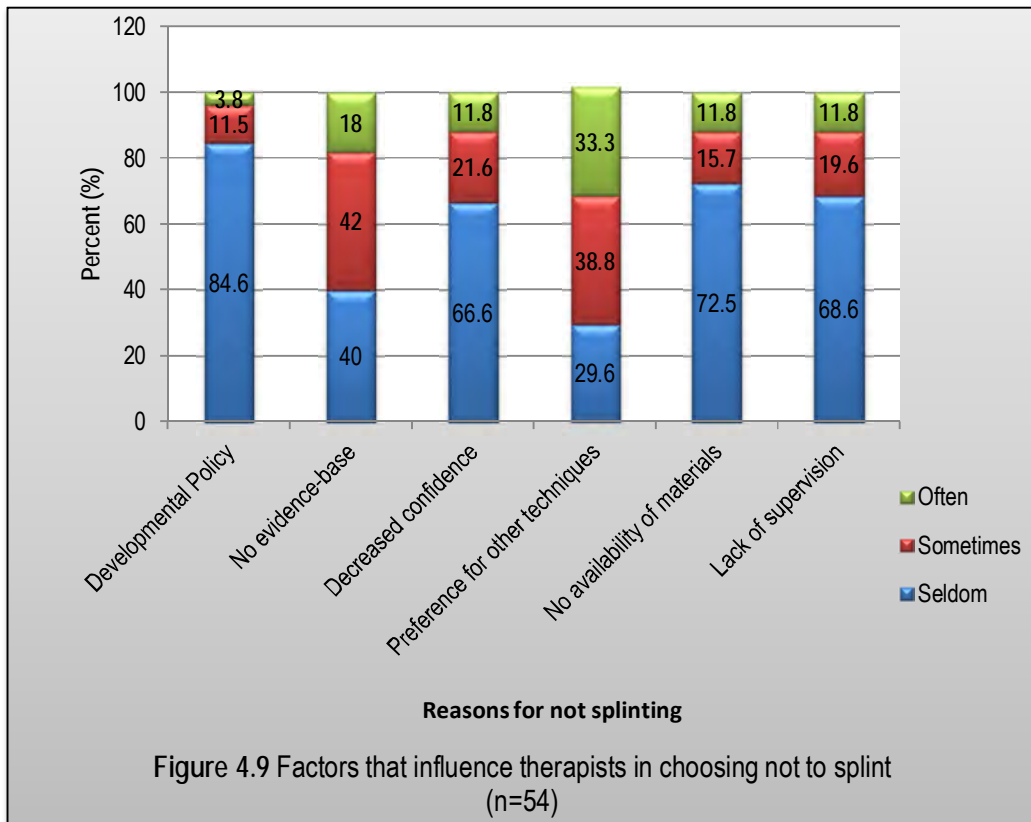


4.3. BACKGROUND ON SPLINTING EXPERIENCE

This section of the survey explored the therapists' neurological splinting experience as determined by objective 1. It examined therapists who work with children with neurological impairments, but may not necessarily splint and their subsequent reasoning. Experience was also measured in terms of how often splints are prescribed on average per month as well as where therapists had learnt about splinting in neurological conditions.

Although the study focused on therapists who splint children with neurological impairments, it was felt that exploring the reasons for not splinting would contribute to the study. The following influential factors were explored: departmental policy, lack of evidence-base, decreased confidence, preference for other techniques, no availability of materials and lack of supervision. This showed which factors therapists take into consideration the most or the least when choosing not to splint. This data was requested on a 5-point likert scale on the reasons therapists chose to not splint. The 5-point scale was collapsed to read as a 3-point scale for ease of reporting (~~Never~~ and ~~seldom~~ was reduced to ~~seldom~~ ~~sometimes~~ remained the same and ~~very often~~ and ~~always~~ was reduced to ~~often~~).

Figure 4.9 indicates that the main factors that had little effect on the therapists' decision to splint a child with a neurological impairment included the presence or absence of any departmental policy (84.6%). This was followed by a lack of supervision (64.8%) with only 11.8% always indicating that this was often a problem when deciding whether or not to splint. Most therapists appeared to seldom consider these factors, suggesting that they would choose to splint based on their own clinical decision-making. They did, however, show a preference for other techniques, with 33.3% stating this influenced them often, with 38.8% stating that it sometimes influenced them. The therapists showed little consideration for evidence based research, with only 18% indicating this as an important factor, as well as decreased confidence and lack of materials as only 11.8% always considered these two factors respectively when deciding to splint.



It was found that although the largest percentage of therapists (31.5%), as depicted in **Figure 4.10**, only treated on average 0 to 3 children with neurological impairments each month, 66% stated that they make on average 1 to 5 splints per month for neurologically impaired children (Figure 4.11). Less than a quarter of the therapists (22%) stated that they do not construct or prescribe any splints (**Figure 4.11**). This would account for the response rate decreasing in size after this per month.

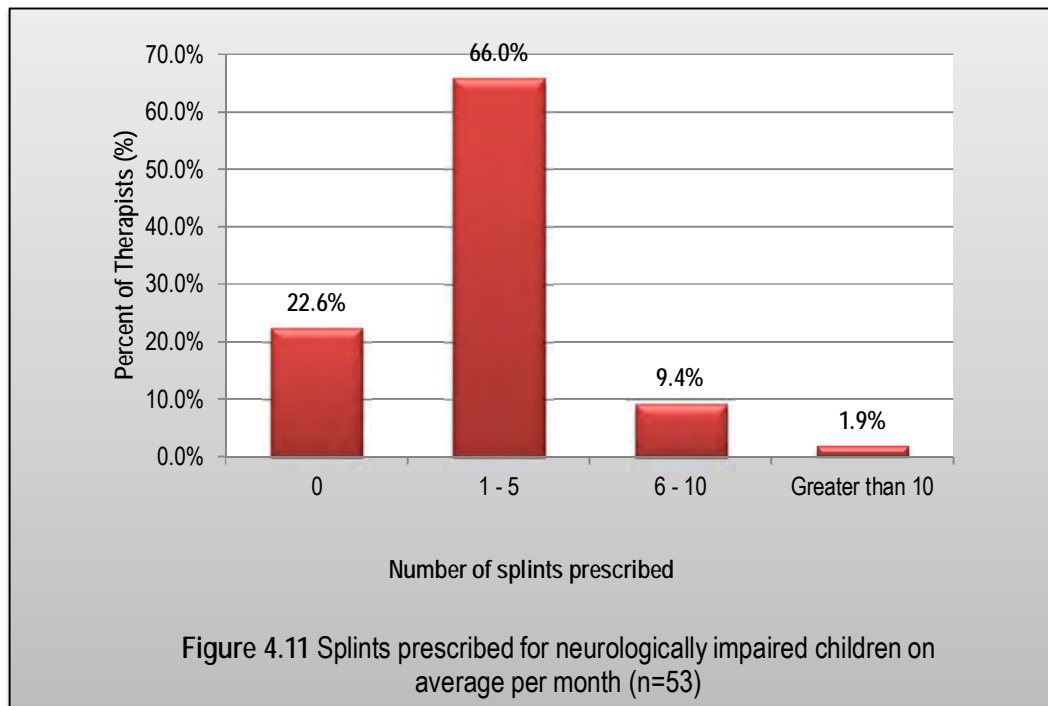
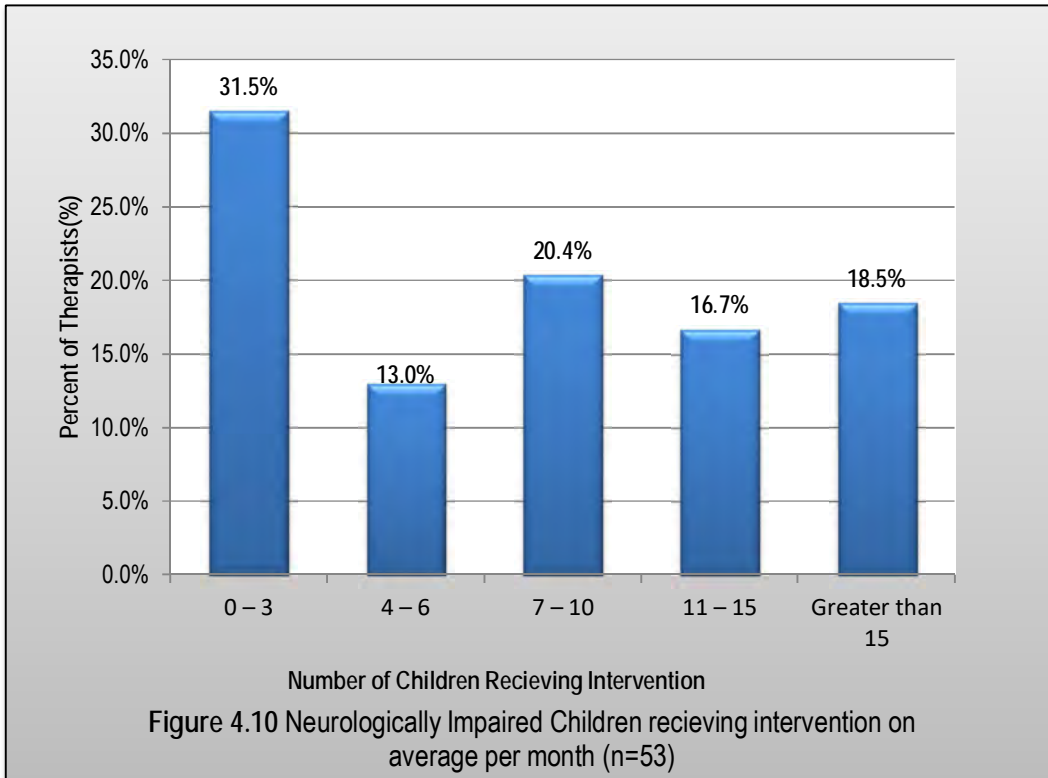
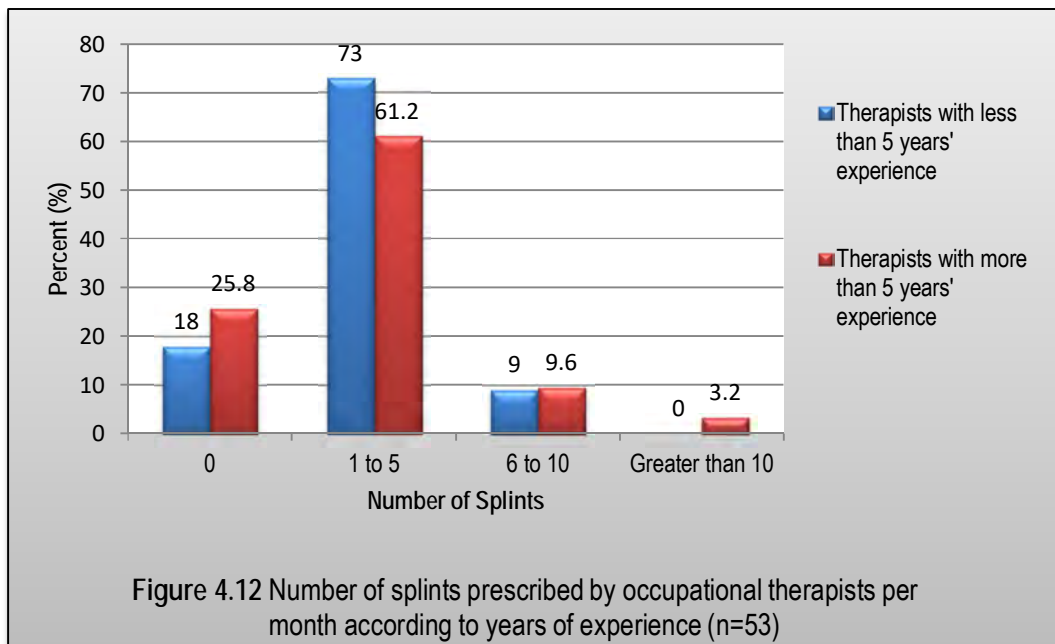
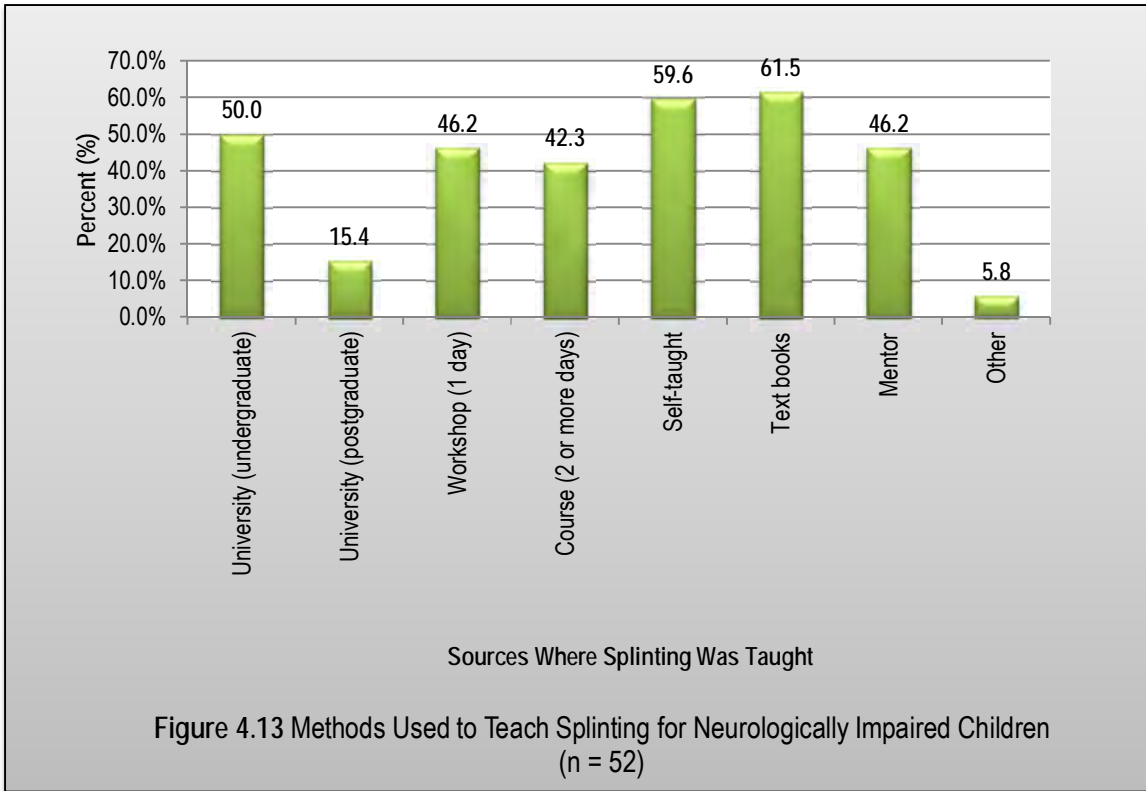


Figure 4.12 illustrates that only a small percentage of the therapists (18% with less than 5 years experience and 25.8% with more than 5 years experience) chose not to splint children with neurological impairment. Eight therapists with greater than five years experience (n=8) chose not to splint in comparison with four who had less experience. Both the less experienced and more experienced therapists had the highest frequency in prescribing 1 to 5 splints per month.



Therapists stated that they learnt how to splint from a variety of sources (**Figure 4.13**), with the majority doing so in their own time as 61.5% stated having used textbooks and 59.6% being self-taught. Only 50% stated that they had learnt to make splints for children with neurological impairments at university. The least common resource was postgraduate training (15.4%).



4.4. TYPES OF SPLINTS BEING PROVIDED

The next part of the questionnaire explored the types of splinting materials used and preferred when splinting children with neurological impairments as determined by objective 2. They were also surveyed about specific types of splints used, as well as their views on which type of splint (hard or soft) was the most effective for neurological impairments. The participating therapists from this point forward only numbered 40 and many questions allowed for multiple answers.

They reported that thermoplastic (90%) and neoprene (85%) were the preferred types of materials used when splinting for a child with neurological impairments. This was followed by 22.5% making use of plaster of paris and 7.5% using air splints.

Therapists' preferences, as illustrated in **Figure 4.14**, showed that the majority (57.5%) preferred to use a combination of thermoplastic and neoprene.

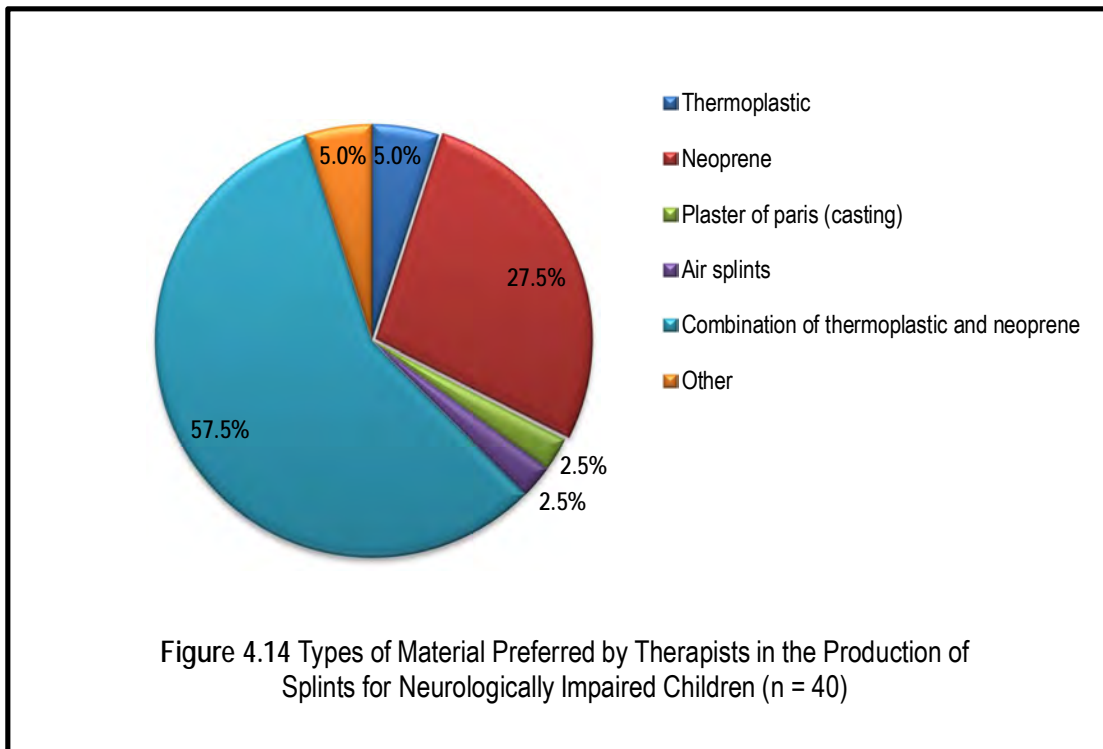
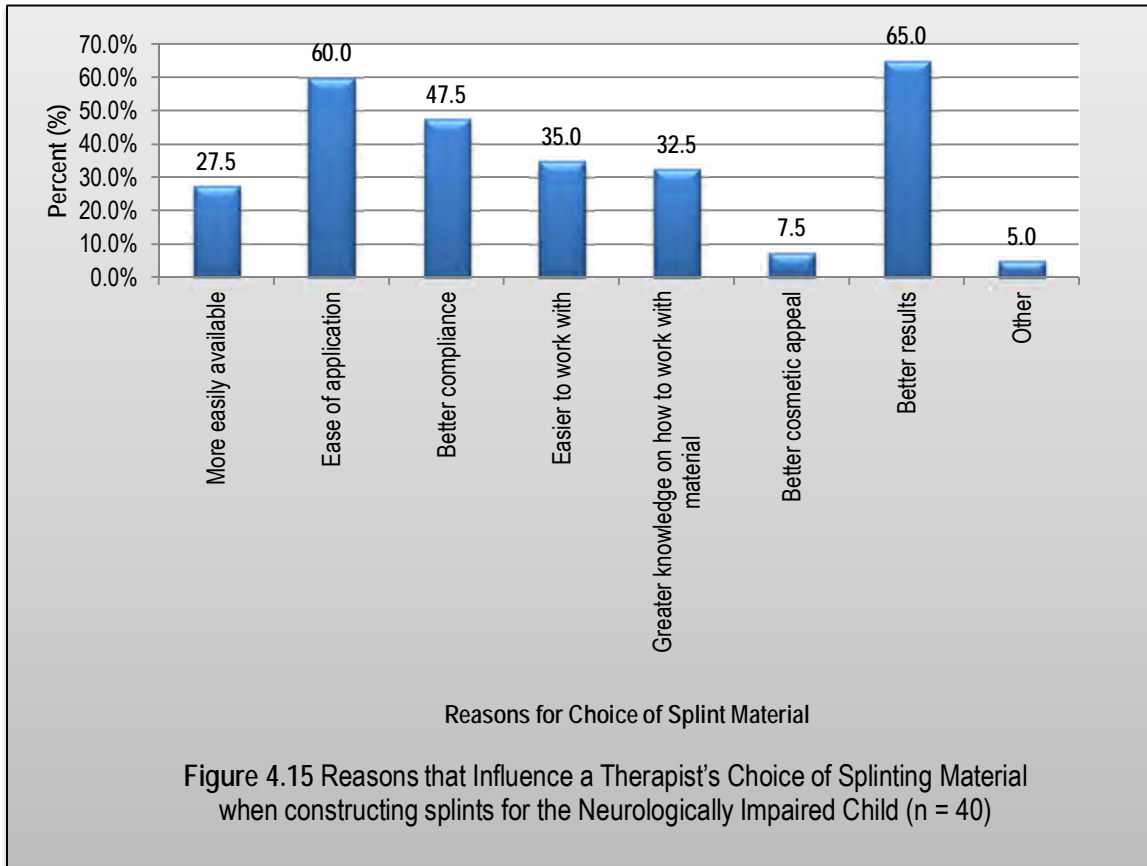
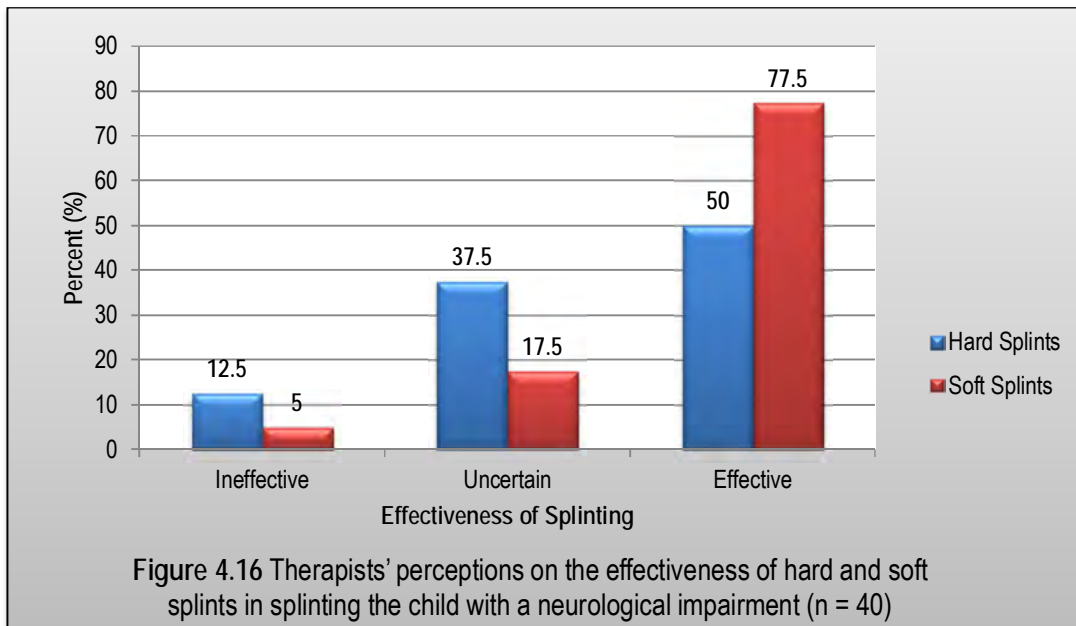


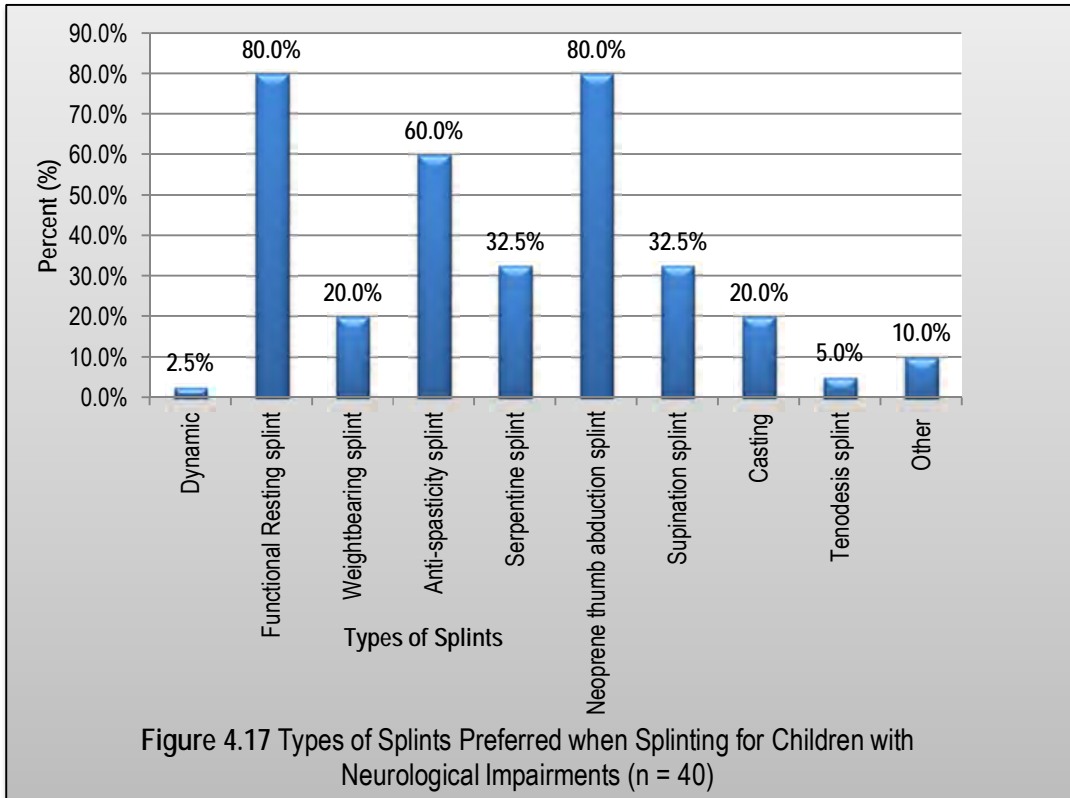
Figure 4.15 depicts that the therapists' preference for splinting material was influenced by the following factors: 65% felt that their choice of material led to better results, 60% chose material based on the ease of application with 47.5% feeling that it was important for better compliance. Only 7.5% based their choice of material on cosmetic appeal. All (100%) agreed that they preferred to custom-make their own splints as opposed to using off-the-shelf products.



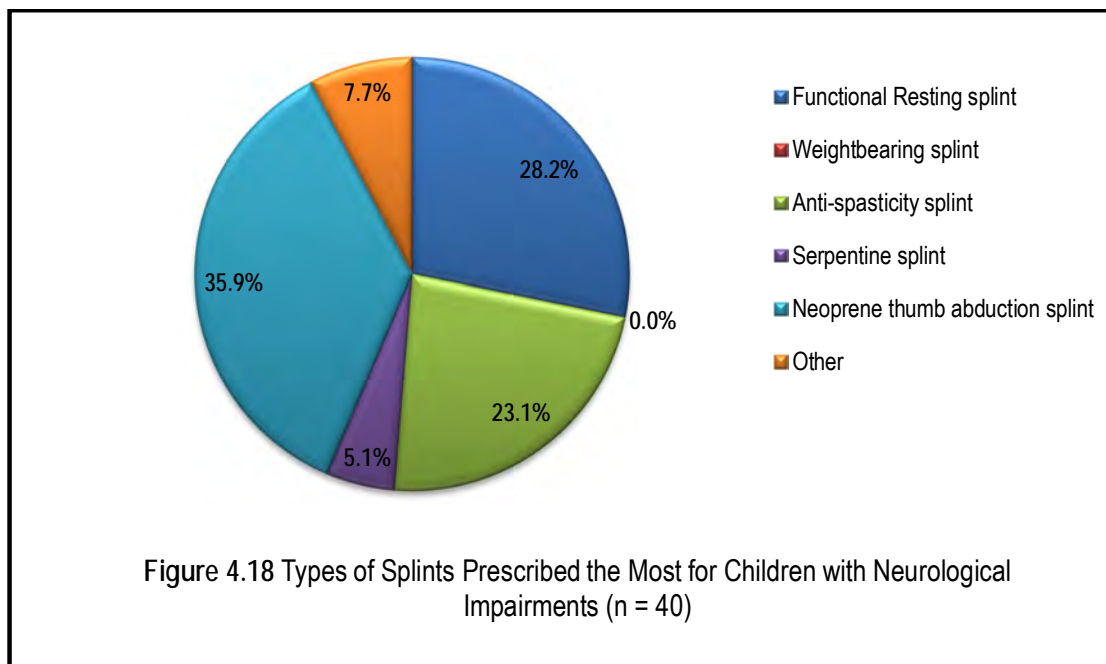
As shown by **Figure 4.16**, 45% of therapists (n=40) felt that hard splints (thermoplastic) were effective, although 37.5% were uncertain of its effectiveness. However, 67.5% felt that soft splints were effective, with only 17.5% being unsure of their effectiveness.



In terms of the type of splints preferred for children with neurological impairments, therapists could choose multiple answers. **Figure 4.17** illustrates that two splints were the most popular: Functional Resting Splint (80%) and the Neoprene Thumb Abduction Splint (80%). There were four responses to the other category, which included thumb opposition splint, wrist extension splints, a postbox splint and a neoprene splint similar to the soft abduction splint, but which includes the wrist.



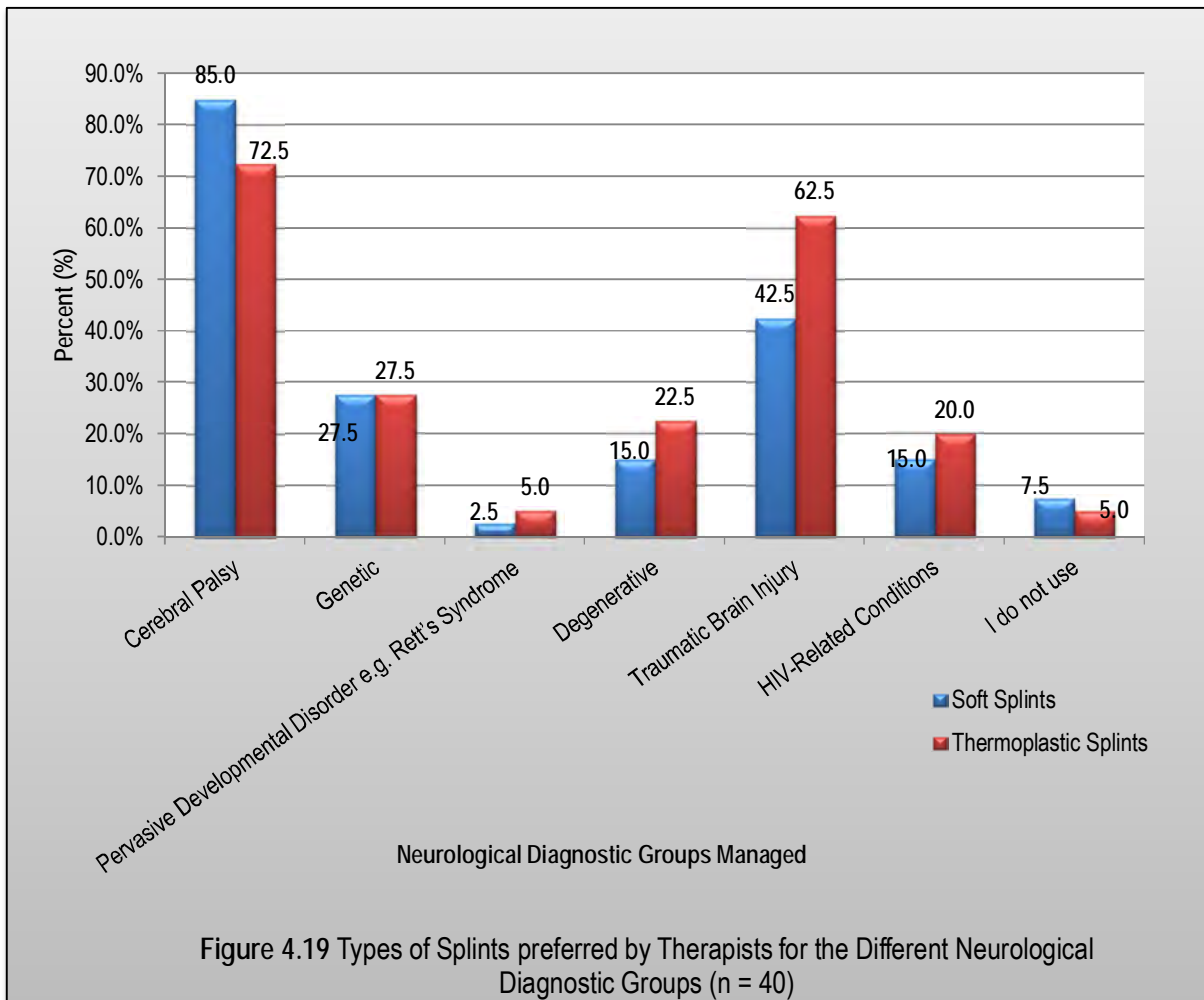
The choice of splints preferred was confirmed by which splint the therapists chose to prescribe the most, with therapists being asked to choose one answer. **Figure 4.18** shows that they again showed preference for the functional resting and neoprene thumb abduction splint. No therapists chose the following splints: Dynamic, weight bearing splint, supination splint, casting and tenodesis splint. There were three responses for the other category and included: neoprene glove splint, neoprene resting splint and soft abduction splint with wrist extension.



4.5. CLIENT FACTORS AFFECTING DECISION-MAKING OBJECTIVE?

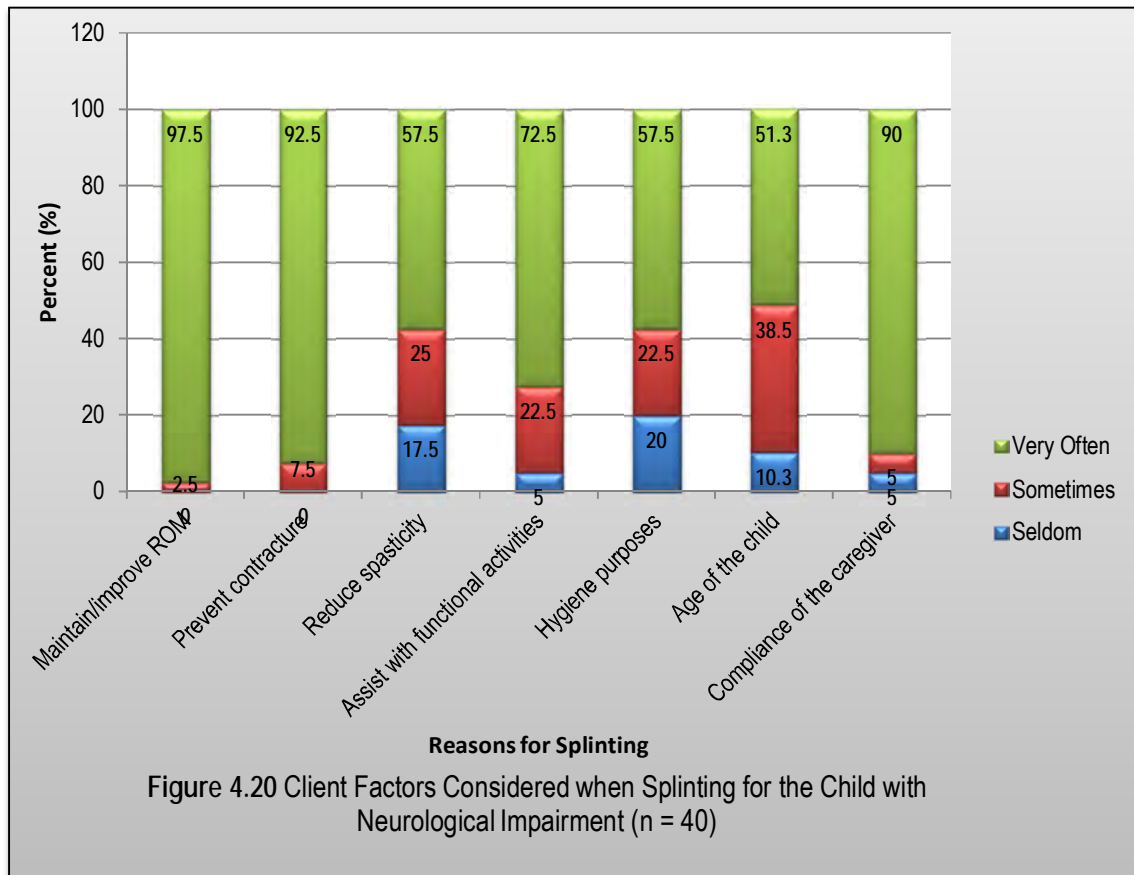
This part of the survey answered objective 3 through the exploration of the diagnostic groups that therapists tend to splint for. The reasons (client factors) that a therapist may consider when choosing to splint a child with neurological impairment was also explored.

Therapists showed that they used both hard and soft splints despite the type of diagnosis (**Figure 4.19**). Cerebral Palsy was the diagnosis where therapists used splints the most, with 80% using soft splints and 72.5% using thermoplastic splints. For traumatic brain injury, however, this was reversed, with more therapists (62.5%) using thermoplastic splints and 42.5% making use of soft splints.



Reasons for splinting were explored through the use of a likert scale. This 5-point scale was collapsed during the data analysis to a 3-point scale for ease of interpretation. The categories *never* and *seldom* was reduced to *seldom*, *sometimes* remained the same and *very often* and *always* was reduced to *often*. With reference to **Figure 4.20**, over half of the therapists considered all the reasons stated when choosing to splint the child with neurological impairments. Maintenance/improvement of ROM (97.5%), prevention of contractures (92.5%) and the compliance of the caregiver (90%) received the highest frequency in being considered often when splinting a neurologically impaired child.

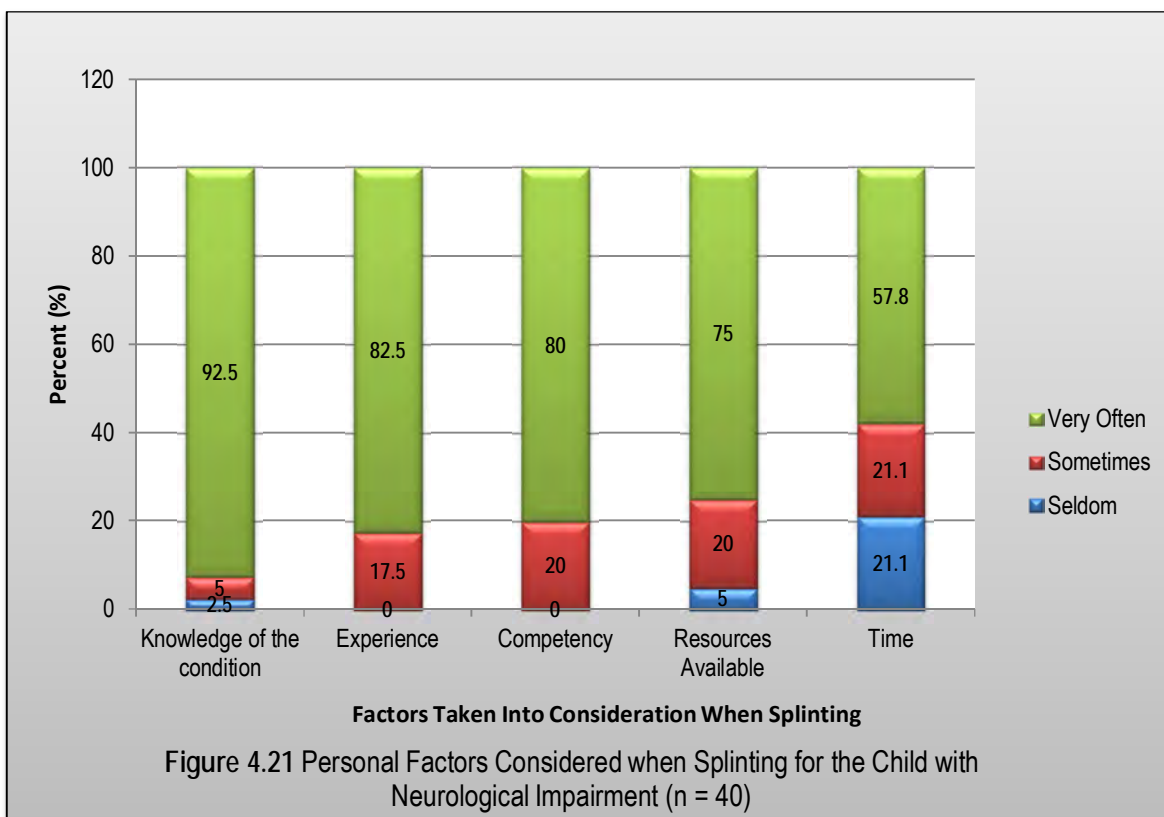
Over half the therapists would often consider the following reasons when deciding about splinting a child: reducing spasticity (57.5%), assisting with functional activities (72.5%), for hygiene purposes (57.5%) and the age of the child (51.3%). Reducing spasticity (17.5%) and using splints for hygiene purposes (20%) showed the highest frequencies for the seldom considered category, however, over half the therapists still considered these often as reported above.



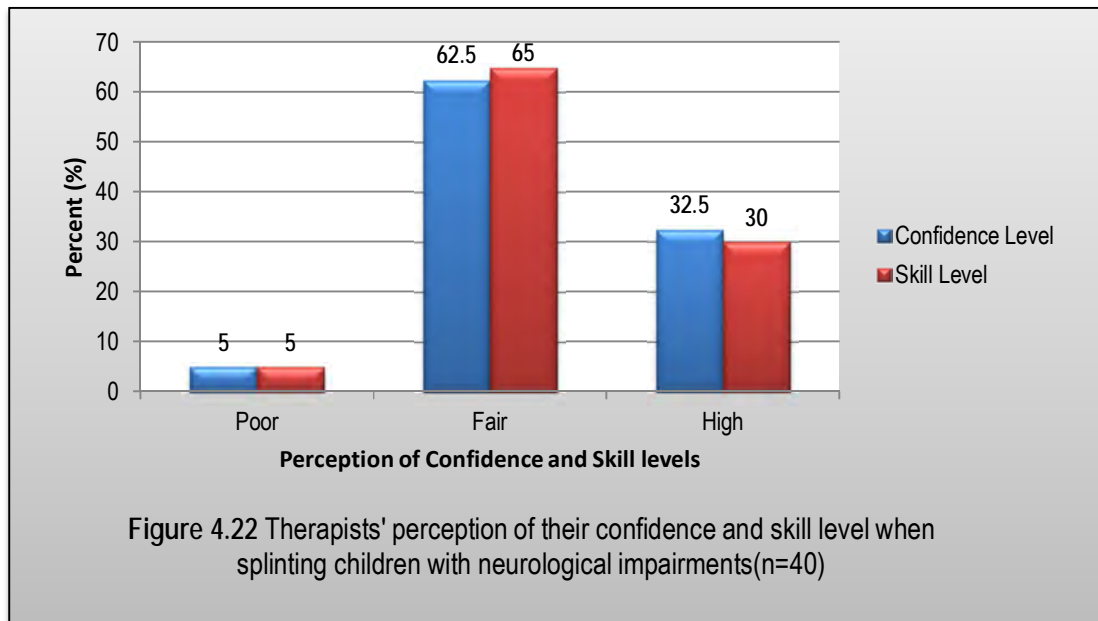
4.6. PERSONAL FACTORS AFFECTING DECISION-MAKING OBJECTIVE?

This part of the survey answered objective 4 through the exploration of the internal and external factors that may impact on a therapists choice to splint a child with neurological impairments. The therapists perceptions of their confidence levels, skill and knowledge of splinting were also explored.

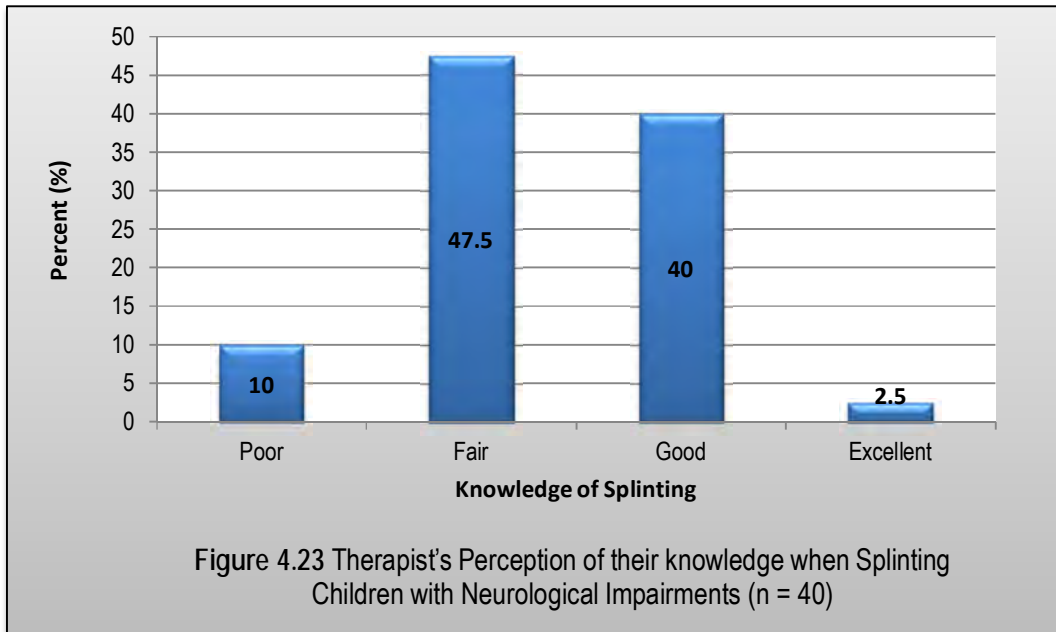
Personal factors that were considered during splinting included knowledge of the condition, therapists experience with splinting, and their feelings of competency, resources available and time (Figure 4.21). A 5-point likert scale was once again collapsed during the data analysis to a 3-point scale for ease of interpretation (Never and seldom was reduced to seldom, sometimes remained the same and very often and always was reduced to often). It was found that the knowledge of the condition (65%) was the main factor that was often considered during splinting. This was followed by almost half of considering that competency (47.5%) and experience (45%) should often be taken into account when splinting. The category that had the highest frequency with regards to seldom being considered was time (21.1%).



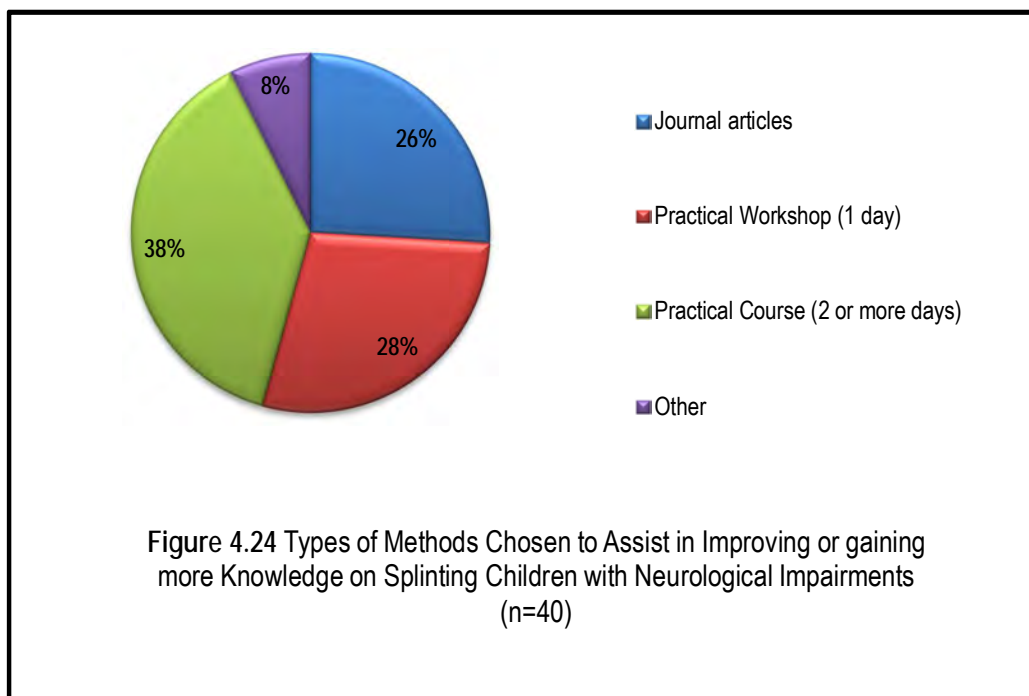
Overall, as shown in **Figure 4.22**, the majority of therapists responded that their level of confidence (62.5%) and skill (65%) when splinting neurological conditions in children was fair. Less than half of the therapists felt that their confidence and skill level was good (32.5% and 30% respectively). This data was collapsed from a 5-point likert scale to a 3-point likert scale for ease of reporting and analysis.



In terms of level of knowledge of splinting in these cases, 47.5% felt it was fair, with 40% responding that it was good (**Figure 4.23**). It is interesting to note that the mode was fair, showing that the majority of the therapists were not highly confident in their knowledge.



The following question, as depicted in **Figure 4.24**, allowed for multiple answers. The majority of therapists expressed a need to engage in more practical courses in order to improve their knowledge and skill on neurological splinting (practical workshops and practical courses). A small percentage (8%) suggested mentoring and in-services, international speakers and clinical reasoning.



4.7. SUMMARY

Although the full survey was only completed by 40 occupational therapists, the results describe a trend that appears in keeping with the thinking amongst occupational therapists internationally (Adrienne & Manigandan, 2003; Reid, 1992; Chazen, 2013; Khatri et al, 2013 and Kilbrade et al, 2013). Although the participating therapists may represent a minority of South African occupational therapists within the paediatric neurological field, it is still evident that splinting is occurring despite the lack of scientific evidence.

Although additional qualifications are available, therapists are making use of knowledge gained at university as well as mentorship and self-taught methods in order to gain greater skill in splinting for the neurologically impaired child.

Regarding the preferred material, the preference was for a combination of neoprene and thermoplastic materials, based on their perception that these yield better results (65%) as well as being easier to apply (60%). Therapists believe that although both thermoplastic (45%) and soft splints (67.5%) are effective, they were uncertain about thermoplastic material (37.5%). In terms of types of splints, they showed a preference for prescribing the functional resting splint (28.2%) and the neoprene thumb abduction splint (35.9%).

The two main neurological diagnoses that therapists splint for are cerebral palsy and traumatic brain injury, preferring soft splints for the former and thermoplastic splints for the latter. In terms of client-related factors, they decide to splint mainly according to how well the splint can improve or maintain ROM (97.5%), prevention

of contracture (92.5%) and the compliance of the caregiver (90%). Other factors including reducing spasticity, assisting functional activities, with hygiene purposes and the age of the child being were considered less often. In terms of personal factors, therapists feel that knowledge of the condition (92.5%) is an important consideration when splinting. This was followed by experience (82.5%), competency (80%), resources available (75%) and time (55%).

Overall the majority of therapists felt that their confidence (62.5%) and skill (65%) was fair, but the majority feel their knowledge is poor (47.5%). Therapists have shown an interest in improving their knowledge on neurological splinting mainly through a practical course (38%).

CHAPTER 5. DISCUSSION

5.1 INTRODUCTION

This study aimed to describe the current trends amongst occupational therapists in South Africa with respect to splinting the hand of children with neurological impairments. As with studies done elsewhere (Adrienne & Manigandan, 2003; Reid, 1992; Chazen, 2013; Khatri et al, 2013 and Kilbrade et al, 2013), this study found that therapists prescribe splints to patients with neurological impairments despite the literature stating that their efficacy still needs to be tested and proved. This study is the first within South Africa to describe the perceptions and views of occupational therapists for splinting the paediatric neurologically impaired hand.

A discussion of the therapists' demographics and professional experience regarding splinting will be followed by the study's four objectives: 1) How often do occupational therapists provide splints for children with neurological impairments as discussed under section 5.3 background on splinting experience, 2) What types of splints are issued in section 5.4 types of splints provided, 3) the client factors affecting decision-making in splinting, discussed in section 5.5 and 4) the personal factors that affect decision-making in splinting, as discussed in section 5.6.

The chapter will therefore discuss the findings as presented in Chapter 4 with respect to the responses of the 54 participants, unless otherwise stated, who manage children with neurological impairments. Each section will review the findings of other studies in order to examine and describe their similarities and differences to those found in the current study.

It has been found that the decision-making process regarding using hand splints, although traditionally separate for the adult and paediatric neurologically impaired patient, has been shown to share commonalities (Kuipers, McKenna & Carlson, 2006:106). Hence the findings from this study will be discussed in relation to studies on both paediatric and adult neurological cases.

5.2 DEMOGRAPHICS AND PROFESSIONAL EXPERIENCE

The findings were obtained from a national electronic survey of occupational therapists. Initial consent to participate was received from 72 participants, but after the first question, this dropped to 65. This may be due to therapists reassessing their decision about consenting to participation. The full survey was completed by 40 occupational therapists that splint children with neurological impairments. This was a similar sample size to the study done by Adrienne & Manigandan (2013).

It was important to collect data regarding the therapists' demographics and professional experience in order to create a context for the study. The majority of the therapists (n=65) were from KwaZulu-Natal (KZN) and the Western Cape (WC) Provinces. It is interesting to note that the participants who responded to the questions relating to managing children with neurological impairments (n=54), a quarter of the KZN and WC therapists choose to splint children with neurological impairments.

The main working sectors were public acute hospitals and private practice. This is similar to Reid's (1992:20) study where 41.3% of therapists were from acute care facilities. This may be due to acute hospitals having greater access to splinting

materials, as opposed to schools or clinics, as splinting will be prioritised. Resources may also be more readily available in the private sector due to approval through supply chain management not being needed.

Half the therapists were aged between 26 and 30 years, suggesting few years of experience. This is supported by the fact that the majority of respondents had 1 to 5 years of experience as practitioners. This suggests that there are a large number of relatively new therapists with little practical knowledge and experience in splinting. A quarter of the therapists had 6 to 10 years of experience with another quarter having 16 to 20 years of experience. This therefore allowed the results to reflect opinions from therapists with different practical experiences and knowledge. This range of experience is different from the study done by Chazen (2013), also in South Africa, where her participants needed at least four years of experience in neurorehabilitation to participate in the study. This study therefore allows for a fresh perspective from newly graduated occupational therapists.

The range of experience is further highlighted through the attendance of varying courses, such as NDT, sensory integration and hand therapy (cf. **Figure 4.7**). Although over one third of the therapists only had an undergraduate degree in occupational therapy, this was supplemented with an introduction to the Assessment and Treatment of Cerebral Palsy course by half the respondents. This may suggest that many of the therapists' knowledge on splinting for the neurological impaired child is from their undergraduate training or from other sources, and further allows for exploring a different sample, as over half of Chazen's (2013) participants held postgraduate degrees relating to neurology.

The participating therapists reported a wide range of experience, specifically with neurologically impaired children, although the majority only had one to two years of experience. It has been reported that few workshops exist for junior therapists to improve their skills with regards to managing children with cerebral palsy (McLaren, 2014:3). Thus therapists with only a few years of experience may still be discovering new knowledge and developing their skills in neurology, indicating the need to learn more through practical workshops.

It is important to note that therapists rarely use splinting as their only approach in neurological rehabilitation (Barnes, 1989:152). Although not the main focus of the study, it was found that they (n=54) use a variety of treatment techniques when managing children with neurological impairments. The most common techniques were NDT followed by developmental techniques (cf. **Figure 4.8**). This may be due to a quarter having attended the NDT course, whether for adults or paediatrics, in order to translate theory into practice. This is in accordance with an international study (Khatri et al, 2013), which found that therapists preferred NDT and was the most frequently used theory as an adjunct to splinting. Thus, although splinting can be a mode of intervention, it should not be used in isolation from other intervention techniques (Jackman, Novak & Lannin, 2014:146). This emphasises that therapists adopt a holistic approach through neurodevelopmental and developmental approaches while addressing hand function.

Therapists without advanced training in NDT and sensory integration are using its principles and techniques, which they learnt about during their undergraduate

training at university, where NDT is often the most commonly taught theory (Freeme, 2011:90) This also suggests that therapists without the advanced training are using the techniques and principles. It is thus important to take this into account when conducting experimental studies, as the different approaches to what may also influence improving the physical and functional components of what and not just the splinting.

5.3. BACKGROUND ON SPLINTING EXPERIENCE

Objective 1 was to determine how often therapists construct and issue splints to children with neurological impairments and is thus described as their background of splinting experience. The survey, although mainly attempting to describe reasons for splinting, also examined the reasons why a therapist may choose not to splint. Interestingly, 54 therapists completed the splinting experience and their experience with children with neurological impairments, what treatment techniques they use as well as their reasons for not splinting. However, only 40 completed the remainder of the survey, which suggests a lack of consensus among those who work with neurologically impaired children in terms of whether splinting is a suitable course of intervention.

Although 22% (n=53) indicate that they do not construct or prescribe splints, the remaining 78% construct one to five per month. As seen in other studies (Adrienne & Manigandan, 2003; Reid, 1992; Chazen, 2013; Khatri et al, 2013 and Kilbrade et al, 2013), this indicates that some occupational therapists are splinting despite the controversy that surrounds its use (Langlois, Pederson and MacKinnon, 1991:18). As over three quarters indicated that they would splint a child with neurological

impairments, this may reflect a positive perception towards neurological splinting amongst the therapists who responded to the survey. The 40 therapists who answered the full survey all wanted to learn more about neurological splinting through various methods.

The therapists stated that they learnt to splint for neurological conditions from a variety of sources (cf. **Figure 4.13**); with only half indicating that this was at university as part of their undergraduate degree. This is similar to the findings of Chazen (2013:42), who found that therapists were more likely to gain theoretical knowledge or basic splinting practice on a colleague's hand at university. However, this may not have related to neurology, which may have been the case in the current practice, as their lack of knowledge about the different types of splints may have resulted in them being less likely to splint a child with a neurological impairment.

Reid (1992:24) provided a list of splints that were usually prescribed during paediatric neurological splinting, with the therapists having received training in each splint at university, and therefore felt more comfortable to prescribe them during their interventions. Unlike Reid's (1992:24) study, only half of the current study's therapists learnt to splint at university and this was not necessarily specific to paediatric neurological splinting. Further training is thus needed, perhaps in the form of CPD, activities in order to bridge the gaps in knowledge. The generalization of splinting practice taught at university may contribute to their feelings of limited confidence, particularly amongst the newly qualified therapists,

with splinting knowledge having more likely been gained through other methods, as described below.

Overall, therapists made use of their own time to learn through the use of textbooks or self-teaching. Although this appears similar to Kilbrade et al (2013:561) study, with trial and error reported to have been used by nearly half the therapists, almost all preferred learning from a colleague, with three quarters supplementing their experimental knowledge with post-graduate training. Reid (1992) found that therapists with less than 5 years experience tend to make more splints than those with more years experience, with Chazen (2013:66) and Kilbrade (2013:561) attributing this to trial and error. These results are similar to this study, as almost all the therapists with less than 5 years experience chose to make use of splints at least once per month, as opposed to three quarters with more years experience. The supplementation of self-taught splinting knowledge with postgraduate training in whose study was, however, different from the results in this study, as discussed below, which indicates a need for more evidence-based research (Adrienne & Manigandan, 2003:9).

Although participants in Reid's (1992:24) study felt that they had gained sufficient information at university, additional postgraduate training, including workshops, led to the more frequent use of certain splints. Interestingly, in this study, the least common resource relating to splinting knowledge was postgraduate training (excluding workshops and courses). This is in accordance with Chazen's study (2013:68), where almost half the participating therapists held postgraduate degrees in neurological rehabilitation. However, the authors did not discuss this as

a resource for knowledge when splinting the neurologically impaired client. This may suggest that sharing information about neurological splinting, whether through postgraduate degrees or workshops, varies internationally.

The following reasons were explored as to why therapists may be influenced not to splint, and provide insight into their thinking and clinical decision-making processes regarding current splinting practices.

5.3.1 Departmental Policy (cf. Figure 4.9 for Section 5.3.1 to 5.3.6)

South Africa differs from other countries, as many therapists tend to access local evidence-based guidelines (Kilbrade et al, 2013:562) or as seen in Adrienne & Manigandan (2003:4) study, in which almost all of the therapists surveyed followed hospital departmental guidelines, whilst other national splinting guidelines were also available. The majority of therapists, within this study, however, did not make use of departmental policy as a reason not to splint. This may be due to many departments or practices not having a specific policy or even that therapists still choose to splint based on the child's presentation.

5.3.2 No evidence-base

Naylor (1995:842) stated that where research evidence is lacking there needs to be greater use of expert clinical opinion and clinical reasoning skills. Almost half of the therapists did not consider the lack of evidence-based research as a reason not to splint. This shows that they feel that practical experience and their perceived benefits are more important. This is in accordance with Adrienne and Manigandan (2003: 4) study, which also found that therapists continued to

prescribe splints, despite the lack of research on their efficacy. The authors indicated that this may be due to limited splinting research by therapists in terms of complications or positive qualities, as they prefer to rather make use of clinical experience.

Therapists who did not prescribe splints stated the lack of evidence as a reason for not doing so, and show the difference in opinion amongst them (Adrienne & Manigandan, 2003:7). This is also emphasised in the current study, where 38.8% sometimes and 16.6% often considered the lack of evidence based research to be a factor in choosing not to splint.

5.3.3 Decreased confidence

Despite therapists having low confidence in terms of splinting for the neurologically impaired hand, over half of the therapists would seldom consider this as a reason not to splint. This is supported by Chazen (2013:46), with the less experienced therapists possibly choosing to splint in order to gain better handling of splinting materials through extended practice, thereby increasing their confidence levels. This is seen as an important form of clinical experience and should be encouraged by all therapists (Wainwright et al, 2010:81).

5.3.4 Preference for other techniques

Therapists also appear to be divided in terms of whether preference for other techniques would be of more benefit than splinting. This may be explained by Chazen (2013:48), who stated that many of the younger therapists may choose to

under-splint due to the associated controversy for the neurologically impaired child (Langlois, Pederson and MacKinnon, 1991:18).

5.3.5 No availability of materials

Although it is easier to order splinting materials in the public sector, there can be long delays in receiving these materials. Reid (1992:25) found that a lack of materials was a significant factor when choosing whether splinting was an option. This study suggests otherwise, as most of the therapists seldom consider a lack of resources as a reason not to splint. This may be due to therapists using materials that are available or, as indicated through experience in the public sector, sharing of resources between occupational therapy departments. One therapist showed initiative when she stated that she likes to use sponges or bandage when splinting.

5.3.6 Lack of supervision

Just over half of the therapists were able to splint independently if needed, as they seldom considered a lack of supervision to be a factor when choosing not to splint. This is commensurate with data collected by Kilbrade et al (2013:562), which stated that over a quarter of the therapists in their study would prefer to splint with supervision. This may also be due to the availability of mentors or other colleagues in the department, however, many departments, particularly in the more rural areas within South Africa, only have one occupational therapist per hospital or clinic.

5.4. TYPES OF SPLINTS PROVIDED

In order to answer objective 2, the therapists were asked about the types of splints that they construct and issue to children with neurological impairments.

Kilbrade et al (2013) found that 30% of occupational therapists preferred off-the-shelf static splints in their study, whereas 100% of the therapists (n=40) in the current study preferred custom-made splints. This is in keeping with Adrienne and Manigandan (2003:5) study, which showed a various preferences amongst different groups of occupational therapists. It is interesting to note that Kilbrade (2013) study included both occupational therapists and physiotherapists, with more physiotherapists preferring prefabricated static splints. Although prefabricated splints can be adjusted for each individual patient, a custom-made splint is specific and individualised, which may suggest that the therapists who participated in the survey spend more time on splinting. Due to the modifications and adaptations that can be made to custom-made splints, this can lead to their assisting a child more with function, thus fulfilling a core principle of occupational therapy.

Prefabricated splints are often more expensive than splinting sheets. Although a box of 12 sheets of splinting material is three times that of a box of 10 prefabricated paediatric splints, about 8 to 10 splints could be constructed from one sheet of splinting material, this being observed from personal experience. Prefabricated splints are usually only available as the standard functional resting, wrist extension and foot drop splints. Thus the cost and the availability of prefabricated splints would also influence the therapists preference.

It is motivating to note that South African therapists prefer custom-made splints, as Pitts and O'Brien (2008:459) found that ill-fitting off-the-shelf splints can lead to an increase in psychosocial fears and in tone. Although relating to strokes, Pitts and O'Brien (2008:460) also felt that custom-made splints could increase the chance to reduce contractures while increasing function.

Almost all of the therapists report using thermoplastic material when splinting the child with neurological impairments, as did those who reported having used neoprene, which already shows an overlap in types of material. This is confirmed, in terms of preference, by their using a combination of thermoplastic and neoprene material as the best choice, followed by neoprene. This is interesting to note, as resources, especially in the public sector, are not always readily available in developing countries, and material such as neoprene is expensive. More literature is reporting on whether soft splints can be effective for children with neurological impairments and if this can assist more with function, as neoprene allows for movement (Hughes, 2013: i-142; Kumar, 2012:2). This suggests that South African therapists read the current literature and implement the new ideas and splints.

Soft splints, however, have been gaining popularity, as can be seen by 35.9% of therapists stating that they prescribe the neoprene thumb abduction splint the most for children with neurological impairments. This may be due to therapists believing that a soft splint is more effective (77.5%) than a hard splint (50%), with 12.5% of the therapists stating that thermoplastic splints are ineffective (cf. **Figure**

4.16). Research has also found that soft splinting material may be more feasible in a developing country (Kumar, 2012:31).

Although studies have been performed to investigate the benefits of soft splinting in children with CP, a systematic review (Blackmore et al, 2006:8) found the evidence supporting its use to be weak, with only one out of the five studies reviewed having been published. Therapists are also of the opinion that, besides the benefits, the soft material is better tolerated by children (Reid, 1992:22). This once again shows a discrepancy between the evidence and therapists' perception of the benefits of splinting in children with neurological impairments.

The above findings, however, are different from the study done by Kilbrade et al (2013), in which the majority of occupational therapists would only fabricate thermoplastic splints, with only 7% choosing to use other types of materials. This is in line with the other studies describing splinting trends (Reid, 1992; Adrienne & Manigandan, 2003; Chazen, 2013), as the focus appears to be on thermoplastic splints. This study therefore allows for greater insight into the use of neoprene or soft splinting in the neurologically impaired child.

The therapists show a marked preference for three splints despite the lack of scientific evidence documenting their benefits (cf. **Figure 4.17** and **4.18**). The functional resting splint, as described by Gabriel (2008:353) in the literature review (cf. 2.5.1.2), is the most preferred and second most prescribed splint for children with neurological impairments, despite a lack of scientific evidence (Lannin & Ada, 2011:24). This is in accordance with Reid's (1992:21) study, which indicated that

many therapists used the functional resting splint. Adrienne and Manigandan (2003:5), however, found that therapists preferred volar-based splints as opposed to dorsal-based splints. This shows a discrepancy in preference amongst occupational therapists, and may be impacted upon by the functional resting splint restricting daily activities due to finger movement limitation (Gabriel, 2008:353).

The second most prescribed splint, but the most preferred splint, was the neoprene thumb abduction splint. As a soft splint, new studies are being done in order to assess its effectiveness. Fedrizzi et al (2003:85) found that soft splints allows for movement, as opposed to the functional resting splint, while still providing a prolonged stretch. In terms of normal development, active movement is encouraged from an early age. Grasps begin from the ulnar side of the hand and thereafter move to the radial side of the hand (Ter Schegget, 2002:41). A neoprene-based splint may be able to take this into account, as it is more likely to encourage normal movement and exploration, which is essential for a child's overall development.

The use of neoprene in a South African context may also imply that local therapists, as documented, are reading current articles on splinting in order to keep up to date with research. They may also prefer the fabrication process, and feel that it is more comfortable for patients (Coppard & Blanchard, 2008:43). The other prominent splint that is prescribed is the anti-spasticity splint, this being the third most used splint in Reid's (1992:21) study. . Although relating to adult neurology, Chazen (2013:47) found that therapists thought this to be the most effective post-stroke and that it also allowed for improved hygiene.

Only a one therapist (2.5%) choose to prescribe dynamic splints despite their having good results in assisting in active movement (Farmer & James, 2001:554). Boutner et al (2008:36) found, in a randomised-controlled trial, that grip and fine motor skills were improved after dynamic splinting compared to static splinting. Although in conjunction with other development, such as cognition, children's fine motor skills in hand development are essential for exploring the environment to perform ADL as well as more school-related tasks.

This reluctance to use dynamic splints may be due to the amount of time needed for their construction, a decreased knowledge of dynamic splints for the neurologically impaired child, as well as lack of compliance due to the complexity of the splints. This is again in keeping with Adrienne and Manigandan (2003:8), who stated that dynamic splinting is often under-utilised.

Like dynamic splints, casting is only used by a small percentage of therapists who participated in this study, despite having been shown to have positive benefits, particularly in ROM improvement (Yasukawa et al, 2008). The reasons for the under-utilisation of casting is not known, but may also be impacted on by the little research performed on clients with neurological impairments, as well as the limited handling requirements of this material compared to perhaps thermoplastic and neoprene.

It is noted that a small percentage of therapists chose not to splint children with neurological impairment. Of the therapists that did choose to splint, both the less experienced and more experienced therapists had the highest frequency in

prescribing a small number of splints per month. Only one therapist, who had greater years of experience, prescribes more than 10 splints per month (cf. Section 4.3.2). This is different from Reid's (1992) study, which found that therapists with less than 5 years of experience were more likely to make use of splints. The choice to splint may be due to inexperienced decision-making processes, as well as a trial and error approach while practical experience is still being gained.

The therapists stated that there were a multitude of reasons for their choice of splinting material. This provides some insight into their thought processes and clinical reasoning when considering splinting as an intervention method. Although little scientific evidence is available about specific splints and their efficacy, it is even more difficult to compare the benefits of both thermoplastic and soft splints. Over half of the therapists, however, stated that they would choose materials based on the positive results they had achieved in the past. This may be the reason for a difference in results between what splints they prescribed during their years of experience and which splints they prescribe the most (cf. Section 4.4.4 and 4.4.5).

Chazen's (2013) study proposed that splinting guidelines, in terms of neurological rehabilitation, should include considering materials as well as the ease of applying a splint. This was also seen as the second most important factor that influences the therapists' (60%) choice of splinting material in this study, and will therefore affect compliance of splint use, which influenced half of the therapists when choosing splinting material.

Material that is easy to work with (35%), more familiar to therapists (32.5%), more easily available (27.5%) and had cosmetic appeal (7.5%) were not seen as important as the above mentioned factors. Reid (1992) also found that a similar percentage of therapists used specific splints for cosmetic appeal, and indicates that few therapists are influenced by this factor. The factors that are considered to be less important indicate that therapists do consider a patient-centred approach, as it appears that they would rather have what is best for their patient than what would be easier for the therapist to utilise.

5.5 CLIENT FACTORS AFFECTING DECISION-MAKING FOR SPLINTING

With respect to Objective 3, a number of client-factors affected the therapists decision to use a splint. As occupational therapy is often associated with functional aims, the main goals of splinting should reflect a decision-making process aligned to occupational therapy practices. Adrienne and Manigandan (2003:8) found that there was a difference between the perceived improvement in physical components and functional outcomes. This may be related to the method of how the question was asked, as when therapists were questioned through qualitative means (Chazen, 2013), it was found that splinting should not take away from functional use and should only occur if active movement is present in order to promote function.

Kilbrade et al (2013:563) recommended that knowledge of the types of neurological conditions being splinted for would benefit future protocols or guidelines. The survey found that therapists, whether using thermoplastic or soft splints, mainly splinted for children with cerebral palsy (72.5% and 80%

respectively), as well as traumatic brain injury, where 62.5% used thermoplastic splints and 42.5% used soft splints. It is interesting to note that therapists made use of splints in pervasive developmental disorders, and future studies would be able to investigate this further.

The three most common considerations when splinting, as reported by the therapists, in terms of client factors include 1) maintenance/improvement of ROM, 2) preventing contractures and 3) compliance of the caregiver. This reasoning appears to show some universality, as the main reasons stated for splinting, as explored in Adrienne and Manigandan's (2003:8) study, was decreasing tone in the hand, preventing contractures and improving ROM. A similar finding was found in the survey done by Khatri et al (2013), which stated that therapists mainly used splinting to prevent contractures. The reasons taken into consideration when splinting in this study are described in greater detail.

5.5.1 Splinting for Maintenance / Improvement of ROM

The majority of therapists (97.5%) stated maintenance or improving ROM as reasons for splinting the hand/s of neurologically impaired children. This was corroborated by Chazen's (2013:52) findings, as the participants agreed that this was the most common reason for splinting post-stroke clients despite insufficient evidence. Reid (1992:22) investigated the functional resting splint further, and discovered that therapists prescribe it to maintain ROM during the night. As the therapists in the current study show a preference for the functional resting splint, as well as mainly prescribing them to maintain ROM, this could also be a possibility in the South African context. Comparing paediatrics and adults shows that, despite

insufficient evidence on the benefits of splinting in the neurologically impaired client, therapists still choose to splint according to their clinical decision-making (Lohman & Aragon, 2008:308).

5.5.2 Splinting for Prevention of Contractures

Both Kilbrade et al (2013) and Khatri et al (2013) found that one of the most common reasons for splinting was preventing contractures (95%). This was in keeping with Chazen's (2013) study, in which it was found that therapists splinted mainly to reduce contracture and to improve ROM, despite the little scientific evidence available, and indicates similar thinking for their use for adults and children. However, Lannin et al (2007) disagreed that splinting should be used for contracture management. This shows a general acceptance that splinting the neurologically impaired hand should be used to prevent contractures despite the lack of evidence, and should thus be investigated further by clinicians.

5.5.3 Splinting to Reduce spasticity

Studies have found no statistical difference between the presence of tone after splinting (Steultjens et al, 2003) or even after conventional therapy (Lannin & Ada, 2011). It was also found that splints used in the stroke population may actually increase tone, although this is based on a small sample (Langlois, Pederson & MacKinnon, 1991). A small group of therapists in a South African study (Freeme, 2013) indicated that splints could have an effect on tone, the number of therapists agreeing with this increasing when faced with a theoretical scenario.. This shows that therapists' thinking can change based on the situation and individual cases. The study done by Khatri et al (2013:1) reported that less than half the therapists

viewed splints as a way to prevent or reduce spasticity, once more showing a division amongst therapists thinking. With less than half the therapists considering splinting to affect tone in the above studies, 58% in the current study felt that it should be considered as a method to reduce spasticity. As mentioned earlier, this may suggest that therapists rely on their own clinical judgment when assessing whether the splint has made an improvement in tone in specific cases.

Therapists may also display different opinions in terms of the benefits between thermoplastic and soft splints. As mentioned earlier, soft splinting appears to be gaining popularity. According to Wallen and O'Flaherty (1991:229), soft splints may provide the correct temperature and pressure that could be effective in muscle tone normalisation. This may suggest why a higher percentage of therapists in the current study often use splinting as a way to reduce spasticity.

5.5.4 Splinting as assisting with functional activities

Although occupational therapists are considered to provide a client-centred approach, with performance and independence being a main component, only three quarters of the therapists in this study considered how a splint could assist with functional activities. This leaning away from the main client-centred ideology of occupational therapy was also noted in Kilbrade et al. (2013) study, as only half of the therapists surveyed reported using splints to assist with functional activities. A systemic review conducted by Jackman, Novak Lannin (2013:141) reported that of the six studies reviewed, five made use of non-functional splints. In addition, Pitts and O'Brien (2008:456) reported that current research has found

that the brain has increased plasticity, and with functional use, the cortical map can adjust.

This information, examined in the current study, may suggest that therapists need to take function into consideration more often when reviewing the benefits of splinting. As the reason for splinting for function was not explored more therapists may also be of the opinion that splinting leads to non-use (Lannin & Ada, 2011:25). As stated by Gabriel (2008:353), however, a functional resting splint may be better suited for night use, as it impairs the function of the fingers, thereby affecting daily activities, which is against the core principles of occupational therapy. This shows that irrespective of the clinical decision, it should be in line with a client-centred approach allowing for greater function.

Whilst some of the other studies showed therapists straying from the functional component of therapy, Khatri et al (2013) stated that three quarters of therapists saw this as significant. This may suggest that occupational therapy education and core principles need to be relooked at on a regular basis, whether through analysing the current educational curriculums or having reminders during relevant CPD activities.

5.5.5 Splinting for Hygienic Reasons

Gabriel (2008:356) stated that one of the main reasons for splinting the paediatric hand was to ensure good hygiene, with over half of the therapists considering this to be important, while a quarter felt that it was one of the least important factors and therefore seldom considered it during decision-making.

The study by Khatri et al (2013:1) showed a different priority for occupational therapists, as hygiene was considered to definitely be improved with splints. This noted improvement would therefore influence their considering hygiene purposes when splinting. This was highlighted by Sheehan et al (2010), who found that poor skin conditions were often as a result of contractures that developed from increased tone. It is therefore important to consider splints that will address hygiene concerns (Chazen, 2013:47) in order to prevent secondary complications, such as poor hygiene.

5.5.6 Consideration of Age of the Child prior to Splinting

Half of the therapists often considered the age of the child when splinting, with less than half sometimes considering it. Ten Berge et al (2012:369) noted that although younger children showed improvement in hand function with the use of a thumb opponens splint, this may have been due to repetitive learning or maturation of each child. Reasons for therapists considering the age of the child during splinting were not identified in this study, but it is important to note the developmental stage of the child, as this can impact on compliance (Reid, 1992:23), particularly with regards to hand development, and this factor should be investigated further in future studies. The age of the child may also impact on the compliance of the splint wearing schedule, and should therefore also be considered in conjunction with the compliance of the caregiver (Bennett & Bennett, 2000:172).

5.5.7 Compliance of the Caregiver with splinting interventions

Caregivers form an integral part in the compliance of splint wear and care (Chazen, 2013:78). Almost all the current study participants felt this to be

important and often considered whether the caregiver would comply with the splinting regime before choosing to splint. This was the third highest consideration, and one therapist emphasised this by stating that a home programme was also important to follow. Compliance was also found to be a factor for the therapists in Reid's (1992:23) study, where a quarter of the therapists felt that children had poor compliance to splint wear, resulting in splints being ineffective. This may be linked to the therapists' choice of splinting material, which was based on the ease of application in order to allow for greater compliance.

These findings suggest that therapists take into account a number of factors relating to the client before choosing to splint, and while many have been documented in literature, there is little scientific proof of their efficacy. Despite showing evidence of clinical decision-making, Davies and Nutley (1999:9) feel that reasoning with no evidence based research could lead to poor decision-making if used at inappropriate occasions.

5.6 PERSONAL FACTORS AFFECTING DECISION-MAKING FOR SPLINTING

With respect to Objective 4, a number of personal-factors affected the therapists' decision to use a splint. In order to achieve aims or goals in therapy, an occupational therapist requires an integration of theoretical knowledge and practice. They need knowledge of both the condition and types of splints available before splinting. Practical experience will therefore lead to greater feelings of competency and confidence, these factors being explored as personal factors that affect decision-making.

5.6.1 Factors Taken into Consideration when Splinting

Almost all the therapists felt that knowledge of the condition was important when splinting, as conditions may have a number of presentations, for example, children with cerebral palsy may present with spasticity or dystonia (cf. Section 1.2), as classified in Fairhurst's (2013:124) article. This links to a therapist's knowledge about hand development and splinting, as it may influence the choice of splint, materials and whether splinting would be beneficial. Although the therapists had seemed confident in terms of their knowledge of the different types of splints, almost half responded that their knowledge on neurological splinting was only fair.

It has been noted that therapists rely on their experience and indicated that using their clinical observations when deciding whether a splint would be of benefit is important (Adrienne & Manigandan, 2003:9). The majority of therapists in the current study agreed, and considered experience as an important factor in their decision-making process with respect to splinting. This was emphasised by Sweetland and Craik (2001), who stated that therapists are less than likely to base their choice of intervention on evidence based practice than on previous training and experience.

A feeling of competency is often related to both experience and confidence (Holland, Middleton & Uys, 2012). The study thus assists in highlighting competency, as almost half the therapists in the current study stated that this should be considered on a regular basis. This may be explained by therapists attributing increased skill to time and experience (Chazen, 2013:66), thus leading to a greater feeling of competency.

In Reid's study (1992:25), it was found that therapists' use of splints was not dependant on the materials available. This was also not found to be the main factor when considering splinting as an intervention in this study. They rather appeared to consider knowledge, competency and experience before the availability of resources. This may be due to the South African context, where the majority of the therapists work in public sector hospitals, in which certain materials may not be easily available and thus they must make use of their initiative and creativity.

As Adrienne and Manigandan (2003:9) highlighted, resources may include the lack of standardised assessments available to measure the improvements observed after splinting. This absence allows for more subjectivity during re-assessment which is what many of the therapists base their decisions on when splinting. The lack of assessments may also suggest why 'resources available' is a factor only considered after experience.

Time to construct splints was felt to be the least important factor to consider when deciding on which splint to use, as only half of the therapists considered this often. This may be associated with the therapists' preference for custom-made splints, as this would take more time construct splints than a prefabricated one.

5.6.2 Perceptions on levels of knowledge, confidence and skill in Splinting

Therapists appeared to be neutral in terms of both their confidence and skill in splinting. As mentioned earlier, despite over half perceiving themselves to only have fair confidence in terms of splinting for the neurologically impaired hand, they

would still not consider this as a factor not to splint. Many therapists with less than five years experience participated in the study, and as reported by Steenbergen and MacKenzie (2004:163), a lack of support can lead to decreased confidence and ultimately poor decision-making. Confidence was better perceived by therapists in Kilbrade's (2013:563) and Adrienne and Manigandan (2003:9) studies, as over half of both samples felt confident in either conducting lessons in splinting or feeling competent in both prescribing and fabricating splints. Unlike the above mentioned study, and although therapists appear to take many of the factors mentioned into account, confidence levels in the current study were not high. This also applied to their reported skill level associated with splinting, which may suggest that more practical workshops and undergraduate practice is necessary.

A fair knowledge base on splinting for the neurologically impaired child may also lead to therapists not feeling confident in this area. Almost half reported only having a fair knowledge on splinting, while a similar percentage also report having a good knowledge. It is interesting to note the similarities between the therapists' knowledge of splinting and their confidence and skill. This suggests that if their knowledge levels were improved, they may feel better informed and thus have more confidence to try splinting more often with the neurological cases.

5.6.3 Further Training Needs for Therapists Splinting in Neurological Conditions

This study clearly shows the need for further knowledge and training in the South African context for splinting children with neurological impairments. Therapists

working with both adults and children with neurological impairments showed different priorities in terms of their wants and needs for further training in splinting. Chazen (2013: 45) stated that therapists found supervision and mentoring important as well as relying on their own practical experience. A small percentage agreed that mentoring and own practice (10%) would be a good approach to learning.

The therapists in Chazen's (2013:44) study also highlighted the need to ~~keep up~~ keep up to date, which is emphasised by the therapists in this study. As the majority appeared to only have a fair knowledge on splinting and indicated that they would like to learn more, new developments in neurological splinting should be highlighted in courses and undergraduate curriculums.

Although the therapists in Chazen's (2013:45) study were resistant to using current literature to learn more about new trends in splinting, as they found a discrepancy between practical skills and what was being researched, more than half the therapists in this study would use journal articles to improve or gain knowledge for splinting the child with neurological impairment. This is significant to note, as the field of neurological rehabilitation is constantly evolving and it is important for practitioners to stay up to date with new findings as noted above. Moreover, Chazen (2013:42) postulated that undergraduate training often provided the theoretical framework, and thus therapists with less experience chose splints based on their theoretical knowledge. In order to effectively improve practical skills, specific training with theoretical knowledge is needed (Ericsson and Smith, 1991). The study supports this statement, as the majority of therapists would either

make use of a practical one day workshop (57.5%) or practical two or more day course (77.5%) in order to improve their skill and knowledge with regard to splinting for the neurologically impaired child.

As noted in the results, the therapists stated that they had learnt how to splint for neurological conditions through their own initiative, using various self-teaching methods and text books. This is similar to the study conducted by Kilbrade et al (2013:561), which stated that over 40% of therapists learnt through trial and error and suggested that this should encourage more training in this field. This is similar to the current study, as many of the therapists emphasised wanting further knowledge through practical courses or workshops.

5.7 SUMMARY

The lack of scientific evidence on the clinical benefits of splints for paediatric neurological impairments has not appeared to affect therapists when considering the reasons to splint. Although only a minority of therapists from across the country were represented in this study, many continue to splint children with neurological impairments. They were in agreement that splints can be effective for child with neurological impairments, but are unsure whether thermoplastic or soft splints present with more benefits. They also indicated that different types of splints may be more effective for the various neurological conditions.

In accordance with other literature (Khatri et al, 2013:1), therapists are in agreement that splinting, although with subjective benefits, such as maintaining ROM and preventing contractures, should not be used in isolation. The therapists

reported a range of techniques that are used with splinting as an adjunct to therapy. Therapists were able to identify the factors, both client and personal related, that influenced their decision-making when choosing to splint. They also showed an interest in furthering their knowledge and skill with regards to splinting.

CHAPTER 6. CONCLUSION

6.1 INTRODUCTION

The aim of the study was to explore the current splinting practices for the child with neurological impairments amongst occupational therapists in South Africa. A group of therapists from different provinces and settings were surveyed to assist in answering this research question. The following chapter presents the summarised main findings and discussion from the study. The limitations of the study and the recommendations for future research are indicated.

6.2 MAIN STUDY FINDINGS

A quantitative study was undertaken across South Africa to enable the results to be generalised to the population of occupational therapists who work with neurologically impaired children. Due to the small sample of therapists, the descriptive findings must be considered with other studies that have been conducted. The results do however provide a platform to guide therapists in terms of future research that is needed in this area.

A group of therapists with different levels of experience and backgrounds in the field of neurology were surveyed in order to explore their splinting trends. While there is a lack of evidence-based research that details the benefits of neurological splinting, whether for the child or adult, therapists continue to consider splinting as part of their holistic interventions.

Although splinting is occurring, it appears to be on an infrequent basis, with many therapists only prescribing between 1 to 5 splints per month. This may be due to a small number of children with neurological impairments seen per month, but as indicated by the therapists, other techniques also take preference. In terms of splinting, therapists show a preference for both thermoplastic and neoprene, as opposed to other materials, especially in combination for one splint. All the therapists surveyed preferred to splint according to each individual patient using custom-made splints instead of ordering or prescribing prefabricated ones. This reduces the costs to the department or practice, and therapists can attempt to make splints that are better fitting and thus prevent the onset of secondary complications.

Three main splints were identified in terms of prescription frequency and preference: 1) functional resting splint, 2) neoprene thumb abduction splint and 3) anti-spasticity splint. Therapists showed a greater perception of effectiveness for the soft material, which may suggest a growing popularity in the use of soft splints. They appear to take many factors into account before splinting, with each therapist making use of personal experience and theoretical knowledge to make a decision regarding splinting. Scientific proof regarding the benefits of splinting in the child with neurological impairments has still to be established, yet therapists continue to prescribe them to maintain ROM, prevent contractures and reduce spasticity. Splinting for assisting with functional activities does not appear to be of high priority, which is concerning, considering the principles of occupational therapy.

Factors relating to the therapists' own ability were also considered when deciding to splint. These appear linked to the therapists' perception of their knowledge, confidence and skill level regarding splinting, as well as their personal experience in specific cases. Experience is also an important factor and thus allows the choice of splint to be based on previous subjective findings. Although therapists considered their knowledge, confidence and skill regarding splinting to be fair, they also showed a desire to learn through more practical courses.

6.3 LIMITATIONS OF THE STUDY

The study had the following limitations:

- Although 72 participants initially consented to the survey, only 40 completed the entire survey. With this small sample size, it cannot be assumed that the results found reflect the current trends with all therapists.
- The findings cannot be generalised to the population of occupational therapists working with neurologically impaired children, as the sample could not be randomised.
- The study yielded a small sample size due to a poor response rate. Electronic surveys have been noted to have lower response rates due to email addresses having expired or the email being sent to spam (Archer, 2008). The response rate may have also been improved if the survey was open for a longer time period.
- As the study was based on a cross-sectional design, the reasons for choice of specific splints could not be detailed nor could the therapists' personal experience be explored in specific cases.

- The wording for question 11 . %What are your reasons if you choose not to splint the paediatric neurologically impaired hand+, made it more difficult to analyse and discuss. This may have made it difficult to interpret during answering to some therapists, despite feedback from the pilot study.

6.4 SIGNIFICANCE OF THE STUDY

The aim of this study was achieved despite a small sample size and thus describes new knowledge regarding the current splinting trends within South Africa. The findings describe and provide insight into the types of splints that are considered appropriate for children with neurological impairments, as well as insight into the decisions regarding splinting amongst these occupational therapists. As summarised in the main study findings, the four objectives were met, and indicated that therapists do choose to splint despite the controversy that surrounds its use in neurology. Splints that are prevalent in practice have been identified in conjunction with the perceived opinions of what factors influence the decision to splint.

Similarities and differences with other studies were discussed and overall, despite South Africa being a developing country, the types of materials used are very similar. It was also noted that therapists working with adults and children, when compared to therapists in studies exploring only adult neurological splinting, use similar thought processes, and that theoretical knowledge can be transcribed and adjusted when working with different age groups in neurology.

The study has also identified the learning needs of the therapists, especially in terms of what new research is being done, as well as the practical courses that will provide splinting practice under the guidance of mentors. The therapists also showed an interest in learning more, which should encourage other therapists to want to organise courses.

Lastly, despite not describing the benefits of splinting with scientific evidence, it allows other therapists to be enlightened to the splinting preferences of therapists around South Africa. The study provides initial data on how factors may be considered when splinting the child with neurological impairments, and how this may influence practice, and highlighted the need for more evidence-based studies examining the efficacy of splinting.

6.4 RECOMMENDATIONS

The following recommendations are made as a result of this study:

- Experimental studies need to be done using the splints that are preferred by South African therapists. This should include the functional resting splint and thumb abduction splint, as the former has been recognised as being preferable in other countries, and the therapists indicated that soft materials are more effective. The efficacy between thermoplastic and soft splints should also be explored, as a preference for soft splints is also evident.
- One respondent detailed the use of bandages and sponges when splinting. It may also be beneficial to explore the use and efficacy of adapted splinting materials in resource constrained areas.

- Practical splinting workshops need to be conducted to enable therapists to learn and debate the benefits of splinting for children with neurological impairments.
- Future research can explore the use of splints for specific purposes, as this study only examined the therapists' preferred splints in general. It may thus be valuable to follow up these findings with a qualitative component with focus groups in order to gain more data regarding their reasoning behind each splint choice.
- As suggested by Chazen (2013:91), it may be useful for therapists to design checklists to enable them to consider all the factors explored in this study prior to choosing to splint. This may assist therapists to order their thoughts regarding what factors should be considered before splinting.

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APPENDIX 1. Research Questionnaire for Occupational Therapists working in Paediatric Neurology

(*This was transferred into the electronic format on SurveyMonkey)

Section A: Demographic Data

1. After reading the attached informed consent letter, do you hereby consent to participate in this survey?	1) Yes 2) No
2. Are you currently registered with the HPCSA?	1) Yes 2) No
3. Age:	1) 20 – 25 years 2) 26 – 30 years 3) 31 – 40 years 4) 41 – 50 years 5) 51 – 60 years 6) 61 years and older
4. Years of Experience:	1) 1 – 5 years 2) 6 – 10 years 3) 11 – 15 years 4) 16 – 20 years 5) Greater than 20 years
5. Highest Level of Postgraduate Education: <i>Please tick one</i>	1) Degree 2) Postgraduate diploma 3) Masters 4) Doctorate 5) Post-doctorate
6. Additional Qualifications: <i>Please tick all that apply</i>	a) Introduction to the Assessment and Treatment of Cerebral Palsy b) Bobath/Neurodevelopmental Therapy Basic Eight Week Paediatric Course c) Bobath/ Neurodevelopmental Therapy Advanced Paediatric Courses d) Sensory Integration e) Hand Therapy Diploma / Masters f) None of the above g) Other (Specify):
7. Which sector do you spend 60% or more of your	1) Public: Acute Hospital 2) Public: Rehab or Long-term Hospital

practice?	3) Public: Clinic 4) Public: School 5) Private: Acute Hospital 6) Private: Rehab or Long-term Hospital 7) Private: Private practice 8) Private: School 9) NGO / NPO 10) Other (Specify):
8. In which province are you currently working?	1) KwaZulu Natal 2) Eastern Cape 3) Western Cape 4) Northern Cape 5) North West Province 6) Free State 7) Gauteng 8) Limpopo 9) Mpumalanga

Section B: Background on Splinting Experience

9. How long on average have you been working with neurologically impaired children? <i>Please tick one</i>	1) 1 – 2 years 2) 3 – 4 years 3) 5 – 10 years 4) Greater than 10 years
10. What treatment techniques do you use during intervention with a child with neurological impairments? <i>Please tick all that apply</i>	a) Sensory Integration b) Constraint-Induced Movement Therapy c) Neurodevelopmental Techniques d) Mirror-box therapy e) Developmental Techniques f) Other (Specify):
11. What are your reasons if you choose not to splint the paediatric neurologically impaired hand? a) Departmental policy b) No evidence-base c) Decreased confidence d) Preference for other techniques e) No availability of materials	<u>This applies for each question</u> 1) Never 2) Seldom 3) Sometimes 4) Very Often 5) Always

f) Lack of supervision	
g) Other (Specify):	
12. How many children, on average, do you treat with a neuro impairment? <i>Please tick one</i>	1) 0 – 3 2) 4-6 3) 7 – 10 4) Greater than 10
13. How many hand splints for children with neurological impairments do you make per month? <i>Please tick one</i>	1) 0 – 5 2) 6 – 10 3) Greater than 10
14. Where did you learn to splint for children with neurological conditions? <i>Please tick all that apply</i>	a) University (undergraduate) b) University (postgraduate) c) Workshop (1 day) d) Course (2 or more days) e) Self-taught f) Text books g) Mentor h) Other (Specify):

Section C: Types of Splints Being Prescribed

15. What type of material do you use to make splints for children with neurological impairments? <i>Please tick all that apply</i>	a) Thermoplastic b) Neoprene c) Plaster of paris (casting) d) Air splints e) Other (Specify):
16. What type of material do you prefer to use for paediatric neurological conditions? <i>Please tick one</i>	1) Thermoplastic 2) Neoprene 3) Plaster of paris (casting) 4) Air splints 5) Combination of thermoplastic and neoprene 6) Other (Specify):
17. What influences your choice in splinting materials? <i>Please tick all that apply</i>	a) More easily available b) Ease of application c) Better compliance d) Easier to work with e) Greater knowledge on how to work with material

	f) Better cosmetic appeal g) Better results h) Other (Specify):
18. Which type of splint do you use the most often? <i>Please tick one</i>	1) Custom-made 2) Off-the-shelf
19. Types of Splints <i>Please tick all that apply</i>	a) Dynamic: Please specify: b) Functional Resting splint c) Weightbearing splint d) Anti-spasticity splint e) Serpentine splint f) Neoprene thumb abduction splint g) Supination splint h) Casting i) Tenodesis splint j) Other (Specify):
20. If you chose dynamic, please specify	
21. Please state the splint you prescribe the most: <i>Please tick one</i>	1) Dynamic 2) Functional Resting splint 3) Weightbearing splint 4) Anti-spasticity splint 5) Serpentine splint 6) Neoprene thumb abduction splint 7) Supination splint 8) Casting 9) Tenodesis splint 10) Other (Specify):
22. If you chose dynamic, please specify	
23. How would you rate the effectiveness of using a hard splint in neurological impairment is? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 Very effective Effective Uncertain Ineffective Very ineffective	
24. How would you rate the effectiveness of using a soft splint in neurological impairment is? <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 Very effective Effective Uncertain Ineffective Very ineffective	

Section D: Client Factors that Influence Decision-Making

<p>25. Which diagnostic groups do you use soft splints with? <i>Please tick all that apply</i></p>	<p>a) Cerebral Palsy b) Genetic c) Pervasive Developmental Disorder d) Degenerative e) Traumatic Brain Injury f) HIV-Related Conditions g) I do not use</p>		
<p>26. Which diagnostic groups do you use thermoplastic splints with? <i>Please tick all that apply</i></p>	<p>a) Cerebral Palsy b) Genetic c) Pervasive Developmental Disorder d) Degenerative e) Traumatic Brain Injury f) HIV-Related Conditions g) I do not use</p>		
<p>27. Which of the following reasons do you take into consideration for when splinting the paediatric neurologically impaired hand?</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>a) Maintain/improve ROM b) Prevent contracture c) Reduce spasticity d) Assist with functional activities e) Hygiene purposes f) Age of the child g) Compliance of the caregiver h) Other (Specify):</p> </td> <td style="width: 50%; vertical-align: top;"> <p><u>This applies for each question</u></p> <p>1) Never 2) Seldom 3) Sometimes 4) Very Often 5) Always</p> </td> </tr> </table>		<p>a) Maintain/improve ROM b) Prevent contracture c) Reduce spasticity d) Assist with functional activities e) Hygiene purposes f) Age of the child g) Compliance of the caregiver h) Other (Specify):</p>	<p><u>This applies for each question</u></p> <p>1) Never 2) Seldom 3) Sometimes 4) Very Often 5) Always</p>
<p>a) Maintain/improve ROM b) Prevent contracture c) Reduce spasticity d) Assist with functional activities e) Hygiene purposes f) Age of the child g) Compliance of the caregiver h) Other (Specify):</p>	<p><u>This applies for each question</u></p> <p>1) Never 2) Seldom 3) Sometimes 4) Very Often 5) Always</p>		

Section E: Personal Factors that Influence Decision-Making

<p>28. What factors do you take into consideration when needing to make a splint for children with neurological impairments?</p>	
<p>a) Knowledge of the condition b) Experience c) Competency d) Resources Available e) Time g) Other (Specify):</p>	<p><u>This applies for each question</u></p> <p>1) Never 2) Seldom 3) Sometimes 4) Very Often 5) Always</p>

<p>29. How would you describe your confidence level in splinting for neurologically impaired children?</p> <p><input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5</p> <p>Very Poor Poor Neutral / Fair High Very high</p>	
<p>30. How would you describe your skill in splinting for children with neurological impairments?</p> <p><input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5</p> <p>Very Poor Poor Neutral / Fair High Very high</p>	
<p>31. How would you rate your knowledge is with regards to splinting for children with neurological impairments?</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5</p> <p>Very Poor Poor Neutral / Fair High Very high</p>	
<p>32. How would you like to gain greater knowledge about splinting for children with neurological impairments?</p> <p><i>Please tick all that apply</i></p>	<p>a) Journal articles</p> <p>b) Practical Workshop (1 day)</p> <p>c) Practical Course (2 or more days)</p> <p>d) Other (Specify):</p>

APPENDIX 2. FEEDBACK FORM

HSSREC Research office

University of KwaZulu-Natal
Research Office: Ethics, Westville Campus
Govan Mbeki Building
Private Bag X 54001, Durban, 4000
KwaZulu-Natal, SOUTH AFRICA
Tel: [+27312604557](tel:+27312604557) - Fax: [+27312604609](tel:+27312604609)
Email: mohunp@ukzn.ac.za



Feedback Form for Pilot Study Participants

1. Were the questions easy to understand?
Yes No (go to question 3)
2. Which questions were difficult to understand?
3. Was the questionnaire quick and easy to fill out?
4. Would you change anything about the content of the questionnaire?
5. Do you have any other recommendations for improving the questionnaire?

Thank you for accepting to perform in the pilot study.

Lauren Hepworth

Tel: 0832879262

Email: lauren.hepworth89@gmail.com

Supervisors Details:

Gina Rencken

Email: rencken@ukzn.ac.za

Pragashnie Naidoo

Email: naidoo@ukzn.ac.za

Ms Phindile Nene
Postgraduate Officer
School of Health Sciences
Westville Campus
Nenep1@ukzn.ac.za

Unilever Ethics Centre

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: +27 (0)31 260 2222

Facsimile: +27 (0)31 262 2195

Email: public@ukzn.ac.za

Website: www.ukzn.co.za

Founding
Campuses:



Edgewood



Howard
College



Medical School



Pietermaritzburg



Westville

APPENDIX 3. ETHICAL CLEARANCE



09 December 2014

Miss Lauren Hepworth
P.O. Box 358
Hillicrest, 3650
lauren.hepworth89@gmail.com

Dear Miss Hepworth

PROTOCOL: Exploring current trends in splitting children with Neurological Impairments: Degree Purposes (Masters). BREC REF: BE319/14.

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 20 June 2014.

The study was provisionally approved pending appropriate responses to queries raised. Your responses received on 08 December 2014 to queries raised on 03 December 2014 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval.

This approval is valid for one year from 09 December 2014. To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be RATIFIED by a full Committee at its meeting taking place on 10 February 2015.

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

Professor D.R. Wassenaar
Chair: Biomedical Research Ethics Committee

Biomedical Research Ethics Committee

Professor D.R. Wassenaar (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag 354001, Durban 4008

Telephone: +27 (0) 31 266 2488 Fax/WhatsApp: +27 (0) 31 266 4809 Email: brec@ukzn.ac.za

Website: <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>

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APPENDIX 4. INFORMATION SHEET

Discipline of Occupational Therapy

School of Health Sciences

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: 031 260 7821



Information Sheet and Consent to Participate in Research

Date: 11 December 2014

Exploring Current Trends in Splinting the Hand for Children with Neurological Impairments

Dear Colleague

My name is Lauren Hepworth, an Occupational Therapy Masters in Hand Rehabilitation student from UKZN. My email address is lauren.hepworth89@gmail.com

You are being invited to consider participating in a study that involves research exploring the current trends in splinting the paediatric neurologically impaired hand. Surveys will be sent out on a national level to all Occupational Therapists. A link is attached to this email that connects to an online survey site.

The aim and purpose of this research is to explore the types of splints that Occupational Therapists construct for children with neurological impairments within South Africa. The study is expected to enrol about 350 participants. It will involve the answering of questions found on the online survey site. The questions are quick and easy to answer and should take between 20-30 minutes to complete.

I hope that the study will contribute towards the knowledge of splinting trends in South Africa and encourage therapists to explore their decision-making process to a larger degree. It is also hoped that this study will allow for a future experimental research in this field.

This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number BE319/14).

In the event of any problems or concerns/questions you may contact the researcher at lauren.hepworth89@gmail.com or the UKZN Biomedical Research Ethics Committee, contact details as follows:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

Taking part in this study is voluntary and you can refuse or stop taking part at any time. Any questions that make you feel uncomfortable do not need to be answered. If you choose not to participate you will not incur any penalties and can still ask for the results of the study if you are interested.

There will be no compensation or costs involved in the participation of this study. Your privacy and confidentiality will be protected in the following ways:

- **Names or identifying information will not be published in the final report.**
- **Identifying factors will remain confidential due to the anonymity of the online survey.**
- **Data will be stored in a locked safe and will only be accessed by the researcher. This data will be deleted after 5 years.**

Kind Regards



L. M. Hepworth

APPENDIX 5. INFORMED CONSENT

Discipline of Occupational Therapy

School of Health Sciences

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: 031 260 7821



Informed Consent Form

I have been informed about the study entitled Exploring Current Trends in Splinting the Hand for Children with Neurological Impairments by L. M. Hepworth.

I understand the purpose and procedures of the study. (Please note that the questionnaire gives you the opportunity to allow for informed consent).

I have been offered the opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any treatment or care that I would usually be entitled to.

I have been informed about any available compensation or cost that may be involved.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at L. M. Hepworth.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION

**Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000**

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604769 - Fax: 27 31 2604609

Email: BREC@ukzn.ac.za

11 December 2014

Signature

Date