



**THE DEVELOPMENT OF DISABILITY  
CONCEPTS IN CHILDHOOD:  
A DOMAIN-SPECIFIC COGNITION  
PERSPECTIVE**

**Lesley A Smith**

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To my parents



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## Declaration

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I composed this thesis and the work is my own. The publication arising from this thesis is contained in the appendix. The publisher and joint author of this publication have granted permission for its inclusion.

Lesley A Smith

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## Acknowledgements

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## Abstract of Thesis

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This thesis examines the development of children's disability concepts from a domain-specific cognition perspective. Previous research into children's concepts of disability is lacking and has been rarely linked to cognitive developmental theories. One particular set of theories suggest that children represent knowledge in domain-specific ways and that prior to formal education, children evidence three core knowledge domains; a naïve physics, a naïve psychology and a naïve biology, which provide causal-explanatory frameworks for interpreting everyday events (Wellman & Gelman, 1992; Hirschfeld & Gelman, 1994).

Children's disability concepts are employed to explore how children utilise these foundational knowledge domains in their reasoning of complex phenomena. There were two principal objectives. Firstly, to examine the role of core knowledge domains in children's reasoning about disability and how this may change with age. Secondly, to provide a more comprehensive overview of the content, structure and development of children's disability concepts.

Studies 1a and 1b explored which core knowledge domains children use to reason about disability. Using a semi-structured interview schedule, four to five, six to seven, nine to ten and eleven to twelve year-olds ( $N = 77$ ) were asked open-ended questions about the consequences (Study 1a), causes, controllability and chronicity of different disabilities (Study 1b). The results showed that by age seven, children's disability concepts are mainly conceptualised within naïve physics and naïve biology. The use of multiple causal-explanatory frameworks did not emerge until eleven years of age. Older children had significantly more cohesive concepts of disability and were able to differentiate the causes of various disabilities. The results showed an early appreciation of the physical and biological nature of disabilities but highlights methodological limitations of open-ended interview methods.

Study 2 examined four to five, six to seven and ten to eleven year-olds (N = 79) causal conceptions of disability more directly and explored the issue of experience in children's disability concepts. Children with and without classroom contact with peers with disabilities were asked to consider the appropriateness of causes of disability relating to each of the foundational knowledge domains (physical, biological and social/psychological), using a forced-choice response scale. The results showed that children of all ages rate biological and physical explanations as significantly more appropriate causes of disability than social/psychological ones. No significant effects of classroom contact were found. The findings highlight the abstract and implicit nature of young children's causal concepts of disability and suggest that these causal concepts were not influenced significantly by direct social contact.

To investigate the role of the language environment in children's disability concepts, Study 3 examined the effects of labels on four to five, six to seven and ten to eleven year-olds (N = 93) concepts of disability. Children heard about a character with a disability that was either referred to by a general description, diagnostic label or a noun label. Children were then asked about their understanding of the causes, controllability, chronicity and perceived differences of disability. The results found few labelling effects on children's disability concepts. The results suggest that the language environment in the context of labelling have minimal effects in influencing the way disability is conceptualised.

Together, the three studies provide evidence for the early emergence of disability concepts, that may initially be abstract and implicit in nature but which become progressively more explicit, flexible and theoretical with age. Furthermore, social experience and linguistic labels do not exert much influence on children's causal conceptions of disabilities. The educational implications of the results are discussed and potential for future research in this area will be considered. In conclusion, children's disability concepts have been a fruitful area in which to investigate children's domain-specific reasoning.

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## Table of Contents

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Declaration	i
Acknowledgements	ii
Abstract of Thesis	iii-iv
Table of Contents	v-ix
List of Figures	x
List of Tables	xi
<b>Introduction to Thesis</b>	<b>1-6</b>
<b>CHAPTER ONE: Childhood Cognitive Development: An Introduction to the Notion of Domain-Specificity</b>	<b>7-25</b>
1.1 Issues in Cognitive Development	7
1.2 Approaches to Cognitive Development	8
1.2.1 A Domain-General Perspective	8
1.2.2 A Domain-Specific Perspective	11
1.2.3 What is a 'Domain?'	12
1.2.4 Are Domains Theories?	13
1.2.5 Domains and Learning Constraints	16
1.3 Domain-Specific Cognitive Theories	17
1.4 Domain-Specificity and Core Knowledge Domains	20
1.5 Summary and Conclusions	24
<b>CHAPTER TWO: The Development of Core Domains of Thought</b>	<b>26-47</b>
2.1 Domain-Specificity: Core Knowledge Domains	26
2.1.1 Naïve Physics	26
2.1.2 Naïve Psychology	29
2.1.3 Naïve Biology	33
2.2 Children's Simultaneous Physical, Psychological and Biological Reasoning	38

2.3 Children's Concepts of Complex Social Phenomena	40
2.4 Children's Concepts of Disability	44
2.5 Summary and Conclusions	46
<b>CHAPTER THREE: Children's Understanding of Disability</b>	<b>48-65</b>
3.1 Traditional Research on Disability Concepts	48
3.1.1 Children's Awareness of Disability	48
3.1.2 Children's Attitudes Towards Disability	49
3.2 Previous Research on Children's Understanding of Disability	51
3.2.1 Children's Causal Concepts of Disability	52
3.2.2 Children's Understanding of the Controllability and Chronicity of Disability	59
3.2.3 Children's Understanding of the Consequences of Disability	61
3.3 Taking a Domain-Specific Approach to Children's Disability Concepts	63
3.4 Summary and Conclusions	65
<b>CHAPTER FOUR: An Exploratory Study into Children's     Conceptions of Disability.     Study 1a: Understanding the Consequences     of Disability</b>	<b>66-80</b>
4.1 Children's Concepts of the Consequences of Disability	66
4.1.1 Study 1a	67
4.2 Method	68
4.2.1 Ethical Issues	68
4.2.2 Participants	69
4.2.3 Materials	69
4.2.4 Procedure	71
4.3 Results	71
4.3.1 Disability Differences	72
4.3.2 Age Differences	72
4.3.3 Summary of Key Findings	77
4.4 Discussion	78
4.4.1 Disability Differences in Consequence Understanding	78

4.4.2 Age Differences in Consequence Understanding	79
4.5 Summary and Conclusions	80
<b>CHAPTER FIVE: Study 1b: Children's Conceptions of the Causes, Controllability and Chronicity of Disability</b>	<b>81-104</b>
5.1 Children's Concepts of Disability and Domain-Specific Cognition	81
5.1.1 Study 1b	83
5.2 Method	83
5.2.1 Participants	83
5.2.2 Materials	83
5.2.3 Procedure	83
5.2.4 Coding	84
5.3. Results	86
5.3.1 Causal Explanations of Disability	86
5.3.2. Causal Explanations and Disability Type as a Function of Age	88
5.3.3 Individual Response Patterns for Causal Explanations	90
5.3.4 Multiple Causal Explanations	91
5.3.5 Perceived Controllability and Chronicity of Disability	93
5.3.6 Disability Differences in Judgements of Controllability and Chronicity	94
5.3.7 Conceptual Coherence in Children's Disability Concepts	96
5.4 Discussion	98
5.4.1 Causal Explanations	98
5.4.2 Controllability and Chronicity	100
5.4.3 Theory-like Understanding of Disability	101
5.4.4 Methodological Note	102
5.5 Summary and Conclusions	104
<b>CHAPTER SIX: Study 2: Children's Causal Conceptions of Disability</b>	<b>105-124</b>
6.1 Children's Understanding of the Causes of Disability	105
6.1.1 Study 2	107
6.2 Method	108
6.2.1 Participants	108
6.2.2 Materials	108
6.2.3 Procedure	109
6.3 Results	110
6.3.1 Age Differences	111
6.3.2 Disability Differences	115

6.4 Discussion	119
6.4.1 Children's Preferences for Causal Explanations of Disability	119
6.4.2 Causal Potency	120
6.4.3 Tailoring of Causes to Disabilities	121
6.4.4 The Effect of Classroom Contact	122
6.5 Summary and Conclusions	123

**CHAPTER SEVEN: Study 3: The Effects of Labels on Children's Conceptions of Disability** **125-142**

7.1 Language and Disability	125
7.2 Language and Conceptual Development	126
7.3 Language and Core Knowledge Domains	128
7.3.1 Study 3	129
7.4 Method	129
7.4.1 Participants	129
7.4.2 Materials	130
7.4.3 Procedure	132
7.5 Results	133
7.5.1 Causal Ratings	133
7.5.2 Disability Differences in Causal Ratings	134
7.5.3 Controllability, Chronicity and Perceived Differences	136
7.6 Discussion	139
7.6.1 Lack of Labelling Effects	139
7.6.2 The Replication of Key Findings from Studies 1b and 2	141
7.7 Summary and Conclusions	141

**CHAPTER EIGHT: General Discussion and Conclusions** **143-163**

8.1 Summary of Empirical Findings	143
8.2 Children's Causal Concepts of Disability: Content and Development	146
8.3 The Structure of Children's Disability Concepts	151
8.4 The Origins and Acquisition of Disability Concepts	154
8.5 Educational Implications	158
8.6 Limitations and Implications for Future Research	160
8.7 Concluding Comments	162



Appendices

- I Local Educational Authority Research Permission Letter  
Sample Copy of Parental Consent Form
- II Study 1a/1b Vignettes
- III Study 1a: Pictorial Stimuli
- IV Study 2 Vignettes  
“Thumbs” Pictorial Stimuli
- V Paper 1: Smith, L.A., & Williams, J.M. (2001). Children’s understanding of the physical, cognitive and social consequences of impairments. *Child: Care, Health and Development*, 27, 603-617

## List of Figures

Figure 5.1 Percentage of causal explanations across all disability types

87

## List of Tables

Table 4.1 Participant information	69
Table 4.2 Adapted pictorial scale of perceived competence and social acceptance for young children	70
Table 4.3 Mean difference in competency ratings for different disabilities across all age groups	73
Table 4.4 Age differences in mean competency ratings for different disabilities	74
Table 4.5 Age differences in children's ratings of physical, cognitive and social consequences for each disability	75
Table 4.6 Differences in children's competency ratings for each disability for 4-5 , 6-7, 9-10 and 11-12 year-olds	76
Table 5.1 Categories and examples of children's causal explanations	85
Table 5.2 Categories and examples of children's controllability and chronicity explanations	86
Table 5.3 Number (percentages) of causal explanations as a function of disability type for each age and overall	89
Table 5.4 Number (percentages) of children showing different response patterns by age	91
Table 5.5 Number and mode of multiple causal explanations given by each age group	92
Table 5.6 Percentage of uncontrollability and chronicity judgements	93
Table 5.7 Number (percentages) of children who think the character can change his/her disability	95
Table 5.8 Number (percentages) of children who stated the character would not have his/her disability when an adult	95
Table 5.9 Number of coherent scores for each disability and each group	97
Table 6.1 Causal explanations	110
Table 6.2 Mean causal ratings for each age group and overall	112
Table 6.3 Mean differences in causal ratings within each age group	113
Table 6.4 Mean causal ratings for each disability	116
Table 6.5 Disability differences in mean causal ratings	118
Table 7.1 Participant information	130
Table 7.2 Five item sets	131
Table 7.3 Causal explanations	132

Table 7.4 Mean causal ratings as a function of age and labelling condition	133
Table 7.5 Mean causal ratings as a function of disability and labelling condition	135
Table 7.6 Number of uncontrollable, chronic and perceived differences judgements for each age group and labelling condition	136
Table 7.7 Number of uncontrollable, chronic and perceived differences Judgements for each disability and labelling condition	138

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## Introduction to Thesis

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This thesis examines the development of children's disability concepts from a domain-specific cognition perspective. There is a distinct lack of research into how children conceptualise disabilities in relation to current cognitive developmental theories. One particular domain-specific theory suggests that prior to formal education, children acquire three core domains of knowledge; a naïve physics, a naïve psychology and a naïve biology (Hirshfeld & Gelman, 1994; Wellman & Gelman, 1992). To date, much of the earlier research has examined only children's concepts that fall neatly into one foundational knowledge domain without considering the plethora of concepts that are less easily categorised. Consequently, children's disability concepts have been employed to explore how children use their core knowledge domains in their concepts of complex phenomena. This thesis has two principal aims.

The first aim of this thesis is to investigate the content, development and structure of children's disability concepts from a domain-specific cognition perspective. This thesis will examine the role of naïve physical, psychological and biological knowledge in children's understanding of disability, which will be an original contribution to traditional research on children's concepts of disability. It will explore factors that may influence the development of children's disability concepts: specifically, the effects of direct classroom contact with disabled peers and the language environment. Furthermore, this thesis will examine whether children's disability concepts are structured in terms of intuitive theories.

The second and more general aim of this thesis is to provide a much more comprehensive overview of children's disability concepts. Previous research on disability concepts in childhood often included only one or a small number of disabilities and have examined a limited age range of children (Diamond, 1993, 1994; Goodman, 1989; Sigelman & Begley, 1987; Lewis, 1993). This makes it difficult to chart the development of disability concepts both on the basis of age and on the basis of specific disability types. This thesis will include a broad spectrum of disabilities and a

wide age range of children with the aim of contributing a more detailed account of how children's understanding of disability develops.

The concept of disability, for adults at least, is a complex one. Adult concepts of disability, particularly in the sociological literature, have led to two main ideologies of disability: the biological and social-constructionist positions (Hedlund, 2000). In this realm, a biological understanding of disability refers to a biomedical deficit of body or mind. The social constructionist position refers to certain social conditions that 'construct' or define a disability for a person. There has been a plethora of debate about the definitions of disability, with impairment, disability and handicap, being used as distinct but related terms (Thomas, 1982). However, research on childhood disability concepts is not only sparse but has adopted a different focus. Here, investigators are interested in children's ideas about the *causes* of disability, the *controllability* and *chronicity* of disability and the specific *consequences* that the disability may have for the individual. Note here that in contrast to adult concepts, the terms 'impairment' and 'disability' are used interchangeably, as will be the case in this thesis.

The general consensus of previous work on children's disability concepts is that ideas about disability are early emerging (Diamond, 1993; 1994). Prior to any formal education, children have by four years of age some ideas as to the causes, controllability, chronicity and consequences of disabilities (Diamond, 1993; 1994; Goodman, 1989; Sigelman & Begley, 1987). This previous research has been largely motivated by discussions about the potential benefits of educational inclusion and the development of disability concepts in childhood has rarely been linked to broader theories of cognitive development. To date, only a handful of researchers have applied a cognitive developmental framework to children's disability concepts, such as the Piagetian-stage model (Diamond, 1993; Lewis, 1995; Glasberg, 2000). However, newer approaches to cognitive development may be able to offer further insights into children's reasoning about disability. The domain-specific approach to cognitive development may have considerable potential for understanding children's disability concepts as acknowledged by Lewis (2002), yet there is currently no published research on this issue.

In the past few years, much research has indicated that cognition is domain-specific (Hirschfeld & Gelman, 1994; Chomsky, 1988; Wellman & Gelman, 1992). That is, many cognitive abilities are specialised to handle specific types of information (Goswami, 1998). One particular domain-specific theory suggests that prior to formal education, children acquire core domains of naïve *physical* knowledge, *psychological* knowledge and possibly a rudimentary form of *biological* knowledge. These core domains of thought encompass most phenomena in the external world, constitute naïve understandings since they are acquired without formal instruction and are considered by many to constitute intuitive *theories* (Gopnik & Wellman, 1994; Carey, 1995). Only recently however have researchers begun to examine how children might co-ordinate these core reasoning systems when thinking about complex concepts, such as race and gender, which are not neatly conceptualised within the one domain (Taylor, 1996; Hirschfeld, 1995). Despite these advances, there continues to be a lack of research into children's concepts of complex social phenomena. Disability may be one example of an especially useful phenomenon in which to investigate the role of children's core knowledge domains. This thesis attempts to understand disability within a domain-specific cognitive framework and to contribute to existing knowledge on children's disability concepts. This thesis is divided into eight chapters and consists of three literature review chapters, four empirical chapters and a final general discussion chapter. The remainder of this introduction gives a brief overview of these forthcoming chapters.

Chapter 1 introduces and contrasts two fairly distinct approaches to cognition in childhood. Firstly, traditional domain-general perspectives of cognitive development are discussed which for many years have dominated research in this area. In particular, Piaget's theory of cognitive development and information processing views of cognition are described. Domain-general accounts of cognitive development however have become increasingly problematic. Consequently, this chapter outlines alternative and contemporary domain-specific approaches to cognition. In relation to domain-specificity, this chapter considers definitions of a domain of knowledge, the structure of domains as theories and the possibility of constraints on the acquisition of domain-specific knowledge. It will discuss recent research on one particular domain-specific theory of cognitive development: the core knowledge domain view. The aim of

Chapter 1 is to provide a detailed account of domain-specificity and the core knowledge domains theory, which is the central premise of this thesis.

Chapter 2 is the second of the literature review chapters and describes in detail the content and development of children's core knowledge domains. Children's naïve physical knowledge, psychological knowledge and biological knowledge will be described. In particular, debates about the onset and development of naïve biological knowledge will be discussed. Since disability has been chosen as an example of a less easily, categorised phenomena, recent attempts at investigating children's thinking across all three knowledge domains will be examined. Furthermore, this chapter will also describe previous research on children's concepts of complex social phenomenon; namely children's gender and racial concepts. Chapter 2 concludes by suggesting disability is a potentially fruitful candidate for domain-specific research.

The final literature review is outlined in Chapter 3 and presents previous research on children's disability concepts. Several key aspects of children's disability concepts are highlighted including earlier studies on children's causal understanding of disability, children's understanding of the controllability and chronicity of disability and finally children's conceptions of the consequences of disability. Although these studies are valuable given their contribution to our knowledge about children's disability concepts, they are somewhat limited in scope due to their focus on one particular disability or age range. This chapter concludes by taking a domain-specific perspective on children's disability concepts and highlighting the unique contribution that this paradigm could make to our understanding of disability concepts in childhood.

The first empirical study of this thesis is an initial exploratory investigation into the content of children's disability concepts and is separated into two parts. Study 1a investigates children's understanding of the consequences of disability and is described in Chapter 4. Study 1b, described in Chapter 5, examines children's conceptions of the causes, controllability and chronicity of disability from a domain-specific perspective. Children in four different age groups heard eight vignettes describing a character with a disability. In Study 1a, children were asked to rate how competent each character was on a variety of different tasks, in order to assess their consequence understanding. In Study 1b, the same participants were interviewed to learn their ideas about the



causes, controllability and chronicity of disability. The aims of this study were twofold: to examine the conceptual underpinnings of children's disability concepts and to enable a more in-depth examination of the development of disability concepts by adopting a developmental perspective and incorporating a variety of disabilities.

Study 2 follows up Study 1b's findings by examining in more detail children's causal conceptions of disability. Study 2 also investigates the role of social experience with disabilities in shaping these concepts by including children who have classroom contact with a disabled peer. Using a fixed-choice response format, children in three different age groups were asked to rate the appropriateness of causes of disabilities relating to each of the core knowledge domains. The aims of Study 2 were to ascertain whether young children show a bias towards preferring some causes of disability over others and to specifically examine their judgements about the appropriateness of biological causes of disability, given the naïve biology debate.

The findings from Study 2, reported in Chapter 6, signalled a need to identify other possible environmental influences on children's disability concepts. The aim of the final empirical study was to investigate the role of language on children's disability concepts. Using a similar methodology to Gelman & Heyman (1999), children in three different age groups heard a short description of a disabled child and were assigned to one of three conditions; noun label condition, diagnostic label condition and description condition. They are then asked questions about the cause, chronicity, controllability and perceived differences of the described child. It was hoped that Study 3 would demonstrate the effects of disability labels on children's conceptions of disability.

The final chapter of this thesis (Chapter 8) discusses children's disability concepts in relation to the domain-specific literature. An overview of the main empirical results is provided. These findings are then discussed with reference to the content, structure and development of children's disability concepts. The content of children's causal concepts of disability is discussed especially in relation to naïve biology. The structure of children's disability concepts is also considered with reference to the theoretical status of children's knowledge. Several suggestions are then made as to the origins and acquisition of disability concepts in childhood, including the role of cognitive constraints, social experiences and the linguistic environment. Some limitations and

implications for future research in this area are also considered. This chapter concludes by addressing the educational implications of these findings and suggests that the domain-specific cognitive perspective has been a worthwhile paradigm in which to investigate children's disability concepts.

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# CHAPTER 1

## Childhood Cognitive Development: An Introduction to the Notion of Domain-Specificity

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This chapter will provide a comprehensive account of both traditional domain-general perspectives of cognitive development and more recent domain-specific approaches to cognition. The themes to be addressed in this chapter are the definitions of a domain of knowledge, the structure of domains as theories and the role of constraints in the acquisition of domain-specific knowledge. Three domain-specific theories will then be discussed with particular reference to the core knowledge domain view, which is the central premise of this thesis. This chapter will begin with a brief examination of three key issues in cognitive developmental research. These issues will be specifically addressed throughout this thesis in relation to children's disability concepts.

### 1.1 Issues in Cognitive Development

The study of cognition in childhood has traditionally focused around three major issues (Lee, 2000). Firstly, cognitive developmentalists study the *process* by which knowledge is acquired. As knowledge acquisition involves complex mechanisms, researchers tend to focus on specific cognitive processes such as language, memory or perception. The majority of research has been devoted to understanding how these cognitive processes change with age. The second major issue in the study of cognitive development is the *content* of children's knowledge at various ages. This deals with what is known by children about the physical and social world around them. Developmentalists are selective in their choice of research topics when it comes to ascertaining the content of children's knowledge. Thus, many studies have examined how children learn basic principles of physics (Spelke, 1991), how they understand their psychological world (Leslie, 1994) and how they construe complex social phenomena (Taylor, 1996; Hirschfeld, 1995). The third area of interest in cognitive developmental research concerns the *structure* of children's knowledge. This addresses how knowledge is represented in children and how this representation changes with age. This research

has led to much debate about the way knowledge is structured and as a result, a wide range of competing developmental theories exists in this area (Piaget, 1952; Case, 1985; Kail, 1991; Carey, 1985; Karmiloff-Smith, 1992).

Historically, domain-general approaches to cognitive development have dominated the field with progress in cognition being characterised by advances in general stages or rules of thought. For example, information-processing approaches to cognitive development tend to assume cognition is domain-general (Karmiloff-Smith, 1992). A variety of different research findings makes a domain-general account of cognitive development problematic however, and more recently domain-specific approaches to cognition have been proposed as the best way to characterise the structure of children's knowledge. Not only do domain-general and domain-specific accounts presume different cognitive structures, but they also make differing assumptions about the acquisition and content of cognition in children. The following section will outline more fully, domain-general perspectives on cognitive development.

## **1.2 Approaches to Cognitive Development**

### ***1.2.1 A Domain-General Perspective***

Traditionally, the domain-general approach dominated cognitive development (Piaget, 1929; Bruner, 1973; Case, 1985). According to this pre-dominant view, human beings are endowed with a general set of cognitive reasoning abilities that are brought to bear on a wide range of tasks. Thus, a common set of cognitive structures and processes apply to all areas of thought including learning languages, solving mathematical puzzles and the categorisation of living kinds. As such cognitive structures were thought to be domain-general. The appeal of such domain-general approaches to cognition has been their ability to account for a wide range of developmental features with relatively few principles (Hirschfeld & Gelman, 1994).

The most detailed domain-general theory of cognitive development has been the work of Jean Piaget. As documented, Piaget was an epistemologist, interested in the nature of human knowledge and how it changes over time (Piaget, 1952). For Piaget, human intelligence is neither a general mental strength or power, nor the operation of specific cognitive processes. Rather it is the process of adaptation, through assimilation, accommodation and equilibration that characterises mental life. Thus, intelligence

arises neither from the 'inside' or the 'outside' but from external actions on physical objects and other human agents (Richardson, 1998).

The most widely discussed and critiqued aspect of Piaget's theory has been his description of general stages of thought. Piaget observed that children's understanding of the world appeared to develop in a series of stages. Progress through each stage occurs slowly and at any one age, the child has a particular general view of the world as determined by that stage. Each level of thought was described as fitting together into a succession of coherent and qualitatively different stages, the major ones being sensorimotor, pre-operational, concrete-operational and formal operational stages. According to Piaget, each stage of thought is applicable to virtually any area of knowledge and in this sense, cognitive structures are content-independent and domain-general. The structure of each stage is such that thought is consistent in its level across different content areas and this consistency is to be especially expected when concrete, and later formal operations, are fully developed (Meadows, 1993). Thus, a child's performance on a test of conservation in the concrete operational stage predicts performance on other tests of concrete operations. The Piagetian-stage model has been extremely influential and has been applied to several areas of conceptual development, including children's illness concepts (Bibace & Walsh, 1979) and more recently disability concepts (Diamond, 1993).

However, research on Piagetian tasks such as conservation and classification seems to show that children "work out concepts in separate domains without using the same kind of integrative structures that would be required by a general stage theory" (Gelman & Baillargeon, 1983, p.214). That is, children are not very consistent in their level or stage of performance across tasks (Flavell, 1982). This lack of consistency across tasks is not a trivial matter. It questions the whole concept of 'stages' or 'sequences' in cognitive development. As Flavell (1982, p.17) once noted, "human cognitive growth is generally not very stage-like". This raises the possibility that cognitive development is not domain-general but domain-specific in its representations. Consequently, if a domain-specific view of cognitive development is adopted instead of a Piagetian framework, this may result in a different perspective on children's conceptual development.

Despite many contrasts with Piagetian theory, information processing views of development also suggest cognition is characterised by general cognitive processes. Researchers using the information-processing approach describe cognitive development as largely a matter of handling information in order to solve problems (Meadows, 1993). The focus is on how mental processes select, represent, store and retrieve information and how this changes during learning and development. For example, Case (1985) postulates innate capabilities for setting goals, formulating strategies to meet these goals and integrating more complex strategies together. However, the main maturational constraint in cognitive development is the size of short-term storage space which a child has available for information processing. Case (1985) proposes that the capacity of short-term storage space increases with development coupled with greater processing efficiency. These developmental changes are proposed to influence many areas of cognition and are therefore domain-general and universal.

A similar information-processing theory has been proposed by Kail & Bisanz (1982). Here, development is characterised by an increasing number of rules and processes that are 'sufficient' in that they allow more proficient problem-solving. For example, young children often have only one strategy when solving problems which operates over a limited range of situations. However, older children develop more complex and conditional rules that leads to greater success. Furthermore, Kail & Bisanz (1982) suggest that development shifts towards more efficient information-processing using more powerful and automatic procedures. This account therefore also proposes domain-general changes in cognition since a general improvement in capacity is held across all domains of knowledge.

However, in the past two decades, a domain-general view of information processing accounts of cognitive development has become problematic. Many conceptual abilities appear to be specialised for particular types of content. For example, in a seminal study, Chi (1978) found that memory skills or capacities were determined by specific content and not by developmental age. Children who were chess experts outperformed adults who were chess novices on memory for chess board positions. This was not the result of overall better memory in children as adults had greater success on standard memory tasks. Memory was not developing in a domain-neutral fashion but was tied



to a particular content area. Moreover, there seems to be a degree of universality in the types of knowledge that children acquire about the world. For example, Berlin (1978) found cross-cultural uniformity in a content area that has been assumed to vary widely: folk biological classification. In spite of significant variation in the types of plants and animals that different cultures encounter, there is a striking consistency in the way humans everywhere classify the world of living things. Atran (1990) suggests that this must be understood in terms of a domain-specific device for categorising the biological world. At the very least, these findings pose problems for domain-general approaches to cognition.

### ***1.2.2 A Domain-Specific Perspective***

In the last few decades there have been marked changes in cognitive development research. In particular, maintaining a domain-general approach to cognitive development has become increasingly difficult as a large number of researchers have concluded that many cognitive abilities are specialised to handle specific types of information (e.g., language, number, physical phenomena). That is, much of human cognition appears to be domain-specific (Hirschfeld & Gelman, 1994). Cognitive abilities are domain-specific to the extent that the mode of reasoning, structure of knowledge and mechanisms for acquiring knowledge differ in important ways across distinct content areas. For example, many researchers now conclude that the ways in which language is acquired and represented are distinct from other cognitive skills (Chomsky, 1988). Other candidate domains include, but are not limited to, naïve physics (Carey & Spelke, 1994; Leslie, 1994), psychology (Gopnik & Wellman, 1994; Wellman, 1990), biology (Keil, 1992; 1999; Hatano & Inagaki, 1994) and number (Gallistel, 1990). A domain-specific approach to cognitive development however still retains some components of domain-generality. For example, the mechanisms of conceptual change may occur in a similar fashion across domains of knowledge (Karmiloff-Smith, 1992). Yet, the differences between these two major approaches have important implications for how we view cognitive development in childhood. Much domain-specific research has led to revised estimates of cognitive competence among young children in comparison to previous estimates by more domain-general approaches (Flavell, 2000).

### **1.2.3 What is a 'Domain'?**

Although a domain-specific approach has now been embraced by many researchers, the term 'domain' has been used in several separable senses (Wellman & Gelman, 1992; Hirschfeld & Gelman, 1994). Firstly, it has been used to indicate an innately given modular ability. Fodor (1983) suggests that knowledge of the world is represented in distinct modules. Likewise, Sperber (1994) suggests there are three cognitive modules (i.e., a meta-representational module, a physical object module and a folk biology module) which are evolutionarily adapted and thus innately specified. Here, a domain is the extension of a cognitive module; it is the entities in the world that have been selected by evolution to trigger the module. In particular, Atran (1990) suggests folk biology is a core cognitive module with living kinds as its domain. Like Sperber, Atran considers representations of core domains to be innately determined. Secondly and alternatively, the term 'domain' has been applied to areas of knowledge that have special properties due to prolonged and intense experience (Chi, 1978; Chase & Simon, 1973). The notion of expert skill domains makes no appeal to innate modular structures or evolutionary forces. A third view held by a range of domain-specific cognitive researchers is that a domain is 'foundational' or 'core' knowledge. Accordingly, a domain is "a body of knowledge that identifies and interprets a class of phenomena assumed to share certain properties and to be of a distinct and general type" (Hirschfeld & Gelman, 1994, p.21). In this instance, it is important not to confuse 'domain' with 'module', since knowledge can be represented domain-specifically without being modular (Karmiloff-Smith, 1992).

In relation to the core knowledge view, Hirschfeld & Gelman (1994) have argued that a domain of knowledge has two components. Firstly, domains are ontological guides that partition the world. That is, domains function conceptually to identify phenomena as belonging to a particular domain even when these phenomena can be categorised in several different ways. This is not to imply that there is one correct way to partition the world. Indeed there are several ways one could usefully organise a group of things. For example, living kinds can be classified in a number of different ways ranging from feeding habits to sleeping patterns or predators and prey. However, there do appear to be domains that virtually every child masters: number, physical objects, biology and psychology (Keil, 1999). Such domains are universal across individuals and cultures. As noted earlier, despite the significant variation in the kinds of living things different



cultures encounter, there is a striking consistency in the way different cultures categorise living kinds (Berlin, 1992). Therefore, in this sense, domains refer to areas of knowledge where there is a depth and interconnectedness between its concepts.

The second central component of a core 'domain' is to function as a causal-explanatory framework for interpreting everyday events (Hickling & Wellman, 2001). The explanatory framework goes beyond the original phenomena and integrates diverse aspects of the world. For example if asked, "why did this balloon expand when placed in the sun?" statements such as "I saw it get bigger" or "I like balloons" do not constitute causal explanations because they do not place the phenomenon in some larger conceptual framework. However, statements such as "it contains gas and gases expand when heated" do, do so because this explanation follows from the framework in a causal manner (Brewer, Chinn & Samarapungaven, 2000). Furthermore, each domain of thought has its own unique causal-explanatory framework. For example, an understanding of why John went to the shops is grounded in psychological-intentional causal thinking whilst knowledge of why germs cause illness is grounded in a biological-functional framework. Thus, the type of causal explanations that children employ will depend on the larger domain of understanding they invoke to a particular phenomenon. In this sense, investigating children's *causal* explanations of a phenomenon, for example disability, is especially important since it will reveal which domains of knowledge children find useful in their conceptions of that phenomenon.

#### **1.2.4 Are Domains Theories?**

Many researchers have argued that domain-specific knowledge is theory-like (Gopnik & Wellman, 1994; Carey, 1995). That is, everyday knowledge is thought to be structured as an intuitive theory. An 'intuitive theory' is defined as a cognitive structure that embodies a person's ontological commitments (i.e. specifies what kinds of things there are in the world) and provides a mode of explanation for the phenomena within a particular domain (Carey, 1995). The definition of an 'intuitive theory' is very similar to the characterisation of 'domains' as discussed by Hirschfeld & Gelman (1994). Indeed, the notion of domains as 'theories' is related to assumptions about what constitutes a domain. Central to an intuitive theory is the causal mechanisms that it employs in its explanation. For a child to possess an intuitive theory, the child must be able to distinguish entities within the domain of the theory

from those outside the relevant domain and appeal to theory-like causal mechanisms when explaining entities in the domain (Carey, 1995). Moreover, a hallmark of an intuitive theory is conceptual coherence. The concepts that make-up the theory are mutually inter-dependent and defined in relation to each other (Murphy & Medin, 1985; Wellman, 1990). This notion of theories and conceptual coherence can also be applied to disability. Disability is a complex concept and children's understanding of disability comprises several different areas of knowledge including causal concepts, judgements about controllability and chronicity and understanding the consequences of disability. It would be interesting to examine whether these different areas of knowledge are coherent among children in their concepts of disability. The theoretical status of children's disability concepts will be examined empirically in Chapter 5.

Wellman (1990) makes an important distinction between framework theories and specific scientific theories. Framework theories outline the ontology and causal devices for their specific theories and thereby define a coherent form of reasoning about particular phenomena (Wellman & Gelman, 1992). Thus, framework theories define domains. For example, intuitive knowledge of physical causality is an example of a framework theory and understanding object forces is the specific theory (Wellman & Gelman, 1992). The notion of domain in this view, is a set of phenomena involving the entities recognised by the theory. In contrast, scientific theories are often formalised and are the result of schooling (Carey, 1995). Similarly, Karmiloff-Smith (1992) retains the term domain to cover broad areas such as language, physics and maths whilst micro-domains refer to subsets of the domain. In a highly influential review, Wellman & Gelman (1992) propose that three intuitive framework theories are evident in childhood; naïve physics, naïve psychology and naïve biology. Instinctively, these seem to be the three major sorts of understanding that encompass most of the external world. Other examples of specific intuitive theories in the literature include the ten-year-olds theory of matter (Carey, 1991), high school students intuitive mechanics (McCloskey, 1983) and an intuitive cosmology in early school years (Vosniadou & Brewer, 1992). In each case, attribution of an intuitive theory to the child requires that the child distinguish between entities within and outside the domain and must appeal to theory-specific causal mechanisms.

The idea that children have intuitive theories that enable them to engage in explanations of the world around them underlies much contemporary research in cognitive development. However, the notion that children's domain-specific knowledge is theoretical, remains controversial. Keil (1999) has argued that this attribution of theories to young children is "well justified and clearly groundless" (p. 285). For example, infants seems to possess a naïve theory of mechanics which allows them to differentiate their physical and social worlds (Spelke, 1991). However, children are often surprisingly ignorant of many specific and critical details of how things work in a given domain. Children may not have intuitive theories in the sense of knowing detailed mechanisms but it is equally unlikely children proceed from no theory to full scientific theory in a single leap (Keil, 1999). Accordingly, Keil (1999) proposes an intermediate level of theoretical knowledge that helps organise children's expectations about different phenomena. In a similar suggestion to Wellman & Gelman's (1992) framework theories, Keil & Lockhart (1999) suggest children have framework modes of construal that tell them what properties are likely to be causally important in a domain and what causal relations are involved. This allows children some theoretical explanatory insight into a domain of knowledge with only some fragmentary sense of specific mechanisms.

In contrast, Atran (1994, 1998), for example, argues that it is fundamentally misleading to construe cognitive domains as theories. From his anthropological vantage, the notion that conceptions of the natural world develop like scientific theories, seems a curious belief (Atran, 1994). He argues that scientific thought is a specialised activity and one therefore that is hardly required for an understanding of a rich and varied everyday world. For example, Atran (1998) argues that folkbiology constitutes a core domain that need never become theoretical in any meaningful sense. Indeed, this is related to the broader modularity approach in which cognitive modules have domain-specific status whilst not necessarily being theoretical (Carey & Spelke, 1994). Whichever aspects of the world children have theories about, an exact characterisation of these theories is required. For example, how many theories are there, how does an earlier version of a theory change as children get older and are theories universal across cultures and history?

### **1.2.5 Domains and Learning Constraints**

Most contemporary cognitive developmental researchers agree that young children could not arrive at the wealth of the knowledge they do without some prior cognitive constraints on learning (Keil, 1981; Gelman, 1990; Karmiloff-Smith, 1992; Hirschfeld & Gelman, 1994; Inagaki & Hatano, 2002). The notion of constraints for learning and development is not well articulated in current theories of cognitive development. Empirically, there have been very few studies that examine how constraints operate in conceptual development (Inagaki & Hatano, 2002). Therefore, based on previous domain-specific research, a prudent characterisation of constraints must be made.

Cognitive constraints operate by controlling or directing attention and by restricting in advance a large number of logically possible interpretations (Inagaki & Hatano, 2002). A unique set of constraints in each domain draws attention to the relevant aspects of the target phenomena, to enable young children to distinguish those that should be interpreted within the domain from those that should not. The constraints on domain-specific knowledge are thought to be acquired early because of the ease and uniformity that children have in acquiring core domains of knowledge. Early cognitive constraints often take the form of biases or preferences that explain children's early and differentiated understandings of important aspects of their everyday world. Karmiloff-Smith (1992) argues that human cognition involves attention biases or pre-dispositions towards particular inputs. Wilson & Keil (2000) suggest that children have constraints on what counts as an appropriate explanation in a domain without having any specific mechanisms in mind. This would account for the acquisition of rather complex conceptual knowledge in childhood and may even operate in the origins and acquisition of children's disability concepts. This issue will be returned to in the general discussion of this thesis (Chapter 8).

The notion of cognitive constraints in the acquisition of domain-specific knowledge does not rule out the possible influence of socio-cultural constraints. Even Karmiloff-Smith (1992) who argues for some innate pre-dispositions in human cognition also acknowledges that many of these pre-dispositions are merely biases that are more directly influenced by the environment. Indeed, Inagaki & Hatano (2002) argue that socio-cultural factors influence conceptual development because children need social experiences and contexts in which to build naïve theories. Consequently, social

contexts can produce variations in children's conceptual knowledge and therefore act as a form of constraint on this knowledge. They emphasise the dual role of both cognitive and socio-cultural constraints in the acquisition of domain-specific knowledge.

The following section introduces and summarises three domain-specific cognitive theories which are reflected in definitions of domains discussed previously; the modularity approach, domain-specificity and expertise, and core knowledge domains (see Hirschfeld & Gelman, 1994).

### **1.3 Domain-Specific Cognitive Theories**

Domain-specificity is not a single unified theory of the mind (Gelman, 1999). There are at least three distinct approaches to cognition that assume domain-specificity; modularity, expertise and core knowledge domains. While these approaches are dissatisfied with traditional domain-general views of cognition, each approach, as noted earlier, has distinctive claims about domains. Many discussions centre around where domains come from, how many there are, what are the prototypic examples, how they are structured, whether they are theory-like and whether they undergo conceptual change. A discussion of domain-specific theories will begin with the modularity approach.

The most extreme domain-specific approach is modularity theory. According to the modularity approach, the mind consists of 'separate systems' (e.g., the language faculty, visual system) with each containing unique properties (Fodor, 1983). Proposals regarding modularity have varied in at least two respects: whether modularity is restricted to perceptual processes or affects cognitive processes as well and whether modularity is innate or constructed. However, most modular theorists postulate innate constraints and rules on the architecture of the mind and all assume domain-specificity (Karmiloff-Smith, 1992).

Fodor (1983) has put forward an influential account of modular organisation. In *Modularity of Mind*, Fodor discusses the implications of modularity for a wide variety of domains. He has argued that the mind is made up of genetically-specified, independently functioning 'modules'. A 'module' is an informationally encapsulated



computational system that is largely innately specified and that is characteristically associated with specific neuroanatomical mechanisms (Fodor, 1983). Fodor describes a number of potential modules including recognition of faces, colour perception, analysis of shapes and 3-dimensional objects. Modules are not simply an entity for perceptual encodings of information but are mental modules delivering representations that characterise the natural order of things in the world (Fodor, 1983). Thus, according to Fodor, knowledge of the different aspects of the world are mentally represented in distinct formats.

In the past few years, modular accounts that involve central knowledge of the world have been proposed. Sperber (1994) suggests the mind comprises three innate cognitive modules: a meta-representational module (whose domain includes people and their minds), a physical object module (whose domain includes objects and their physical relations) and a folk biology module (whose domain includes animals and plants). Leslie (1995) proposes at least four separate innate modules in children's representations of the mind that come 'online', in an independent fashion, by age three. A similar model has been suggested for our knowledge of living kinds (Atran, 1990) and physical objects (Spelke, Breinlinger, Macomber & Jacobsen, 1992). However, a major criticism of 'pure' modular approaches has been the limited role given to experience and development (Karmiloff-Smith, 1992).

The modular view of cognition represents a major challenge to pre-dominant domain-general approaches to cognition. Although it assumes domain-specificity, modularity theories contrast significantly with domain-specific theories. The main difference is that modularity emphasises specificity in relation to cognitive architecture whereas domain-specificity stresses the specialisation for particular types of knowledge. This parallels the focus of different cognitive developmental researchers, with some exploring the structure of children's knowledge whilst others are interested in the content of children's thoughts.

In contrast, for some theorists, domain-specificity is apparent in the remarkable skills that develop as a result of extensive experience. With enough practice at a task, an individual can develop extraordinary abilities in that task domain. With sufficient experience a person can attain amazing feats of memory (Chase & Ericsson, 1981),

develop rich networks of causally related information (Chi, Hutchison, & Robin, 1989) and can hold an impressive array of representations (Chase & Simon, 1973). Importantly, these abilities are sufficiently powerful that child experts can even surpass novice adults in contrast to the usual developmental finding of adults outperforming children (Chi, 1978). Just as important, these skills cannot be explained by individual differences in experts or as domain-general effects. The same individual who is an expert in one task domain shows mundane performance on skills outwith that domain. The expertise is so focused in scope that these abilities seem to be domain-specific (Chi, 1978).

The notion of skill domains identified by expertise is distinct from other senses of 'domains' in the literature. There is no appeal to innate modular structures, innate constraints or the importance of evolutionary forces. Rather, these domains appear to be a result of hours of intensive practice. Expertise-skill domains pose an interesting challenge to other notions of domain-specificity. They challenge theorists to consider what constitutes a domain. It is clear from the expertise literature that in one sense, domains can include arbitrary and small corners of experience. The other challenge is that it demonstrates the effects of intensive experience in a domain, suggesting that there may be far-reaching implications of experience and how that influences a domain of knowledge. Although the expertise approach is not central to the present research, the issue of experience will be returned to throughout the thesis.

The final domain-specific cognition approach to be discussed is the core knowledge domain view. Recently, a variety of theoretical and practical research on children's cognitive development has shown the early development of core human knowledge domains (Wellman & Gelman, 1992). The proposal is that infants and young children rapidly acquire domain-specific knowledge relating to the physical, psychological and biological worlds (Wellman & Inagaki, 1997) which in turn frames later conceptual acquisitions. Consequently, several core areas of human cognition have been identified as important domains for children's reasoning; naïve physics (Spelke, 1991; Baillargeon, 2000), naïve psychology (Gopnik & Wellman, 1994; Leslie, 1994), naïve biology (Keil, 1992; 1994).

However, there are continuing debates amongst researchers as to the content of each core domain, the process by which knowledge changes within each knowledge system, and the early structure of these domains, particularly in relation to naïve biology (Medin & Atran, 1999; Siegal & Peterson, 1999). This makes it difficult to compare different theories of how core domains of knowledge develop in childhood. The following section will consider different theories on the structure and development of these core domains of thought. These contrasting theories are crucial for later discussions on children's conceptions of disability.

#### **1.4 Domain-Specificity and Core Knowledge Domains**

A key contributor to discussions about core knowledge domains is Carey (1985; 1995) who believes both naïve physics and naïve psychology constitute core intuitive theories at an early age. However, she does not believe young children have a distinct domain of biological knowledge. Indeed, there has been considerable debate about the onset of biological knowledge (Siegal & Peterson, 1999; Medin & Atran, 1999) and this may have implications for the content of children's disability concepts. Consequently, the naïve biology debate will be revisited throughout this thesis. Carey (1985) argues children do not have a distinct domain of biology because biological concepts are embedded within a different conceptual domain. She claims a biological causal explanatory system emerges as an independent domain from naïve psychology, but not until middle childhood.

Furthermore, the emergence of an autonomous biology requires conceptual change according to Carey (1995). As noted earlier, core domains are sometimes thought of as intuitive theories (Carey, 1985; 1995; Gopnik & Wellman, 1994) and changes in domain-specific knowledge are analogous to theory change in science. Conceptual change involves change in the core principles that define entities in a domain and govern reasoning in that domain. It carves the world at different points, bringing new principles that are irreconcilable with the old (Carey & Spelke, 1994). For example, one major conceptual change in children's biological knowledge is the construction of a new ontological category, living kinds, which includes plants as well as animals (Carey, 1985). Although Carey (1996) argues that the accumulation of facts may act as a catalyst for conceptual change they will not alone lead to an overhaul of existing concepts. Carey (1999) suggests children use a bootstrapping mechanism to revise



concepts in a domain, which enables an overlap to occur between older theories and new ones. The process of bootstrapping occurs when older theoretical knowledge becomes blended with the newly formed theory and provides links to this new theory (Carey, 1999). This has become a significant feature of Carey's recent work.

Similarly, Gopnik & Meltzoff (1997) propose a 'theory' theory account of knowledge acquisition in children. They propose three characteristics of theories that ought to apply to children's core knowledge. Firstly, children's theories should invoke characteristic patterns of explanation relevant to that particular domain. Secondly, this should lead to distinctive predictions that finally allow specific interpretations of the evidence. Thirdly, a child with one theory should interpret facts differently to a child with an alternative theory. This distinctive pattern of explanation, prediction and interpretation are central to the notion of 'theory' theory (Gopnik & Meltzoff, 1997). In addition to theories, they also propose that children have empirical generalisations, which are "accumulated pieces of information about the world" (Gopnik & Meltzoff, 1997, p.59). Empirical generalisations often are a rich source of theorising. Similar to Carey's (1996) suggestions, a rich set of generalisations could provide children with an important initial knowledge base from which new theories could later be constructed (Gopnik & Meltzoff, 1997).

Although not born directly out of the core domains perspective, Karmiloff-Smith (1992) has proposed the representational redescription (RR) model of developmental change, which is closely tied to the notion of theory building. The RR model attempts to account for the way in which children's representations become more manipulable and flexible for the emergence of conscious access to knowledge and theory building. It involves a continuous process whereby independently functioning specific representations are made progressively more available to other parts of the cognitive system. In this sense, representational redescription is a process by which implicit information in the mind becomes explicit knowledge to the mind. This process, when repeated, is a central part of theory building and allows implicit knowledge to become explicit and theoretical (Karmiloff-Smith, 1992). Although not claiming that these areas of knowledge constitute core domains, Karmiloff-Smith (1992) does suggest that representational redescription occurs in children's physical, psychological, mathematical and linguistic knowledge.

However, Wellman & Gelman (1992) are less clear as to the mechanisms of conceptual development, although they do advocate some form of theory change. They argue for the existence of three 'framework theories' comprising naïve psychology, physics and biology that are said to represent everyday domains of thought organised around ontological distinctions and causal explanatory frameworks. They thus argue for an early emergence of naïve physical and psychological theories. However, they are as yet non-committal as to the cognitive pre-dispositions of young children's biological knowledge and suggest naïve biology may not be as theory-like as naïve physics or psychology. They further suggest that children use these framework theories to interpret phenomena even in the absence of specific knowledge (Wellman & Gelman, 1992; 1998). Indeed, recent evidence does seem to suggest that young children often invoke a larger domain of causal understanding before evidencing accurate or detailed knowledge of phenomena within that domain (Keil, 1999; Wilson & Keil, 2000). According to Wellman & Gelman (1992) early cognitive development involves "foundational frameworks that shape acquisition of specific understandings" (p.370). The implication of this assertion is that the development of core domains of thought may proceed from an abstract construal to a more concrete conceptual understanding (Wellman, in press).

Indeed, an abstract to concrete shift in children's conceptual development has also been proposed by Keil (1999; Wilson & Keil, 2000). Traditionally, there has been the assumption that causal understandings must arise from clear notions of specific mechanisms. Thus, knowledge of concrete mechanisms must precede abstract understandings. However, despite a certain appeal to such a view, Keil (1999) suggests in many cases development might proceed from the abstract to the concrete. Evidence for this proposal comes from pre-school children who have a sense of 'causal potency' in a domain prior to having insight into specific mechanisms (Keil, Levin, Gutheil & Richman, 1999; Wilson & Keil, 2000). Keil (1992; 1994) asserts that children as young as four years-old, have distinct theoretical domains of physical, psychological and biological thought. Furthermore, he suggests that there are innate biases which contribute to the acquisition of core knowledge domains by constraining the type of input children notice and how that input is utilised (Keil, 1992). In relation to the biological domain, he suggests that children might have abstract expectations about biology whilst not yet understanding the specifics within that realm (Keil et al., 1999).

For example, children prefer to explain illness in terms of germs than 'immanent justice' (psychological explanation), despite lacking detailed knowledge about how germs work (Keil 1992). Young children clearly do not have conscious theories of all aspects of biology yet they still have strong biases to prefer some classes of mechanisms over others.

The notion of 'modes of construal' has been offered as a way of describing how a young child might have a sense of causal potency in a domain (Keil, 1989; Keil et al., 1999; Wilson & Keil, 2000). Although Keil proposes a number of modes of construal, due to his interest in children's biological knowledge, much of his research focuses on the teleological-functional mode of construal. Keil (1992; 1994) argues that a universal component of adult naïve biology is a teleological-functional mode of construal. That is, an animal's or plant's properties are explained in terms of their function. The teleological mode of construal does not lead to specific beliefs about biological things, but embodies biases for certain kinds of explanations over others. Thus, he distinguishes between broad modes of construal and detailed sets of beliefs, in his account of how knowledge becomes organised into domains and changes over time. However, it is still unclear as to how modes of construal would interact with and guide knowledge of the more specific mechanisms. Nevertheless, the notion of causal potency and the abstract to concrete shift in conceptual knowledge, are interesting suggestions as to how children reason about complex phenomena. These issues will be returned to throughout this thesis in relation to disability and are discussed fully in Chapters 6 and 8.

Hatano & Inagaki (2000) propose the notion of cognitive constraints in how core knowledge domains are acquired. They assume that domain-specific constraints are acquired early if not innate, take the form of innate biases and not specific pieces of knowledge, and are critically important at the early phase of conceptual development. As a consequence, development in selected domains such as physics and psychology is easy, early and relatively uniform as a result of constraints that direct children's attention to relevant modes of reasoning. The biological domain, whilst not emerging from psychology, may occur later than physics or psychology (Hatano & Inagaki, 1994). They also argue that conceptual development does not take place under cognitive constraints alone. As children accumulate experiences in sociocultural contexts, such

experiences are represented in the form of domain-specific knowledge, which work as acquired cognitive constraints. Furthermore, the social contexts in which children are exposed to biological information for example is crucial for inducing conceptual change; that is, if children engage in activities that provide meaningful contexts, they are likely to acquire a sophisticated biological knowledge system more readily (Hatano & Inagaki, 1996). The emphasis on activity-based experiences and how these contribute to conceptual development is a recent and welcome approach to domain-specificity. This thesis will examine the role of social experiences in children's understanding of disability (see Chapter 6).

### **1.5 Summary and Conclusions**

This chapter has introduced domain-specific approaches to cognitive development and compared them to more traditional domain-general perspectives. Domain-general approaches to cognitive development and in particular Piaget's stage-model of development has been extremely influential and has been previously applied to several areas of children's conceptual development (Bibace & Walsh, 1979; Diamond, 1993). However, more recent domain-specific perspectives on cognition may be able to offer new insights into children's conceptual development. This perspective has led to the idea that young children could not arrive at the wealth of knowledge they do without some prior constraints on learning that lead children to acquire certain inputs over others (Hirschfeld & Gelman, 1994). That is, children may be endowed with constraints that facilitate learning in core areas of thinking. Indeed, one domain-specific approach to cognition suggests that children do develop core knowledge domains that are distinct from one another and which identify and interpret a distinct kind of phenomena, assumed to share certain properties. Young children are thought to develop core knowledge domains that encompass most of the external world and that are structured as naïve theories; specifically naïve physics, naïve psychology and naïve biology. Although researchers agree that naïve physics and psychology constitute core domains of thought, the biological domain has been a source of much debate.

Researchers have typically examined children's concepts that fall neatly into one core domain and have neglected complex phenomena, such as disability, that are less easily categorised. This thesis will therefore investigate three main aspects of children's disability concepts from a domain-specific perspective. Firstly, this thesis will consider

the *content* of children's disability concepts by examining the role of core knowledge domains in their conceptualisation of disability. Secondly, the *development* of disability concepts will be explored in this thesis by including a broad age range of children and will be discussed in relation to the role of cognitive constraints in the acquisition of knowledge. Finally, this thesis will examine the *structure* of children's disability concepts as being theory-like. As discussed earlier, these three issues are central to cognitive developmental research (see section 1.1). It is hoped that this will not only be a unique perspective on children's disability concepts but will provide a developmental contribution to existing research on disability concepts.

The following literature review chapters will examine in detail, the content of children's core knowledge domains (Chapter 2) and previous research on the content of children's disability concepts (Chapter 3). In particular, Chapter 2 discusses research that has attempted to explore children's concepts of complex phenomena, which although scarce, has made an important contribution to the domain-specific cognition literature. It also provides a rationale for why disability, until now, has never been researched from this perspective but why it may be useful to do so.

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## CHAPTER 2

### The Development of Core Domains of Thought

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#### 2.1 Domain-Specificity: Core Knowledge Domains

Chapter 1 described a domain-specific approach to cognitive development and suggested the existence of at least three core knowledge domains. Prior to formal education, children have core domains of naïve physics, psychology and biology knowledge. An understanding of the nature and behaviour of physical objects is the essence of the naïve physical domain. In contrast, naïve psychology, often discussed under the title 'theory of mind', involves intuitive notions of how the mind works and influences behaviour (Baron-Cohen, Tager-Flusberg & Cohen, 2000, Wellman & Estes, 1986). A great deal of work has addressed children's emerging understanding of psychological processes which includes knowledge of beliefs, desires, thoughts and emotions. Naïve biology has been proposed as another fundamental conceptual domain (Keil, 1989; Wellman & Gelman, 1992; Hatano & Inagaki, 1994). A core domain of biology would include knowledge of processes such as illness, inheritance and reproduction, functions such as eating and sleeping and outcomes such as death. These core domains of thought encompass most of the external world and are therefore essential to children's understanding of everyday phenomena (Keil, 1999). Each domain of thought is organised around distinctive ontological categories and causal reasoning frameworks (Wellman & Gelman, 1992) and empirical research on the content of children's knowledge in each of the core knowledge domains is described below.

#### 2.1.1 *Naïve Physics*

It has been argued that the two key components of a naïve physics are physical objects and physical-mechanical causes (Wellman & Gelman, 1992). An understanding of the existence and behaviour of objects is ontologically central to a naïve understanding of the physical world. Furthermore, knowledge of physical causality is required for understanding object dynamics. If children possess an autonomous domain of physics they must make an ontological and causal distinction between the physical world and other aspects of their environment. In recent years, as a consequence of much research,



naïve physics has been granted special status as a core domain of thought (Hirschfeld & Gelman, 1994; Carey, 1995). However, research within the naïve physics domain remains fragmented. For example, infant physics concepts are mostly researched by psychologists, who share an interest in early cognitive development. In contrast, physics concepts in childhood are mainly examined from an educational perspective with research charting misconceptions relating to school subjects rather than cognitive development. Nevertheless, this section will review and attempt to synthesise some of the empirical findings on naïve physics knowledge.

From the first few months of life, it would appear that infants are constrained by a number of basic domain-specific principles about the persistence and behaviour of physical objects (Spelke, 1991; Baillargeon, Kotovsky & Needham, 1995). Recent experiments provide evidence that infants reason about the behaviour of inanimate objects by drawing on knowledge of constraints on object motion (Spelke, 1991; Spelke, Phillips & Woodward, 1995). Spelke (1991) suggests the presence of three innately determined domain-specific principles of physics: cohesion, continuity and contact. Infants aged three-months appear to know that inanimate objects, move cohesively, continuously and act upon each other through contact (Spelke & Van de Walle, 1993; Spelke, Breinlinger, Macomber & Jacobson, 1992). Furthermore, these principles seem to act as domain-specific constraints, as infants do not apply them to all perceptible entities (e.g., human agents, Spelke et al., 1995). Leslie (1995) similarly suggests infants have a core module of 'theory of body' (ToBy), one which is evolutionarily adapted and innately specified. This core module embodies beliefs that when objects move, they possess or bear a 'force' and when objects contact other objects, they receive or transmit a 'force'. The ToBy module allows infants to have implicit beliefs about physical causal-mechanisms. However, these implicit beliefs still have to be translated into explicit understandings and the method by which this is achieved is not yet fully known.

Coupled with infancy research on naïve physical understanding are many studies that have examined pre-school and childhood concepts of physics. However, developmental pathways between infancy and pre-school have rarely been charted. During the pre-school years, children's naïve physics concepts broaden to include a range of specific theories about physical-causal mechanisms. For example, children



develop naïve theories of projectile motion (Kaiser, McCloskey & Proffitt, 1999; Kim & Spelke, 1999), naïve theories of floating and sinking (Howe, 1998) and naïve theories of force transmission (Howe, 1998). Pre-school children hold intuitive ideas about the nature of projectile motion including the belief that all objects which are unsupported will fall straight down (Kaiser et al, 1999). Pre-school children's ideas about why objects float and sink are also numerous (Howe, 1998). Many children aged five to six years intuitively report the weight of the object as being the key to floating and sinking (Howe, 1998; Piaget, 1930). Other explanatory variables, although employed by children to a lesser extent, include having air/no air inside or being solid/absorbent (Biddulph, 1983). Children aged six years also develop ideas as to the forces that oppose motion (Howe, 1998). For example, when Howe (1998) showed children aged six to fifteen years a picture of a ball being rolled across paving stones and asked "what will happen to the ball's speed?", the youngest children often predicted an internal reduction of force would make the ball stop: that is, the ball would begin to slow down after maintaining a steady speed. However, the most sophisticated explanations that referred to constant external forces, were rarely mentioned in children under ten years.

An intriguing aspect of these theories is the striking misconceptions that children and even adults hold about the physical world. In reference to naïve theories of projectile motion, the straight down rule persists even when reasoning about the movement and fall of objects (e.g, a ball rolling off a table or a carried object dropped by a moving person). Not until middle childhood do children correctly predict that the ball will roll off the table following a parabolic path (Kaiser et al., 1999). In a similar vein, Howe (1998) investigated theories of floating and sinking in children aged eight to twelve years. Although by the age of ten years, the number of irrelevant variables reported were decreasing, no child understood relative density as being relevant to floating or sinking. Therefore, although children may acquire more sophisticated theories of physical-mechanical causes with increasing age, formal teaching may be required to modify some of these misconceptions (Kaiser et al., 1999; Howe, 1998).

Not only do young children have implicit ideas regarding physical-mechanical causes, but they can engage in appropriate explicit physical causal reasoning in everyday speech (Wellman, Hickling & Schult, 1997). Using the natural language database (CHILDES) which systematically records transcripts of speech, Wellman et al (1997)

identified several explanation modes that children use to explain things. The results showed that a physical causal explanation mode figured prominently in the speech of two, three and four year-old children. Young children used physical causal explanations when explaining object behaviour or for relevant yet restricted aspects of human activities as for example in, "he got a bad tooth because he fell off his bike" (Wellman et al., 1997, pp.21). Physical explanations seem to appear early in children's development and are used to exclusively explain physical activities. Young children are apparently able to convert implicit knowledge into explicit physical explanations and this seems to be a very early development in physical causal reasoning.

The general consensus of the research on children's physical understanding is that naïve physics constitutes a core domain of thought from an early age. Young children can distinguish entities within a domain of physics from those not in the domain and appeal to appropriate and specific physical causal mechanisms. Since this ability develops early in infancy, naïve physics is thought to constitute a core domain of thought which is theory-like (Carey & Spelke, 1994; Karmiloff-Smith, 1992). However, as noted in Chapter 1, construing domains as theoretical remains controversial and little empirical work has attempted to address the theoretical status of naïve physics. Indeed, naïve physics is not thought to be the only foundational knowledge domain. Special attention has also been paid to another core domain; naïve psychology.

### **2.1.2 Naïve Psychology**

A naïve psychology involves an understanding of psychological beings whose actions are caused and explained by psychological forces and states (Wellman & Gelman, 1992). That is, our everyday understanding of people is fundamentally mentalistic; we construe people's actions in terms of their internal mental states such as beliefs, desires and intentions. Consequently, a naïve psychology is crucial to our understanding of the social world. There are two central components that characterise naïve psychological thinking: the ontological and causal aspects of the mind (Wellman & Gelman, 1992). The ontological aspect concerns the nature of mental states and processes as being distinct from real world physical objects or mechanical processes. Mental states are internal, unobservable and subjective, whereas the contents of the physical world are external, obvious and objective. The causal aspect of naïve psychological thinking is that people engage in behaviours because they want to or

because they believe those actions will result in a particular outcome. This is often called 'intentional causality' and is the cornerstone to a naïve psychology (Hirschfeld & Gelman, 1994).

Even in infancy, children develop expectations about persons that contrasts with their expectations about physical objects (Wellman & Lagattuta, 2000). For example, within the first year of life, infants will imitate the actions of persons (Meltzoff & Moore, 1983) but not similar activities of mechanical objects (Legerstee, 1991). Thus, even at such a young age, infants can make an ontological distinction between people and objects. However, a conception of mental states and mentally caused actions requires some knowledge of intentionality (Perner, 1991; Wellman & Gelman, 1992). Many studies describe a period from eight to fourteen months, during which the older infant manifests a rudimentary intentional understanding (Bretherton, McNew & Beeghly-Smith, 1981; Stern, 1985). For example, infants at this age are thought to show a sense of subjectivity (Stern, 1985), triadic awareness (Adamson & Bakeman, 1985) and even an implicit theory of mind (Bretherton et al., 1981). These findings are consistent with later achievements such as following another's direction of gaze (Butterworth, 1991), joint reference (Adamson & Bakeman, 1985) and using pointing to refer to objects (Murphy & Messer, 1977). However, infants' implicit intentional understanding is quite different from children's explicit recognition of psychological beings.

Indeed, in the last twenty years, considerable evidence has shown that explicit psychological thinking becomes evident among pre-school children. Often referred to as 'theory of mind' research, previous studies have investigated pre-schoolers understanding of belief states, developing psychological explanations and concepts of consciousness (Wellman & Lagattuta, 2000). In general, such research shows that a naïve psychology is evident in most typically developing pre-schoolers. In particular, most three year-olds can make the ontological distinction between mental states and physical objects. Traditionally, mental phenomena were considered quite confusing for young children. Piaget (1929) asserted that young children could not honour the distinction between mental and physical phenomena. However, Wellman & Estes (1986) have shown that this is not the case. When three, four, and five year-old children are told about a person who has a dog and another who is just thinking about a dog, children correctly judge which dog can be seen, touched and petted. Furthermore,

when asked to consider a thought about a raisin 'in the head' versus a swallowed raisin 'in the stomach', three, four, and five year-olds know which one is literally inside the person and which is metaphorically 'in his mind' (Watson, Gelman & Wellman, 1998). Relatedly, young children also understand something of the subjectivity of thoughts. In simple tasks, young children are able to report that whilst they can 'see' their own mental images, for example, others cannot (Estes, Wellman & Woolley, 1989) or that while they think a particular cookie is yummy, someone else may think it is yucky (Flavell, Flavell, Green & Moses, 1990).

Additionally, young children are also said to understand the causal aspect of the mind. To understand mental causation, children must recognise that people behave in response to intentions and beliefs and not objective facts. For this reason, children's understanding of false beliefs has provided intriguing evidence as to how they understand causal mental states more generally. Many studies now show that by four years of age, children can reason appropriately about false beliefs (see Perner, Leekam & Wimmer, 1987). For example, if participants observe a person noting where an object is placed and then watch the person leave the room, when the object is moved to a new location, they can accurately predict that the person will mistakenly search for the object in the original location. Four and five year olds are able to report that person's false belief (Wimmer & Perner, 1983). Similarly, children of this age can use information about what a character desires to predict his or her happiness, sadness, anger and other various outcomes (Stein & Levine, 1989; Yuill, 1984). In addition, a number of studies have demonstrated that by four years of age, children are showing an interest in deception and are becoming more adept at it (Sodian, Taylor, Harris & Perner, 1991). Deception is an interesting example of naïve psychological thinking because it involves trying to alter someone else's belief. Indeed, Chandler, Fritz & Hala (1989) found that even four year-old children employ various deceptive strategies with the intent to create false beliefs in others' minds.

However, if young children have a core domain of psychology, they should be able to provide spontaneous explanations about mental states and not just predictions. Exploring children's causal explanations has become a recent and revealing experimental tool. Earlier work has shown that when asked to explain simple human actions (e.g., "Jane is looking for her kitten under the piano, why is she doing that?"),

three and four year-olds, like adults, typically provide psychological explanations (Bartsch & Wellman, 1989). More recently, studies have solicited explanations from three and four year-olds about human actions with psychological, biological and physical roots. These studies have found that young children give intentional explanations for psychological action (e.g., a person deciding to stand up) and physical explanations for physical-like human movement (e.g., a person blown over by the wind, Schultz & Wellman, 1997; Wellman et al., 1997). Moreover, whereas by three years of age children report physical causes are necessary to manipulate physical objects (e.g., to open and close a pair of scissors), they assert that 'just thinking' is sufficient to affect mental changes (e.g., thinking about opening scissors). Thus, prior to schooling, children can already distinguish between the psychological and the physical in their explicit causal explanations.

As discussed above, children aged three years have a domain of psychological entities and processes that are distinct from a contrasting domain of physical objects and mechanics. Furthermore, many researchers have argued that naïve psychology is structured as an intuitive theory (Gopnik & Wellman, 1992;1994). In contrast to the physics domain, the theoretical status of naïve psychology has been supported by different sources of empirical work, most notably, theory of mind research. In attempting to ascertain how children understand beliefs, researchers have developed tasks that test children's belief knowledge alongside their understanding of other core psychological concepts such as perception or intention. In these studies, children's performance on false belief tasks tends to improve when they are tested within this coherent framework (Slaughter & Gopnik, 1996; Gopnik, Slaughter & Meltzoff, 1994). That is, children do better on false belief tasks when they have to make explicit use of relations between beliefs and other mental concepts.

These studies show that naïve psychology in general and false belief concepts in particular, are coherent and theory-like among pre-schoolers (see Chapter 1, section 1.2.4). In each of these studies, children's understanding of beliefs improved when considered in relation to other mental state concepts. Thus, children may be scaffolded into a more sophisticated understanding of belief (Slaughter & Gopnik, 1996). Naïve psychological knowledge appears to be domain-specific and some of the core concepts that structure that knowledge are coherently inter-related, as predicted by the 'theory'



theory of domain-specific knowledge acquisition (Gopnik & Wellman, 1994). Indeed, the influence of naïve psychology on children's thinking is considered so pervasive that some researchers have suggested this domain engulfs other areas of thought, such as naïve biology. Consequently, the status of naïve biology not only as an intuitive theory but as a core domain of thought, independent of physics and psychology, has been increasingly questioned. It is the domain of biological knowledge to which we now turn.

### **2.1.3 Naïve Biology**

Although there is convincing evidence that children of three years of age have rudimentary ideas of physics and psychology, disagreement among researchers arises in relation to a third domain; biology (Siegal & Peterson, 1999; Medin & Atran, 1999). Although most researchers agree young children hold ideas about the biological world, the causal-explanatory frameworks from which these ideas emerge is a source of much debate in the literature (Hatano & Inagaki, 1999; Au & Romo, 1999). A key research issue concerns whether children's biological knowledge is ontologically and causally distinct from other conceptual domains.

Ascertaining how and when biological knowledge develops has become a major challenge for cognitive developmental researchers. Although a fully developed adult-like domain of biological knowledge covers a wide range of topics including processes such as illness, inheritance, reproduction and growth, children do not typically receive formal instruction on such topics at an early age (Keil & Silberstein, 1996). As a result, children's knowledge of biological processes such as inheritance and illness are of interest theoretically because the causal mechanisms are unobservable and it is unlikely young children will have any formal knowledge although they may have informal experiences of such processes. It is assumed therefore, that in attempting to discuss these biological processes, children will rely on intuitive knowledge grounded in a particular causal-explanatory framework.

One of the earliest biological beliefs to be investigated was children's understanding of the living-nonliving distinction. Traditionally, Piaget (1929) argued that young children cannot distinguish between biological and non-biological things given children's tendency to attribute animate properties to inanimate things (e.g., a bike is

alive, rocks can feel pain). However, more recent research suggests children have acquired the living-nonliving distinction early in childhood. For example, Hatano & Inagaki (1994) found that five and six year-old children said only animals and plants 'wither and die' and 'grow' but not inanimate things. Baksheider, Shatz & Gelman (1993) also found that pre-schoolers recognise the ability of living kinds to heal through re-growth whilst artefacts must be fixed by a person. Consequently, it appears that young children can distinguish ontological boundaries within their beliefs about the biological world.

However, Carey (1985) suggests that the ability displayed by children to distinguish living from nonliving things may depend upon their knowledge of intentional states and hence reveals naïve psychological reasoning as opposed to biological thought. Carey argues children do not have a distinct domain of biology because from the start, biological concepts are embedded within a different conceptual domain. She claims a biological causal explanatory system does not emerge from naïve psychology until middle childhood (Carey, 1985; 1995), with younger children instead using intentional (psychological) causality to explain many bodily functions such as the role of the heart. She argued that children under nine years know very little of the physiological role of the heart preferring to comment on its psychological and social significance ("It's so you can love, "It makes you do the things you should"). This finding apparently supports the claim that children's understanding of living kinds is embedded in psychological theory, with biological processes being governed by human psychological functioning. This reliance on psychological causality according to Carey (1985), is due to young children's ignorance of biological mechanisms.

In contrast, Wellman & Gelman (1992) believe biology constitutes a core explanatory framework and argue that "a specific belief about biology is found even in young four year-olds" (p. 364). This conclusion was based on findings from several studies on innate potential. This is the belief that biological entities, but not other kinds of objects, manifest an innate potential that causes living kinds to mature in specific ways regardless of initial appearances (Wellman & Gelman, 1998). For example, a newborn tiger is neither large nor fierce but will come to exhibit such traits. Young children's awareness of innate potential is related to their understanding of inborn 'essence'. An essence "is the unique, typically hidden property of an object that makes it what it is,



without which it would have a different identity" (Gelman & Wellman, 1991, p.215). Essences are often unobservable and by their nature require inference about some deeper disposition. It can be thought of as an unseen quality that is responsible for the observable features that hold a category together. A series of studies now show that children can grasp innate potential and impute non-obvious essences (Keil, 1989; Gelman & Wellman, 1991; Hirschfeld, 1995). Similarly, pre-school children are aware of the importance of 'insides' as determinants of identity (Gelman & Wellman, 1991). Since young children have an early understanding of the essence of biological phenomena, Gelman & Wellman have concluded that even young children treat biology as a distinct domain at least in an ontological sense and have specific biological causal beliefs (Gelman & Wellman, 1991).

Closely related to the notion of innate potential is inheritance. Inheritance concepts, as a research topic has become increasingly popular because it requires an awareness of uniquely biological mechanisms. In order for children to be granted an autonomous domain of biology distinct from psychology, children must demonstrate an awareness of causal mechanisms specific to biological kinds and respect the ontological distinction within this causal-explanatory framework. For example, although children as young as four years are aware of the basic facts of inheritance (e.g. that offspring resemble their parents), they may not understand that this resemblance is mediated through a chain of uniquely biological causation (and not psychological or physical causation, Carey, 1985; Solomon, Johnson, Zaitchik & Carey, 1996). That is, young children are unaware that mechanisms of inheritance lead to physical resemblance only (e.g., physical features) as opposed to non-physical resemblance (e.g., beliefs, temperaments). Consequently, Carey (1985) suggests an autonomous domain of biology does not emerge until middle childhood as prior to this, children have no knowledge of specific biological causal mechanisms. In contrast, Springer (1999) argues that a biological theory of kinship appears among some four and five year-olds and this allows them to generate explanations and predictions about mechanisms of inheritance.

A second important area of research explores children's understanding of illness, as this forms for adults at least, a specific biological belief. For example, disease only applies to biological entities (e.g., a car cannot 'catch' a flat tyre) and contagious illnesses are only spread by biological means. Thus, children's knowledge of illness is an interesting

test of their biological understanding as it cannot adequately be explained by any of the other domains. If young children cannot distinguish biological from psychological phenomena, this should reveal itself in their illness concepts. Indeed, traditionally it was believed that children below seven or eight years would have great difficulty understanding the causes of illness (Bibace & Walsh, 1981; Piaget, 1929) and in open-ended interviews on illness understanding, children were indeed likely to offer social or psychological explanations of illness such as 'immanent justice' (e.g. you get ill because you are naughty).

However, recent studies employing more age-sensitive methodological approaches have contradicted these early findings. Siegal (1988) for example, believed young children would show a better causal understanding of illness if they did not have to express their own spontaneous explanation. In his task, four, five and eight year-old children had to evaluate explanations given by a puppet for a cold, toothache and a scraped knee. He found that young children could identify contagion as the cause of a cold and reject 'immanent justice' explanations. Young children were also able to limit their judgements of contagion (e.g. not applying them in the case of a scraped knee). Similarly, Keil (1992) demonstrated that children limit contagion to physical/biological attributes. For example, pre-school children denied that behaviours (e.g., obsessive hand washing) may be caught from another person. However, although children's conceptions of germs are limited to physical contact, an understanding of what they can transmit seems to be much less differentiated (Keil et al, 1999). Nevertheless, these findings highlight the importance of using appropriate methodologies to investigate children's biological concepts, especially when those concepts may be more implicit in nature and not accessible to verbal report.

Kalish (1996) has argued most pre-schoolers have a causal understanding of illness that involves germs. For example, they recognise that events which often contaminate food will not do so if no germs are involved (e.g., a cookie that falls on the floor but no germs get on it). Young children are also more likely to judge germs than poisons as being alive, contagious and able to move or change size (Keil, 1994). However, Solomon & Cassimatis (1999) suggest pre-schoolers do not understand illness in terms of a biological germ theory. In their study, pre-school children did not consider germs to be living things, nor did they distinguish germs from poisons as causes of illness.

Consequently, the formation of a coherent germ theory of illness is considered to be a later construction (Solomon & Cassimatis, 1999).

According to one recent proposal, naïve biology does not constitute an autonomous domain of thought because it is not distinct from naïve physics (Au & Romo, 1999). In particular, Au & Romo (1999) suggest that before children understand any uniquely biological causal mechanisms, it makes sense for them to apply their naïve physics to reason about living things, as it has served them well in reasoning about nonliving things. In relation to illness, Au & Romo suggest that children aged five to thirteen years are unlikely to talk spontaneously about biological mechanisms, instead preferring mechanical causal mechanisms, such as the movement of germs. According to Au & Romo, the fact that illness is something biological does not automatically turn a mechanical causal mechanism into a biological one.

Despite ongoing debate, many researchers believe naïve biology does indeed constitute an autonomous core knowledge domain (Keil, 1992; 1994; Hatano & Inagaki, 1994; Wellman & Gelman, 1992). Keil (1992; 1994) argues the biological domain is not conflated with the psychological domain because naïve biology constitutes foundational knowledge from the beginning. Japanese researchers, Hatano & Inagaki (1997) agree with Keil (1992; 1994) and Wellman & Gelman (1992) that naïve biology is a core domain among children younger than six years of age. However, they do not view young children's initial biological knowledge as completely free from psychological influences. In particular, they suggest that young children might interpret some biological phenomena by borrowing psychological knowledge because "their biological knowledge is not powerful enough to generate convincing predictions and explanations by itself" (Hatano & Inagaki, 1997, p.124). They also stress the importance of direct experience in shaping children's biological knowledge (Hatano & Inagaki, 1997). In one study, Inagaki (1990) compared biological knowledge of Japanese kindergarteners who had actively raised a goldfish at home with that of same-aged children who had never raised any animal. It was found that despite similar levels of factual knowledge about typical animals, the goldfish raisers had richer procedural and conceptual knowledge about goldfish. Moreover, the goldfish raisers used their knowledge about goldfish as a source of analogy when making predictions about other less familiar aquatic animals (e.g., frogs). This is a welcome cross-cultural

perspective and suggests that direct social experience may play a role in acquiring biological knowledge prior to formal education.

In summary, considerable debate still exists about the status of naïve biology as a core domain of thought (Medin & Atran, 1999). Although children develop many ideas about the biological world, it is unclear whether this constitutes an autonomous and theoretical domain of thought separate from other core reasoning systems. That is, it is still unclear as to whether young children can recognise uniquely biological mechanisms and reflect this in their causal explanations. Younger children do misunderstand a significant amount concerning specific biological mechanisms, but they seem to have clear expectations at a more general level of biological understanding (Keil, 1999; Wilson & Keil, 2000). For example, pre-schoolers know little about the precise mechanisms of inheritance yet they have intuitive beliefs about what properties are inherited (Hirshfeld, 1996; Springer & Keil, 1989). Young children evidence only a rudimentary understanding of germs, yet they have strong expectations about what diseases are contagious (Siegal, 1988; Kalish, 1999). It appears that young children have implicit knowledge of biological processes prior to specific knowledge of mechanisms. However, children may find it difficult to convert such implicit understandings into explicit explanations. Recent studies on children's explanations of everyday events does suggest that a biological mode of explanation occurs, even if it is less frequent and less well-developed than physical or psychological ones (Wellman et al., 1997).

## **2.2 Children's Simultaneous Physical, Psychological and Biological Reasoning**

Rarely have studies looked at children's thinking across all three causal reasoning systems at any age or developmentally. This is in part because investigators have previously been interested in children's understanding of a given phenomenon such as object motion (Leslie, 1995; Spelke et al, 1995), illness (Kalish, 1998) or belief (Wellman, 1990; Perner, 1991) which clearly falls within a specific domain. However, much of the world does not carve up neatly into domains of knowledge and children must learn to co-ordinate several core reasoning systems. Recently, several researchers have started to investigate children's ability to engage in such multi-causal reasoning (Wellman et al., 1997; Hickling & Wellman, 2001).

Hickling & Wellman (2001) examined explanations on a range of phenomena given in everyday conversation by children aged two to five years. Analyses of nearly 5,000 explanations showed children focus on varied entities (objects, animals and persons) and utilised diverse modes of reasoning (psychological, physical and even biological) in everyday explanation. For example, children offered psychological explanations ("because I'm afraid of her") and social-conventional explanations ("I got this candy because it's a prize") in their everyday language. Moreover, physical causal explanations ("the teddy's arm fell off because you twisted it") and biological explanations ("you don't bleed and get bruises inside") also occurred with regularity. Children were also able to pair modes of explanation with particular entities suggesting flexible causal reasoning. That is, children explained intentional movement in psychological terms but object-like movements in physical terms. According to Hickling & Wellman (2001), children's application of several modes of explanation to human events appears appropriate rather than indiscriminate.

In a series of studies, Wellman et al. (1997) solicited explanations from three and four year-old children about a variety of human acts with biological, physical and psychological impetus. Contrary to previous research, they found that young children did not restrict each reasoning system to only specific entities. For example, three and four year-olds did not just use psychological explanations for human acts (e.g., "he never eats spinach because he doesn't like the taste") but also included physical explanations (e.g., "the black toe hurts because Marky dropped a pan on it") and biological ones too (e.g., "he'll eat his food, because to be alive"). As noted in Chapter 1, it appears that children can honour the ontological distinction between core domains of thought whilst still recognising an overlap in the entities that each domain can explain. Young children show evidence of differentiating and co-ordinating the three reasoning systems in appropriate and flexible ways when considering complex phenomenon.

In relation to one particular phenomenon, the inheritance of physical properties, Korpan (1999) has found that by seven years of age, children are able to generate explanations derived from numerous domains. In this study, children used an average of five different explanation types, drawing from the domains of biology, physiology and psychology among others. Similarly, Morris (1998) examined this issue of multi-



causal reasoning of inheritance more directly. The aim of this experiment was to investigate whether children employ multi-causal reasoning in cases where both genetic and environmental influences are relevant (e.g., intelligence or weight) or whether they use one single cause to reason why offspring resemble parents. The results showed that even six year-old children recognised the dual contribution of nature and nurture to the inheritance of certain traits. This was most evident for multi-causal psychological features such as maths ability and intelligence. This is consistent with suggestions by Hirschfeld (1995) who proposed that the ability to draw biological and psychological inferences about the inheritance of properties requires the ability to contrast and co-ordinate different explanatory frameworks in an appropriate manner.

Furthermore, in relation to the biological world, Gutheil, Vera & Keil (1998) have found that pre-schoolers possess multiple explanatory frameworks concerning biological kinds and these frameworks guide their inductions about various properties. In addition, a recent study has shown that younger children are not exclusively bound to a particular mode of explanation when reasoning about the animate world (Poling & Evans, 2002). It was found that even six-year-old children endorsed different explanations for different biological categories, indicating causal flexibility. However, children's ability to engage in flexible causal reasoning of phenomena that span several domains of thought requires further exploration.

### **2.3 Children's Concepts of Complex Social Phenomena**

These recent studies confirm that the domain-specific approach has much potential when attempting to understand children's concepts of complex phenomena. Consequently, some researchers have re-examined children's concepts of more complicated phenomena such as gender and race, using this theoretical framework. Gender and racial concepts involve an understanding of both biological and environmental contributions to differences between people. As such, this research is an important contribution to discussions surrounding children's co-ordination of core knowledge domains.

By the early pre-school years, young children provide evidence that they can readily sort people into categories that correspond to the racial and gender categories used by adults (Aboud, 1988; Hirschfeld, 1996; Taylor, 1996). Traditionally, young children

were thought to construct social concepts on the basis of physically prominent and superficial features (Aboud, 1988), with their racial and gender concepts, for example, initially represented in terms of outward and variation in appearance. Not until middle childhood are the intrinsic and immutable natures of these categories grasped (Carey, 1985). Pre-schoolers do so, it is argued, because prior to the age of eight years, children do not appreciate the biological implications of complex social categories. As this chapter has shown, there has been considerable disagreement as to whether children's conceptions of the biological and social worlds develop independently or in tandem (e.g., Carey, 1985). Not surprisingly then, given the debate over onset of naïve biological knowledge, children were initially thought to conceptualise social differences in rather superficial ways.

Within the domain-specific cognition literature, Carey (1985) has argued strongly that for children below the age of seven, gender is not a basic biological fact about people. Coming to see gender as a biological given is part of the emergence of a distinct biological domain. However, a variety of research has recently questioned children's inability to distinguish between these conceptual domains (Keil, 1989), suggesting that coming to understand the biological aspects of gender differences may occur earlier than previously thought.

Recent findings on children's gender and racial concepts do suggest an early awareness of the biological implications of these categories. In an attempt to ascertain whether children view gender as a social or biological category, Taylor (1996) examined children's beliefs about the origins of gender differences. Participants aged four to ten years were told about a child raised with only opposite-sex individuals and were asked whether the child would grow up to possess gender-stereotyped or biological properties. For example, for the story with the female character, children were told about a baby girl called 'Chris' who went away to live on island with only boys or men. The children were then asked a series of questions about what properties the story character would have when she or he was ten years old. Some of these properties were stereotyped, such as 'she wears dresses', 'likes to play with dolls' and 'wants to be a nurse'. Others were biological, such as 'she has a body like a girl's' and 'she will grow up to be a mummy'. At issue was whether children would consider biological factors as more important for gender category membership than social-environmental ones.



The findings showed that by nine or ten years of age, children acknowledge that environmental factors may influence gender-role development. That is, children under 10 years believed gender-stereotyped properties would develop in an infant regardless of the social context in which she is raised. Younger children seem to believe that members of a gender category share something of an innate potential which will become manifest over time (Taylor, 1996). They assume a girl will develop similar to other girls, regardless of being raised in an environment with boys. Thus, prior to age nine, the biological implications of gender carry more influence than social-environmental ones. This result is at odds with Carey's expectation (1985) that children initially understand gender as a social construct and may even reflect an early awareness of the biological nature of gender. In contrast, older children recognise the role of the environment in shaping gender-role development. Furthermore, they are able to distinguish between biological properties that develop regardless of social influence and stereotyped properties that would develop in accordance with the social environment. Older children are able to appreciate the dual contribution of the biological and social worlds to gender differences. In accord with findings reported in this chapter, older children can utilise and co-ordinate several core reasoning systems in appropriate and flexible ways (Wellman et al., 1997; Hickling & Wellman, 2001).

In addition to research on gender concepts, much attention has been devoted to children's racial understanding. How children acquire racial and ethnic concepts has been of long-standing interest to both psychologists and anthropologists (Aboud, 1988; Katz, 1982; Hirschfeld, 1996). In a series of studies, Hirschfeld (1995) revisits the claim that young children lack a biologically based understanding of race and explores the possibility that even pre-schoolers have a more adult-like grasp of race than previous scholars have suggested. Adult reasoning about race is theory-like in the sense that it appeals to a specific ontology and pattern of causal explanation. Adults believe race to be a natural as well as a social phenomenon governed by a range of natural principles. Thus, for adults, race is immutable across the life-span, fixed at birth and derived from family background. Coupled with these aspects of racial thinking is a notion of non-obvious essence (Medin & Ortony, 1989; Hirschfeld, 1995). Race is thought to be an intrinsic feature of a person that is tied to abstract, unobservable properties. Given that adults naturalise race and see it as biologically grounded, ascertaining whether children also have a theory-like view of race means discovering whether children see race as

being biologically controlled. In turn, this involves determining the extent to which children's biological knowledge accords with adults' biological understanding.

In an extensive series of studies, Hirschfeld (1995) examined whether young children's understanding of race is superficial or whether their understanding involves a naturalised, essentialist construal of race. In this study, the following biological attributes of race were examined: that race is defined in terms of physical properties that are fixed at birth, that it is derived from family background and that it is immutable over the life span. Hirschfeld (1995) presented 109 children in three age groups (three, four and seven year-olds) with two sets of line drawings. Each set consisted of a picture of an adult and two pictures of children of the same gender. Each adult was depicted in terms of his or her race, body build and occupation (e.g., a stocky, black police officer). Each of the comparison pictures shared one of the three characteristics (e.g., a stocky white child dressed up as a policeman versus a stocky black child with no occupational apparel). Subjects were either asked which of the comparison pictures was the target as a child or which of the comparison pictures was the target's child. If children understand the biological implications of race they should override the influence of superficial appearance such as occupational apparel when making judgements about inheritance and growth.

The results indicated that children judge race to be more biologically grounded than occupation or body build. That is, children expect race to be inherited and to remain unchanged over the life span more than occupation or body build. If, as previous work suggests, children focus only on surface features then alterations in body build should signal a change in identity just as readily as change in race does. Despite the fact that all three attributes are visually obvious, socially relevant and stereotyped dimensions, even pre-school children believe race is a better predictor of identity than body build or occupation. In summary, "even pre-schoolers see race as immutable, corporeal, differentiated, derived from family background and sensitive to biological principles of causality" (Hirschfeld, 1995, p.226).

These data suggest that young children can reason deeply about intrinsic properties such as race. That is, children's beliefs about race appear to be naturalised and involve essentialist reasoning. Children use essentialist reasoning in that they expect racial

identity to emerge out of a non-obvious substance. Furthermore, consistent with findings on gender concepts, young children do appreciate the biological implications of race. However, Hirschfeld (1996) argues that although adult and child racial beliefs include features of naïve biology, they are not derived from biological principles. Instead, he argues that mental representations of human groups are governed by a distinct domain of naïve sociology. That is, there is a domain-specific competence for the social domain that underlies essentialist thinking about social categories, such as race (Hirschfeld, 1995; 1996). The proposal that naïve sociology constitutes a core domain of thinking is a relatively new one and a lack of research makes it impossible to confirm or deny its existence.

The research findings on children's racial and gender concepts have major implications for domain-specific research. Contrary to Carey (1985), they suggest a biological to social shift in children's social category understanding. Furthermore, this area of research increased debates about whether children can engage in more than one form of causal reasoning given the dual contribution of biological and social factors to gender and racial differences. The findings suggest that with age, children come to differentiate the importance of biological and social factors in appropriate ways. However, due to the methodology employed in the gender and racial studies, it is unclear whether young children *prefer* to reason about complex phenomena using only one causal-explanatory framework (biological) or whether they are *cognitively unable* to utilise more than one domain of thought (biological and social). Nevertheless, ascertaining how children conceptualise more complex phenomena is important for domain-specific research. To this end, a phenomenon which is currently under-researched, but which could contribute greatly to domain-specific theories of cognitive development is children's understanding of disability.

#### **2.4 Children's Concepts of Disability**

In recent years, investigators have become interested in children's concepts of disability. This is largely due to an increasing concern about the integration of children with disabilities into mainstream schools. Most of this interest has been in children's attitudes towards disabled and non-disabled peers but some research has focused on children's understanding of disabilities (Diamond, 1993; Lewis, 1995). Although not grounded in a strong theoretical perspective, previous research has provided some

information on the early development of ideas about disability. In particular, young children's understanding of disability appears to be influenced by visually salient features (Diamond, 1993; Conant & Budoff, 1983). Consistent with earlier research on racial and gender concepts, children frequently mention visible aspects of disability such as walking frames, wheelchairs and glasses.

Children's knowledge of disability has received far less attention as a research topic than racial and gender concepts. It is unclear why this is the case. Due to theoretical and practical interest in educational inclusion (Thomas, Walker & Webb, 1998), children will have increasing opportunities to interact with disabled peers. A general increase in standards of health has led to a greater life expectancy of people with handicapping conditions (Thomas, 1982) and as such both children and adults now have far more opportunity to encounter others with disabilities. Investigating children's developing concepts of disability therefore seems an especially pertinent and necessary area of research.

Disability could be an under-researched area however, because it is not perceived as having any great psychological significance. In other words, it could be that it is not considered to be as potent a social category as race and gender. As discussed earlier, for both adults and children, racial and gender concepts are inferentially potent categories (Hirschfeld, 1995; Taylor, 1996). That is, they invoke a notion of underlying essence and use biological causal principles to reason about gender and racial differences. In contrast, in the disability literature, any focus on the biological and intrinsic aspects of disability is frequently criticised (Oliver, 1996; Shakespeare, 1996; Hedlund, 2000). The argument is that by focusing on the biological cause or visible physical abnormality, this frames disability as an intrinsic, individual problem as opposed to a societal problem. From this viewpoint, research on race and gender is reality-based in that it examines how children and adults actually think about these categories, whereas research on disability tends to be belief-based. That is, scholars have debated how disability should be represented as opposed to how disability is actually understood.

From this prevailing viewpoint it is not perhaps surprising that a psychological approach to disability concepts has received very little attention, especially in relation

to children. How and when children develop ideas about disability has rarely been investigated as part of ongoing cognitive development, nor has it been related to developing conceptions of race and gender. Yet, the fact that disability is such a multifaceted concept, makes it an ideal candidate for research within a domain-specific perspective. Given research on children's ability to co-ordinate their core domains of thought, it would be of interest to examine the ways in which children utilise and differentiate this knowledge when reasoning about disability. Younger children may draw on several core domains of knowledge to reason about disability, but may not do so in an appropriate way. For example, children may draw on biological knowledge (some people are born with learning difficulties), psychological knowledge (learning difficulties can be corrected through personal effort) or physical knowledge (an accident or trauma leads to learning difficulties), although not doing so in a discriminating way. As is the case with race and gender, older children's concepts of disability may be more multifaceted and differentiated. Consequently, asking children about their ideas of disability at different ages could reveal the extent to which they can simultaneously co-ordinate multiple causal frameworks to explain the same phenomena. Ascertaining when children become aware of the biological nature of disability could also contribute to current debates on the status and development of naïve biological knowledge. Given recent findings on the biological to social shift in children's understanding of race and gender, it seems reasonable to explore whether children's disability concepts follow a similar developmental path. All of these issues will be addressed in this thesis.

## **2.5 Summary and Conclusions**

This chapter has described empirical research on the content of children's core knowledge domains. Prior to formal education, young children develop ontological and causal ideas about the physical, psychological and biological world in which they live. This chapter has shown that while limited in number, studies on children's multi-causal reasoning are important for exploring issues central to theories of domain-specificity. These studies suggest that children must be able to utilise and co-ordinate more than one core domain of thinking, especially when reasoning about complex phenomena, such as gender and race. However, research on children's concepts of more complicated phenomena is currently lacking, especially from a domain-specific perspective. This chapter has introduced disability as a potential candidate for such

research. However, as Chapter 3 will demonstrate, not only is generic research on children's disability concepts lacking: few studies attempt to link children's disability concepts to ongoing cognitive development or current developmental psychology theories.



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## CHAPTER 3

### Children's Understanding of Disability

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#### 3.1 Traditional Research on Disability Concepts

Despite its potential to enhance discussions about domain-specificity, research on children's disability concepts is lacking. Much of the earlier work focused on children's awareness of and attitudes towards disability and was motivated, in part, by the rise in inclusive educational practices (Thomas, Walker & Webb, 1998). Furthermore, previous studies that have examined children's concepts of disability have done so without a strong theoretical underpinning (Conant & Budoff, 1983; Sigelman & Begley, 1987; Goodman, 1989). Such studies often included only one or a small number of disabilities and examined a limited age range of children.

The first section of this chapter will summarise previous work on children's attitudes towards and awareness of disability. Thereafter, studies specifically addressing children's understanding of disability will be discussed and related to a domain-specific approach to cognitive development.

#### 3.1.1 Children's Awareness of Disability

Children, in their pre-school years, can recognise physical and behavioural differences in others (Conant & Budoff, 1983; Aboud, 1988; Diamond, 1993). In order to assess patterns of expressed awareness, Conant & Budoff (1983) interviewed typically developing children and adults about blindness, deafness, orthopaedic disabilities, mental retardation and psychological disturbance. They found that even three to five year-olds were able to understand that it is possible for someone to have a visual, hearing or physical handicap. However, young children were less aware of mental retardation or psychological disturbance. These type of impairments involve abstract characteristics which are relatively unobservable and therefore would not be immediately obvious to children (Conant & Budoff, 1983). Young children's awareness of disability is not explicable in terms of the incidence of such disabilities in the population. Blindness is relatively rare but emerged as a disability of which most



young children are aware (Conant & Budoff,1983). Indeed, the disabilities mentioned by the younger children in this study involved highly salient, perceptual features. Some of these salient characteristics are inherent in the disability whilst others refer to adaptive equipment (e.g, walking sticks and dark glasses). This study shows that even pre-school children can recognise the presence of salient disabilities in others, despite limited direct experience with such impairments. The role of experience in how children form disability concepts is a topic which will be returned to throughout this thesis (see Chapter 6).

### **3.1.2 Children's Attitudes Towards Disability**

Previous research suggests that children's attitudes toward people with disabilities also develop during the pre-school and early school years (Favazza & Odom, 1997). In a review of peers' attitudes to disability, Horne (1985) states that "there is substantial evidence that handicapped students are rejected by their classmates" (p.135). However, most of the studies reviewed by Horne (1985) included children of nine years or older and therefore it was unclear how young children would react to disabilities.

Several researchers have in fact suggested that younger children are more accepting of the disabled than older children. Indeed, this was found in a study examining children's attitudes to physical impairments (Richardson, Goodman, Hastorf & Dornbusch, 1961; Richardson, 1970). In one study, Richardson (1970) examined reactions towards various physical disabilities of children from kindergarten through high school. Participants were shown a series of drawings of children with and without physical impairments and were asked to rank order the pictures in terms of preference. The results showed that preferences for certain physical impairments are present in children aged five and six years. Interestingly, this is the only age at which the non-disabled child is not the most liked. For every other age group, the child without the disability is liked more than any of the physically handicapped children. Indeed, Morgan & Wisely (1996) found that primary-school children's ratings of both attitudes and behavioural intentions toward a child in a wheelchair became significantly less positive with age. These findings suggest that younger children may be more socially accepting of children with physical differences than older children.

In relation to learning difficulties, a number of studies have shown that children with developmental delay are consistently less preferred playmates than their peers (Guralnick & Groom, 1987). The acceptance of children with developmental delays by their typically developing peers appears to vary with the severity of the child's delays, although even children with mild delays are less accepted as playmates than their typically developing peers (Guralnick, Connor, Hammond, Gottman & Kinnish, 1996). Guralnick (1992) suggests that these peer interaction difficulties may be associated with deficits in social communication skills and appropriate interaction strategies. In contrast, others have argued that children may be more accepting of a peer who is not expected to perform well than a child for whom there is no explanation for poor performance (Budoff & Siperstein, 1978). Thus, the implication of this argument is that children with severe learning difficulties may be more accepted by peers, than a child with only mild developmental delay.

This possibility was explored by Lewis & Lewis (1987) who investigated the attitudes of young children towards peers with severe learning difficulties. In this study, a group of six and seven year-olds who were involved in an integration project with children with severe learning difficulties (SLD) were interviewed to assess their attitudes towards peers who were described as 'not very clever' and peers with SLD (Lewis & Lewis, 1987). The children reported mixed attitudes towards 'not very clever' classmates. However, all the children expressed positive attitudes towards children with SLD and described them in much more sympathetic terms than classmates with difficulties. The children appeared to be making a qualitative distinction between children with SLD and those that were 'not very clever' (Lewis & Lewis, 1987). This study was important because it highlights the significance of experience by showing that after a period of integration with children with SLD, typically developing children held positive attitudes towards this group.

In the past few years, further research has explored the effect of inclusive settings on children's attitudes to disabilities. Peck, Carlson & Helmstetter (1992) reported that parents and teachers believe participation in an inclusive classroom promotes typically developing children's appreciation for diversity and enhances their pro-social skills. This has been supported by recent work on children's interactions in inclusive pre-school settings. In a study of social relationships between three children with SLD and

three typically developing children in an inclusive summer programme, Hanline (1993) found no evidence of peer rejection of children with SLD. In fact, typically developing children tended to be more persistent in obtaining a response from a child with a disability than from another peer. Similarly, Buysse (1993) also found that the majority of children with disabilities who attended an inclusive school had at least one mutual friend. In one recent study, Diamond (2001) reported that children who had social contact with classmates with disabilities had significantly higher scores on measures of emotion understanding and acceptance of individuals with disabilities, than did children who had contact with typically developing classmates only.

Recently, Favazza & Odom (1997) reported that kindergarten children's attitudes towards peers with a variety of disabilities (learning, sensory, physical, language) became more positive after they participated in an intervention that used children's books, guided discussion, home activities and structured opportunities to play with children with disabilities. They were significantly more accepting of peers with disabilities and had a better understanding of the term 'handicapped'. However, Swaim & Morgan (2001) found that, children's attitudes and behavioural intentions towards a peer with autistic symptoms did not improve when given educational information about autism. Taking these findings together, it is evident that contact with peers with disabilities, may help foster positive attitudes in children. As Giangreco (1996) suggests "inclusion of children with disabilities, beginning in child care centres and pre-schools, is an early step in developing a new generation that experiences the diversity presented by disability as a routine part of everyday life" (p.207).

### **3.2 Previous Research on Children's Understanding of Disability**

Although research on children's reactions towards disability and attitude formation is invaluable for informing policy and understanding of educational inclusion, it does not tell us much about children's conceptions of disabilities. That is, few studies have addressed whether children have any ideas as to the causes of disability or whether they perceive disability to be a chronic and uncontrollable condition. Furthermore, little is known about children's understandings of the outcomes or consequences of disability. This lack of research is surprising given that knowledge about disability may directly influence children's attitudes (Triandis, 1971). Additionally, of the work



on children's understanding of disability that has been carried out, few attempts have been made to relate their disability concepts to broader conceptual development. For example, little is known about the structure of children's disability concepts, what the precise content is of these concepts or the process by which disability concepts develop. The remainder of this chapter will therefore describe previous research on children's understanding of disability and will show early attempts at relating knowledge of disability to broader cognitive structures.

### ***3.2.1 Children's Causal Concepts of Disability***

There is a distinct lack of research into children's causal conceptions of disability. The few findings that do exist in the literature are usually part of a larger study that is not grounded in a conceptual development theoretical framework. Indeed, the impetus for most of the disability concept research has not been to understand cognitive development more fully, but is rather a reflection of the rise in inclusive practices which has seen an increasing interaction between typically-developing children and children with disabilities (Bricker, 1995; Thomas, Walker & Webb, 1998). Previous studies have also usually focused attention on only one particular age group or a specific disability. As a result, it is difficult to ascertain developmental changes in children's concepts of disability, whether children's knowledge varies as a consequence of disability type or how direct experience affects disability concepts. This section will review previous findings on children's causal concepts of physical, sensory, learning and behavioural disabilities.

One of the few researchers to conduct studies into children's disability concepts is Diamond (1993; 1994; 1996). Diamond's focus of research is in pre-school conceptions of disabilities, given that integrated pre-school education is now seen as 'best practice' for young children with disabilities (Salisbury, 1991). In an early open-ended interview of children's disability concepts, Diamond (1993) interviewed four year-old children about their peers with disabilities. Children readily identified classroom peers with significant physical or cognitive disabilities but not those with speech or language delays. More importantly, young children were able to offer causal explanations for their peers' disabilities. The most common explanation for why a peer was disabled was references to immaturity. Responses included comments such as, "he's small" and "when she gets bigger she can walk". Other responses included describing the

disability without referring to its cause "she's handicapped" or referring to an accident or trauma, for example "he broke his leg". This research is an important contribution to the literature because it shows pre-schoolers are able to reason causally about the origins of disabilities. Moreover, given the open-ended methodology employed in this study, it provides preliminary evidence that pre-schoolers can give spontaneous causal explanations for disabilities.

Since this study, further investigations have examined children's causal conceptions of disability (Diamond, 1994; 1996). Diamond & Hestenes (1996) asked children aged three to six years to explain the presence of physical, sensory disabilities and Down syndrome in photographs of unfamiliar children. Children were most likely to mention equipment as the reason for a physical or visual disability such as "she can't walk because she's in that thing" or "she can't see because she's got that thing over her eye"(Diamond & Hestenes, 1996). Consistent with previous findings (Diamond, 1993), children also referred to immaturity as a reason for disabilities, especially Down syndrome. The majority of children could not offer a causal explanation for hearing loss.

In order to gain a better understanding of children's causal conceptions of disability, Diamond applied a cognitive developmental framework outlined by Bibace & Walsh (1979) to children's explanations. Bibace & Walsh (1979) developed a method of probing responses about illness in order to determine which cognitive processes are framing children's explanations. They compiled 12 questions assessing children's understanding of illness-related concepts such as colds and germs (Bibace & Walsh, 1981). They then classified causal explanations into a Piagetian framework (1929) of cognitive development as it relates to children's health and illness concepts. For example, Bibace & Walsh's (1979) research suggests that children in the pre-operational period typically progress through three phases of reasoning about health and illness concepts. Firstly, children evidence incomprehension. Their responses are either nonsensical or they do not respond at all. The next level of reasoning is phenomenism in which illness is seen in terms of one single symptom that children may associate with an external but concrete cause. In the final phase of reasoning, illness is still seen in terms of a single symptom but this has more relevance than in the other developmental phases.



Utilising the framework outlined above, Diamond (1993; 1996) argued that at pre-school level, the cause and the disability are considered related through association rather than through a causal sequence of events. For example, responses such as “she can’t walk because she has a wheelchair” occurred far more than “she can’t walk because she didn’t get enough oxygen to her brain when she was being born” (Diamond & Hestenes, 1996). According to Diamond (1993; 1996), as pre-schoolers are operating within the pre-operational level they tend to exhibit the least mature level of explanation of disabilities. This research suggests that instead of explaining disability in terms of an underlying cause, pre-schoolers report salient physical features of the impairment without indicating a cause. Pre-school children seemed to be swayed by characteristic features that are easily observable but which lack any causal relevance. Indeed, it has been argued that young children are often said to be ‘perceptually seduced’ by typical features (Keil, 1989). Research in the conceptual development literature (see Chapter 2, section 2.3) suggests children’s initial concepts are based on concrete observable properties which only later become more abstract with age. In relation to disability, Lewis (1995) has proposed that children’s disability concepts may also proceed from the concrete to the abstract.

The Piagetian cognitive framework designed by Bibace & Walsh (1979) is an interesting approach to understanding children’s disability concepts and it is one of the few attempts to assimilate children’s knowledge of disability within their existing cognitive structures. However, as discussed in Chapter 1, the more recent domain-specific approach to children’s knowledge has gained in popularity and may offer further insights into children’s reasoning about disability. Recent evidence reviewed in Chapter 2 suggests that prior to formal schooling, children show evidence of physical, psychological and biological reasoning systems which enables them to provide causal explanations for everyday phenomena. As such, children could have a greater causal understanding of disabilities than first anticipated. Indeed, the studies that follow suggest that children are able to report non-obvious, abstract causes for disabilities.

Although young children do frequently mention physical cues such as adaptive equipment when asked to explain the cause of disability (Diamond, 1993; 1996), there is some evidence that they can go beyond this. Sigelman & Begley (1987) examined five



and nine year-olds understanding of peers with uncontrollable and controllable problems. Although most five year-olds were unsure as to why a child might be in a wheel-chair, birth defects and accidents were mentioned with some frequency and controllable internal causes, such as lack of personal effort, were never cited. Even five year-olds were sure about what does not cause physical disabilities: personal failings. Therefore, although young children may not be aware of the specific mechanisms involved in birth defects for example, they still offered this spontaneously as a possible cause of disability. This finding is consistent with suggestions that children initially have a sense of causal potency (Keil, 1999; Wilson & Keil, 2000) in a domain and acquire foundational understandings even in the absence of specific knowledge (Wellman & Gelman, 1998).

Interestingly, Sigelman & Begley (1987) found that different causes were offered for learning and behavioural difficulties. The results showed that 53% of the younger children and 69% of the older children attributed learning difficulty to controllable causes such as not paying attention or trying hard enough. Similarly, in explaining aggression, younger children cited lack of personal control as the cause. This explanation was significantly rarer among older children. Older children were more likely to mention environmental factors such as parental treatment for causes of aggression. These responses suggest that although younger children frequently mention internal causes such as birth defects, older children appreciate the role of the environment in causing disabilities. Moreover, children of all ages appear to make a causal distinction between learning or behavioural difficulties and other types of disabilities.

According to Lewis (1995), children's understandings and misunderstandings about disability arise largely because children are too immature cognitively to understand some aspects of disability. Specifically, she suggests that disabilities with physical indicators will be understood at an earlier age than disabilities which lack physical indicators such as emotional or learning disorders. Support for this suggestion can be found in evidence that younger children are more aware of physical and sensory disabilities than learning or psychological difficulties (Conant & Budoff, 1983). Physical attributes are very salient for young children and feature prominently in their descriptions of others (Aboud, 1988; Keil, 1989; 1994). As such, disabilities with

physical indicators will be more readily understood than less obvious difficulties. Indeed, there is much evidence that points to children's difficulty in understanding learning disorders. In one such study, Lewis (1993) interviewed typically developing seven and eleven year-olds about their understanding of SLD. It was found that understanding of SLD lagged behind understanding of more visible group differences such as ethnicity or gender roles. The seven year-olds described children with SLD in mostly physical terms with frequent references to clothing, hearing aids or spectacles of the children with SLD. The most obvious cognitive characteristics of children with SLD were mentioned relatively infrequently by this age group. Moreover, most seven year-olds were confused about the nature of SLD with only one child reporting that "handicapped means you got something wrong with your brain" (Lewis, 1993, p.137). In contrast, many of the eleven year-olds explained SLD using phrases such as "big bodies, young minds" and "their brains younger than what their bodies are" (p.140). This study shows that only older children understand the quintessential aspects of learning difficulties; namely the cognitive component of the condition.

Similarly, Glasberg (2000) explored the development of understanding of autism in siblings of individuals with autism or a related disorder. She used the cognitive developmental framework described earlier to categorise children's causal conceptions. A total of 63 sibling pairs were included and were classified into one of three age groups: five and six year-olds were assumed to be in the pre-operational stage of development, seven to ten year-olds represented concrete operational reasoning and children above eleven years were expected to perform at a formal operational level. The results showed that although understanding the cause of autism increased with age, all participating siblings demonstrated reasoning within the pre-operational period. However, it is possible that the siblings' understanding of autism was influenced by what their parents had previously told them about the condition. Nevertheless, Glasberg (2000) concluded that children's difficulty in acquiring autism-related concepts may stem from the nature of the disorders. Consistent with Lewis (1993; 1995) she suggests that, "these concepts, being more abstract and less common than many physical illnesses, may simply be more difficult to grasp" (p.151). Furthermore, such difficulties seem to be robust despite direct and extensive social experience. Future studies should aim to establish the types of experiences that can shape children's knowledge of disabilities. Additionally, the interplay between social

experience and children's ability to understand cognitively some aspects of disability needs to be fully explored.

In contrast, Goodman (1989) found that by middle childhood, children had acquired a sophisticated understanding of learning difficulties. Children aged eight and nine years were interviewed concerning their ideas about learning disability as well as related terms such as 'smart' and 'dumb'. Interestingly, this is one of the few studies that used labels in their descriptions of children with disabilities, an issue that will be investigated in Chapter 7. Although most children believed personal effort could make a person 'smart' or 'dumb', personal effort was an infrequent explanation for learning disability. By contrast, the cause of such difficulties was thought to be largely constitutional; responses included it is the "way they are", "God made you that way" and "birth defects" (Goodman, 1989). As such, akin to findings from Lewis & Lewis (1987), learning disability was not thought to be the tail end of the intelligence continuum. Children drew a sharp distinction between a learning disability and those considered, 'smart' or 'dumb'.

Unfortunately, few studies exist on children's conceptions of emotional/behavioural disorders. One exception is an early study conducted by Maas, Marecek & Travers (1978). They examined seven year-olds, nine year-olds and eleven year-olds conceptions of disordered behaviour. Children were given three descriptions of a character exhibiting either antisocial, withdrawn or self-punitive behaviour. In particular, children were asked what caused all of these behaviours. Two categories of causal factors emerged from the data. The category of internal causation included responses stating that the character was 'born that way' or that the behaviour had been a result of a disease process or physical injury. The second category of responses were social-environmental and stated that the behaviour was caused by treatment of family or friends. Consistent with findings from Sigelman & Begley (1987), younger children saw internal factors as the pre-dominant cause of disordered behaviour while for older children social-environmental factors took precedence. With increasing age, children were also likely to believe that disordered behaviour could be most effectively changed by altering the environment, such as finding new friends. This shift towards environmental thinking may be linked to the diminishing role of Piaget's 'egocentrism' (Maas et al., 1978). However, an alternative interpretation is also possible. As reported

in Chapter 2, findings by Taylor (1996) and Hirschfeld (1995) have shown that children initially construe gender and race in biological ways and only later appreciate the causal role of the environment. Children's causal understanding of behavioural difficulties and other less obvious disabilities may also follow a similar developmental path.

To summarise, ideas about the causes of disability seem to be early-developing in children. However, the quality of the causal explanations provided by children varies between studies. In much of Diamond's research (1993; 1994; 1996), young children were often unable to offer a causal explanation or they mentioned salient, physical features of the disability without indicating a cause. One interpretation of these findings is that pre-schoolers are too cognitively immature to be able to reason appropriately about the origins of disability (Diamond, 1993). However, in other studies, young children were able to go beyond the phenomenal by reporting unobservable causes such as birth defects or intentional causes such as lack of willpower. It is difficult to reconcile these findings given differences in research methodology and in the type of disabilities examined.

Interesting parallels can be drawn with the domain-specific literature. The range of causal explanations that children offer for disabilities parallels the types of causal-explanatory reasoning systems found to be early in childhood in relation to other phenomena. For example, children's explanations of disability range from the biological (e.g. birth defects), to the physical (e.g., accident or trauma) and psychological (e.g., lack of effort). As noted in Chapter 2, naïve biology, naïve physics and naïve psychology are all thought to be core domains of thought for young children. Furthermore, children's causal understanding of disability may shift from the internal and biological to the external and social. This however requires detailed examination and will be explored in Study 1b. Interestingly, the biological to social shift is also reported in children's concepts of other social categories such as race and gender. Despite the similarities between domain-specific cognitive research and children's disability concepts, no previous attempt has been made to reconcile these disparate areas of research. Recently in a review of children's learning disability concepts, Lewis (2002) supported the importance of bringing these areas together. This thesis is the first endeavour to do so.

### **3.2.2 Children's Understanding of the Controllability and Chronicity of Disability**

The previous section has shown that causal knowledge of disability develops early in childhood. An awareness of the origins of disability, for adults at least, affects perceptions of the chronicity and controllability of disability. For example, if a disability is thought to be congenital in origin then the disability is likely to be permanent and not within intentional control. Similarly, disabilities that are due to an accident or trauma, although not controllable, may be curable through medical intervention. Although adults may make such inferences, due to lack of research it is unclear whether children recognise that some disabilities are chronic and uncontrollable.

Lewis (1995) suggests that understanding the permanency and irrevocability of disability does not develop until seven or eight years of age. It is argued that this is due to a general shift in children's knowledge about which aspects of group membership do not change. Previous studies reviewed in Chapter 2 have shown that by seven or eight years, children recognise gender and ethnicity to be permanent and irreversible characteristics (Taylor, 1996; Hirschfeld, 1995). Furthermore, Lewis (1995) suggests that understanding the chronicity of less well-recognised disabilities would occur at a much later age.

There is some support for these suggestions. Sigelman (1991) investigated the effect of causal information on children's understanding of physical problems. Participants aged six and nine years-old heard descriptions of obese or wheel-chair bound girls and were presented with causes which were either uncontrollable (through disease, birth defects or bad parental treatment) or unknown. Children were then asked to comment on whether the girls could control such conditions. The findings showed significant age differences in judgements of controllability. Younger children, despite being told the condition was caused by birth defects, were optimistic about the possibility of alleviating the problem. They did not appreciate the difficulty in undoing the effects of birth defects. In contrast, older children viewed problems caused by birth defects to be less remedial than problems of unknown cause or parental treatment. Additionally, young children had much greater confidence in the ability of adults to 'fix' the problems regardless of the causality. This study shows that in contrast to their older



counterparts, young children are less aware of the uncontrollability of physical impairments. The finding supports suggestions by Lewis (1995) that an awareness of the permanency of disabilities develops with age.

Young children do certainly have difficulty understanding the permanency of learning difficulties. Lewis (1993) has shown that most seven-year-olds are unaware of the chronicity of SLD. Only 26.3% recognised that SLD was irrevocable and 36.8% reported that children with SLD would grow out of their difficulties. By eleven years, children understood that SLD could not be changed or outgrown and were aware of the limits of medical intervention. Similarly, as results from a study reported earlier show, by nine years children recognise the irreversibility of learning difficulties (Goodman, 1989). Only a third of children aged eight and nine years, who when interviewed about their ideas of learning disability, believed it was curable. Therefore, by middle childhood, children begin to appreciate the chronicity and uncontrollability of learning difficulties. This parallels interesting work on children's intuitions about the controllability of mental states. Young children usually overestimate people's control over their mental states (Wellman & Hickling, 1994; Flavell & Green, 1999). Moreover, young children are largely unaware of the mind's proneness to faulty interpretations, memory distortions and other shortcomings (Carpendale & Chandler, 1996).

Taken together, these studies provide support for the suggestion by Lewis (1995) that an understanding of the permanency of disabilities does not emerge until middle childhood and that this is especially the case for less visible disabilities. However, what is unclear is whether children can link their ideas about the causes of disability with their judgements of controllability and chronicity. A brief look at previous research suggests they cannot. For example, in Maas et al., (1978), young children were more likely to offer internal biological causal explanations for disordered behaviour. Yet, in contrast to older children, they also judged the behaviour to be controllable through personal effort. Similarly, Sigelman & Begley (1987) found that even when children were provided with causal information about physical and learning disabilities, this had no effect on judgements of controllability. They concluded that "perceived responsibility for solving problems does appear to be independent of perceived responsibility for causing problems" (p.112). One suggestion is that children were not aware during the study that they should keep track of their responses and link them



together in a sensible way. However, another interpretation is also possible: that children's concepts of disability are not theory-like (see Chapter 1, section 1.2.4). That is, their ideas about the causes, controllability and chronicity are not structured in a coherent fashion. As noted in Chapter 2, whereas children's understanding of the physical and psychological worlds may be theoretical, knowledge of complex social categories may not be structured in this way. This possibility will be addressed in this thesis, to be reported in Chapter 5.

### ***3.2.3 Children's Understanding of the Consequences of Disability***

In addition to the development of ideas about the causes, controllability and chronicity of disability, previous research has also shown children develop concepts about the consequences of disability. There are very few studies on children's knowledge of the outcomes or consequences of disability. The most detailed investigation of this issue has been the work by Diamond and colleagues (1994; 1996). Diamond (1994) explored how pre-school children without disabilities think about the skills of their classmates with mild learning difficulties and severe physical disabilities. Using an adapted version of Harter & Pike's (1984) Pictorial Scale of Perceived Competence and Social Acceptance, children aged three to five years, enrolled in inclusive classes, rated their disabled classmates on cognitive, language, physical competence and peer acceptance. The results showed that children with disabilities were judged to have lower cognitive, language and physical competencies. Furthermore, children were sensitive to differences as a function of disability type. The child with a physical impairment received lower ratings for physical competence. However, pre-schoolers rated the child with a learning difficulty as less competent on cognitive, physical and language tasks.

Similar findings were also reported by Diamond & Hestenes (1996). Using the same methodology, pre-schoolers recognised that physical skills would be compromised in someone with a physical disability. Children seemed more confused however about the consequences of sensory disabilities. For example, the consequences of a hearing impairment where difficulties in one area (e.g., hearing) affect performance in a different area (e.g., language) appeared to be too complex for young children. However, Diamond (1994) has shown that participation in a classroom with a severe hearing-impaired peer can improve pre-schoolers understanding of hearing loss. Children who had a deaf classmate were more likely to understand the complex

relationship between the ability to hear and the ability to speak. This suggests that classroom inclusion and social experience more generally can influence young children's understanding of disabilities.

In one study (Diamond, Hestenes, Carpenter & Innes, 1997), the direct effects of participation in an inclusive pre-school class on children's understanding of the consequences of disability was assessed. Participants were pre-school children enrolled in either a mainstream or inclusive school programme. Children were interviewed to learn their ideas about immediate and long-term consequences of physical and sensory disabilities. Using the competency rating scale as in Diamond (1994; 1996), children were asked to judge peer performance on physical, hearing, visual and social activities. In addition, children were asked a series of open-ended questions about the consequences of disability. The results indicated that children in both mainstream and inclusive schools were accurate in identifying the consequences of disability for peers with different disabilities. However, pre-schoolers in inclusive settings were more likely than other children to state that physical and sensory disabilities would persist into adulthood. This finding is consistent with children's experiences since classmates with disabilities continue to have their disability, day in day out. Diamond et al. (1997) suggest pre-school children may acquire basic knowledge about disability from a variety of sources but that understanding more complex aspects of disability, such as the long-term consequences, may be more easily learned in an integrated environment.

Some interesting work has shown that children tend to generalise difficulties about one disabled group and apply it to a less well-known disability. Maras & Brown (1992) talked to school children who had what they described as 'categorised' and 'decategorised' contact with children with physical and learning disabilities. 'Categorised' contact described an integration where disabled children are clearly identified as members of a group of similar others. 'Decategorised' contact was where integration is taking place but children with disabilities are not clearly identifiable to their mainstream peers as being members of a particular group. It was found that children who had 'categorised' contact with children who had a visible, salient disability were able to make accurate distinctions between physically disabled and non-disabled children. However, those children who had 'categorised' contact with

children whose disability was not so immediately obvious tended to distinguish less between one disability and another.

Similarly, a study by Lewis (1993) cited earlier, demonstrated the difficulty younger children had in differentiating between the limitations of SLD and other disabilities. At age seven, typically-developing children drew strong distinctions between themselves and children with SLD. They perceived little intra-group SLD differentiation and tended to confuse learning difficulties with sensory and motor disabilities. However, by age eleven, the conceptual distinctions between typically developing children and those with SLD were looser and differences within SLD groups were being recognised. Indeed, Lewis (1995) has suggested that a major change in children's disability concepts is an awareness of intra-group differences. The recognition of intra-group differences and inter-group similarities requires conceptual differentiation whereby the child refines group boundaries in order to assess whether individuals are members of a particular group. Children who, for example, understand the nature of SLD will be able to recognise that children who have SLD vary from one to another in terms of gender and ethnicity. Additionally, characteristics such as good health can vary within learning disabled groups and do not define differences (Lewis, 1993). The tendency to over-generalise the difficulties that different disabled groups experience is evident among younger children. This tendency is further exacerbated when the disability is abstract and has few visible cues. Thus, it may be useful to explain to children the limited set of consequences of a disability so they do not infer difficulties that do not exist. The development of conceptions about the consequences of different disabilities is to be explored in Study 1a.

### **3.3 Taking a Domain-Specific Approach to Children's Disability Concepts**

Research within the disability tradition has indicated that concepts of disability emerge during the pre-school years. That is, young children develop ideas about the causes, controllability, chronicity and consequences of disabilities. Although children's concepts of disability are of great educational relevance, little attempt has been made to relate the development of these concepts to broader cognitive changes. Consequently, we do not know how children's disability concepts are structured, what the specific content of these concepts are or what factors affect the acquisition of disability concepts. An exception to this has been research using a Piagetian framework which has related

children's causal concepts of disability to Piagetian stages (Diamond, 1993; Glasberg, 2000). However, this is only one theoretical stance and domain-specific approaches to cognitive development may offer a fruitful alternative paradigm. Domain-specific research now suggests that prior to formal education, children have three core domains of thought that they use to reason about everyday phenomena: naïve physics, naïve psychology and naïve biology. Consequently, investigating children's understanding of disability within this framework could be a useful avenue for research, for both theoretical and applied reasons.

In the disability literature, young children appeared to have difficulty indicating a cause for disabilities and instead referred to physical, salient features of the disability (e.g., wheelchair). Yet concurrently, other studies within the disability literature, reveal several different types of causes that young children can produce for disabilities. These include biological explanations such as birth defects, physical explanations such as accidents and psychological explanations such as lack of effort. These explanations parallel the core domains of thought evident in young children. As such, children's core reasoning systems could be the driving force behind causal explanations of disability. Relatedly, these framework understandings may help children to reason about the causes of disability even if they lack specific knowledge about the causal mechanisms (Wellman & Gelman 1998; Keil, 1999).

It seems feasible to suggest that children can potentially use their core domains of thought to reason about the controllability and chronicity of disability. Children who use psychological-intentional reasoning for example, may judge disabilities to be controllable through personal effort. Similarly, disabilities that are interpreted using biological reasoning could be perceived as fixed and irreversible. However, whether children can use their core reasoning systems in a theoretical way to think about disability concepts and whether this ability is dependent on developmental level is unclear. For example, children may be unable to relate their causal understanding of disability to their judgements of controllability and chronicity. Thus, concepts of disability, at least for younger children may not be theoretical. Young children may also be unable to tailor particular causal explanations to specific types of disability in an appropriate and flexible manner. This lack of integrated understanding can be observed in the traditional literature on disability concepts. As discussed earlier, young

children's causal and controllable judgements of disability rarely tie together (Maas et al., 1978; Sigelman & Begley, 1987). Moreover, they tend to generalise the consequences of disability from one developmental domain to another. Young children appear unable to reason about the different aspects of disability in a coherent and tailored fashion. At the heart of the domain-specific approach is the notion that core knowledge is structured as an intuitive theory and therefore this approach may be particularly useful for exploring the extent to which children's disability concepts are theoretical.

### **3.4 Summary and Conclusions**

In summary, previous research into children's disability concepts can be readily interpreted within a domain-specific cognitive developmental framework. This approach has the potential to offer new insights into children's understanding of disability; that is, the notion of theory-like concepts (Gopnik & Wellman, 1994; Carey, 1995) and intuitive causal understandings (Wellman & Gelman, 1998; Keil, 1999; Wilson & Keil, 2000). By adopting this framework, researchers could ascertain which core domains of thought children co-ordinate when reasoning about complex phenomena, such as disability. Furthermore, such research would be an original contribution to the already existing literature on disability concepts.

The first study to be reported in this thesis examines the development of children's conceptions of the consequences of disability. As noted earlier, there is a lack of studies into this aspect of children's disability concepts and the existing studies have been limited by their narrow age range of participants and selective types of disabilities included in the investigations. Thus, the study reported in the following chapter, aims to provide a more comprehensive overview of consequential concepts of disability in childhood and examines the extent to which children have principled and differentiated knowledge of disability.



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## CHAPTER 4

### An Exploratory Study into Children's Conceptions of Disability

#### <sup>1</sup>Study 1a: Understanding the Consequences of Disability

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The first empirical study reported in the thesis is an initial exploratory investigation that is separated into two parts. The first part, Study 1a, examines children's understanding of the consequences of disability and is the focus of the present chapter. The aim of Study 1a is to add to the existing disability literature by providing a more comprehensive overview of children's understanding of the consequences of disability. The second part, Study 1b reported in Chapter 5, investigates children's conceptions of the causes, controllability and chronicity of disability from a domain-specific cognition perspective. The aim of Study 1b is to explore directly whether children use their core knowledge domains to conceptualise disabilities and if so, the ways in which this is accomplished.

#### 4.1 Children's Concepts of the Consequences of Disability

As noted in Chapter 3, very little research attention has been given to children's concepts of the consequences of disability. The research findings that do exist on this topic tend to focus on one particular disability, such as learning difficulties (Lewis, 1993) or age group, such as pre-schoolers (Diamond, 1994; Diamond & Hestenes, 1996), which does not provide a developmental overview of children's disability concepts. The most detailed investigation of this issue has been research by Diamond and colleagues (1994; 1996). They used an adapted version of Harter & Pike's (1984) Pictorial Scale of Perceived Competence to investigate how typically developing pre-school children reason about the skills of their classmates with mild learning difficulties and severe physical disabilities. In their study, pre-school children judged their peers performance in four areas of competence; cognitive, physical, language and peer acceptance and ratings on each item ranged from 1 (the child has difficulty performing the skill) to 4 (the child performs the skill very well).

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<sup>1</sup> The data from this study is published in the *Journal of Child: Care, Health and Development*. The published article can be found in Appendix V.



Diamond (1994) found that pre-schoolers were sensitive to differences as a function of disability type. The character with a physical disability received lower ratings for physical competence but the character with a learning difficulty was rated as less competent on cognitive, physical and language tasks. As noted in Chapter 3, younger children tend to generalise the difficulties that different disabled groups experience and this may be heightened with less-obvious disabilities, as was clearly the case in Diamond's (1994) investigation. However, there are several limitations to the previous studies on this topic (Diamond, 1993; 1994; Diamond & Hestenes, 1996). Firstly, the age range of the participants is traditionally quite narrow with Diamond focusing much of her research on pre-school age children. It is therefore not clear how children's concepts of the consequences of disability would develop with age. Secondly, they have tended to explore typically developing children's sensitivity to their classroom peers who have disabilities. Therefore the participants in these studies had considerable contact with children with disabilities. Little is known about how children with seldom contact with disabilities conceptualise the consequences of disability. Lastly, as much of the previous investigations have been classroom-based, it has been difficult to control or systematically include a range of different types of disability. It is not as apparent how children's consequential understanding would vary as a function of disability type.

#### **4.1.1 Study 1a**

This study explores the ways in which typically developing children, with limited experience of disability, conceptualise the capabilities and limitations of children with different types of disabilities. It extends previous studies by Diamond (1994, Diamond & Hestenes, 1996) by firstly including children aged four to twelve years, in order to achieve a developmental perspective on children's conceptions of the consequences of disability. The present study also includes a broader spectrum of disabilities including physical, sensory, learning and emotional/behavioural types in order to contrast children's understanding of different disabilities. Furthermore, children who have little or no direct school or home contact with children with disabilities are included in this investigation. The aims of this study are to chart developmental trends in children's consequential understanding, especially the extent to which young children generalise or differentiate the consequences of particular disabilities. In addition, this study will examine how children's knowledge about a variety of different disabilities develops.

## **4.2 Method**

### **4.2.1 Ethical Issues**

In conducting study 1a, two key ethical concerns regarding research with children were addressed and these will be discussed before detailing the methodology of study 1a. The first issue concerned gaining access to interview children about their ideas of disability and this was achieved through two main formal channels (Alderson & Goodey, 1996). Firstly, permission to approach schools in the first instance was granted by the local education authority. Secondly, following the schools' agreement to participate in the research, parents were contacted about their child's involvement in the study using an opt-in written procedure. This represents two levels of 'gatekeeping' as discussed by Lewis (2002) in which access to children is typically controlled by both direct gatekeepers (parent, carer) and indirect gatekeepers (schools, teachers, local education authorities). It was made clear to the local education authority, schools, parents and children that the information obtained from the interviews was anonymous and would not be traceable in written documentation to any individual school or child. In addition, on completion of the study, all participating schools and the local education authority were sent short reports of the main findings of the research.

The second key ethical issue that was considered was the notion of 'informed consent' when interviewing children. This requires that children not only give their consent to be interviewed but also that they understand their role in the research process and the purpose of the interview (Lewis, 2002; Lindsay, 2002; Mahon, Glendinning, Clarke & Craig, 1996; Alderson & Goodey, 1996). Although obtaining informed consent can be particularly difficult to achieve (Lewis, 2002), every effort was made in this study to ensure that participating children understood the nature of the research (Alderson, 1995). Children were approached directly for their oral consent to participate and were given information about the study. They were made aware that they had a right to refuse to be interviewed but only a few children of the youngest age group refused to be interviewed. During the interview it was made clear to the children that they could leave at any time. At the end of the interview, children were acknowledged for both their time and involvement in the study but were told nothing further about the research. These ethical issues were considered in relation to all studies reported in this thesis and not just study 1a, which is the focus of the present chapter.

## 4.2.2 Participants

Table 4.1 Participant information

	Males	Females	Total	Mean Age (Range)
4-5 years	7	10	17	4,6 (4,4 - 5,1)
6-7 years	7	13	20	7,3 (7,1 - 7,9)
9-10 years	12	8	20	9,1 (8,9 - 9,4)
11-12 years	9	11	20	11,1 (10,11 - 11,7)

As shown in Table 4.1, 77 children participated in study 1a. Children were recruited from a state nursery and a state primary school of mid-range socio-economic status through a process of written parental consent. Response rates were high as only a few parents of the younger-aged children failed to return consent forms. According to parental report, no child had an immediate family member (parent, sibling) with a disability. Only the six to seven year-old age group had fortnightly contact with a child with a physical impairment who was included in the classroom.

## 4.2.3 Materials

### Disability Vignettes

Eight vignettes were written (see appendix II), each describing a character of approximately eight years of age who exhibited one of the following disabilities: physical disabilities: missing thumb (minor PD) and wheel-chair bound (major PD), sensory disabilities: blindness and hearing loss, learning disabilities: non-specific learning disabilities (NSLD) and Down syndrome (DS) and emotional/behavioural difficulties: attention deficit hyperactivity disorder (ADHD) and lacking in social skills (LSS). The design of the vignettes is similar to those used by Maas et al. (1978) in their study of children's conceptions of disordered behaviour. Descriptions of each disability were adapted from Bowley & Gardner (1980) and care was taken not to label the character's impairment. For example:

Stephen has never been able to see very much and doesn't know what things look like. So, Stephen has to feel things so he knows what shape they are and he has to be careful he doesn't bump into things because he can't see very well.

There were an equal number of male and female characters and all vignettes were designed to be of the same length and difficulty. To maintain children's interest, they were shown a coloured photograph depicting the character in each story (with permission taken from Bryan, 1996; Bryant-Mole, 1994; Pettenuzzo, 1987, 1988).

Competency Ratings

An adapted version of the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1984) was employed and is shown in Table 4.2.

*Table 4.2 Adapted pictorial scale of perceived competence and social acceptance for young children*

4	Do you think X is good at puzzles or not very good at puzzles? (cognitive competence)
5	Do you think X doesn't have many friends or does have a lot of friends? (social competence)
6	Do you think X is good at running or not very good at running? (physical competence)
7	Do you think X gets invited to parties or doesn't get invited to parties? (social competence)
8	Do you think X is not very good at climbing or is good at climbing? (physical competence)
9	Do you think X is good at reading or not very good at reading? (cognitive competence)
10	Do you think X is good at jumping or not very good at jumping? (physical competence)
11	Do you think X isn't very good at counting numbers or is good at counting numbers? (cognitive competence)
12	Do you think X gets invited to dinner at a friend's house or doesn't get invited to dinner? (social competence)

This measure required children to indicate how competent they believed someone else was in three areas of ability; physical, cognitive and social, in contrast to four areas of competence used by Diamond (1994). There were three items for each area of competence and children were asked to indicate whether the child in the vignette was 'good' or 'not very good' at each item (e.g. Is this girl good at running or not very good at running? Would this boy get invited to parties or not get invited to parties?). For each item, two sets of line drawings of children participating in the particular task were

pointed to and described (see Appendix III). One picture depicts a child with a high level of competence or acceptance and the other picture depicts a child with a low level of competence or acceptance. Children were instructed to pick the drawing which best described the child in the vignette.

This format is similar to previously adapted versions of the scale used by Diamond (1994) and Diamond & Hestenes (1996). However, to reduce task demands, the original scale was modified following piloting and the standard four-point response format was replaced with a two-point response format using phrases 'good' and 'not very good' for each item. The child's judgement provides a score of 1 (the child is competent at the task) and 2 (the child would have difficulty performing the task). During piloting it was found that the four-point scale was too demanding and time consuming for the youngest children.

#### **4.2.4 Procedure**

Primary aged children were interviewed individually in a small room separate from their regular classroom. Pre-school children were interviewed separately within a quiet area of the nursery classroom. Every child was read the vignettes outlined above in a random order. Children were presented with each of the consequences and the positive/negative response choices in a random order. Responses were video and tape-recorded for subsequent analysis.

### **4.3 Results**

Disabilities were analysed to see if they could be collapsed into sensory, physical, learning and behavioural categories. However, the rank correlation coefficients within disability categories were small, therefore each disability was analysed separately. The reliability of the consequence scales was assessed using Cronbach's Alpha and internal reliabilities were acceptably high: 0.79 for the physical domain, 0.79 for the cognitive domain and 0.86 for the social domain. Consequently, judgements for each separate item were summed within their competency areas. This provides ratings ranging from 3 (competent) to 6 (has difficulty) for cognitive, physical and social consequences, for each disability.

#### **4.3.1 Disability Differences**

A repeated measures two-way ANOVA was computed to test for differences in consequence ratings across disabilities. Significant main effects were found for consequence ( $F(2, 118) = 30.95; p < .001$ ), disability ( $F(7, 413) = 23.40; p < .001$ ) and consequence by disability ( $F(14, 826) = 36.66; p < .001$ ). As shown in Table 4.3, a one-factor within subjects ANOVA for each disability separately showed an effect of consequence type for every disability except hearing loss. Post-hoc analyses (see Table 4.3) revealed that for blindness, ratings were significantly more positive for social than cognitive and physical consequences. Similar results were found in post hoc analyses on the character with Down syndrome who received more positive social judgements than cognitive and physical ratings. The opposite results were found for ADHD. Children judged there to be more negative social consequences for the character with ADHD than cognitive and physical consequences. The description of a character who lacked social skills also received significantly poorer ratings for social consequences than cognitive and physical consequences. Ratings for NSLD were more negative for cognitive tasks than physical and social tasks. Major PD received significantly more negative judgements on physical tasks than cognitive and social tasks. In contrast, minor PD was judged more negatively on cognitive consequences than physical and social consequences. Physical tasks were rated more negatively than social tasks.

#### **4.3.2 Age Differences**

The results from Table 4.4 show the mean competency ratings in each age group for different disabilities. A two-way mixed measures ANOVA was completed for each disability comparing consequence type (cognitive, physical and social) between ages (4-5, 6-7, 9-10 and 11-12 years). The results in Table 4.4 show significant age effects for hearing loss, minor PD, major PD, NSLD and LSS. A significant interaction effect of age and consequence rating was also found for blindness, minor PD, major PD, NSLD and ADHD. To examine the interactions in more depth, firstly a series of one-way ANOVAs were conducted for each consequence type (physical, cognitive and social) between ages (4-5 years, 6-7 years, 9-10 years and 10-11 years) as shown in Table 4.4. Secondly, each consequence type was compared within age (see Table 4.5).



Table 4.3 Mean difference in competency ratings for different disabilities across all ages

Disability	Consequence Type			One-way ANOVA		Post-hoc t-tests			
	Phy	Cog	Soc	F	df	p	Phy vs Cog	Phy vs Soc	Cog vs Soc
Blindness	5.01	5.05	3.67	73.99	150	0.001	n.s.	9.53***	10.65***
Hearing Loss	3.40	3.57	3.55			n.s.	-	-	-
Minor PD	4.03	4.32	3.39	38.80	148	0.001	2.46*	7.25***	8.52***
Major PD	5.75	3.47	3.66	202.46	144	0.001	16.69***	16.93***	n.s.
NSLD	4.11	4.69	3.32	47.56	146	0.001	3.71***	n.s.	10.28***
DS	4.12	4.35	3.42	21.78	148	0.001	n.s.	5.28***	6.50***
ADHD	3.54	3.82	5.04	48.49	142	0.001	n.s.	8.97***	7.22***
LSS	3.60	3.51	4.03	9.86	150	0.001	n.s.	3.17**	3.74***

(Note: \*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ )

Table 4.4 Age differences in mean competency ratings for different disabilities

Disability	Age												Analyses		
	4-5 years			6-7 years			9-10 years			11-12 years			Mixed Measures ANOVA		
	Phy	Cog	Soc	Phy	Cog	Soc	Phy	Cog	Soc	Phy	Cog	Soc	Age	Conseq	Age x Conseq
Blindness	4.41	4.71	4.29	5.40	5.15	3.25	5.16	5.37	10.4	5.00	4.95	3.65	$F(3, 70) = .42$	$F(2, 144) = 87.75^{***}$	$F(6, 144) = 7.45^{***}$
Hearing Loss	4.00	4.24	4.06	3.21	3.16	3.11	3.32	3.53	3.74	3.21	3.37	3.37	$F(3, 70) = 7.78^{***}$	$F(2, 140) = 1.34$	$F(6, 140) = .84$
Minor PD	4.35	5.29	4.18	3.80	4.15	3.15	4.06	4.28	3.28	3.95	3.70	3.26	$F(3, 71) = 10.48^{***}$	$F(2, 142) = 41.85^{***}$	$F(6, 142) = 2.83^{**}$
Major PD	5.06	4.47	4.35	5.84	3.10	3.10	6.00	3.33	3.56	6.00	3.12	3.68	$F(3, 69) = 4.10^{**}$	$F(2, 138) = 341.78^{***}$	$F(6, 138) = 19.00^{***}$
NSLD	3.75	3.81	3.56	4.95	4.75	3.25	3.79	4.63	3.21	3.79	5.37	3.26	$F(3, 70) = 2.68^*$	$F(2, 140) = 59.30^{***}$	$F(6, 140) = 9.42^{***}$
DS	3.69	3.94	3.63	4.00	4.40	3.25	4.32	4.26	3.32	3.63	4.70	3.45	$F(3, 71) = 1.27$	$F(2, 142) = 20.42^{***}$	$F(6, 142) = 1.41$
ADHD	4.18	4.12	4.52	3.45	3.20	5.00	3.31	3.75	5.31	3.37	4.32	5.32	$F(3, 68) = 1.56$	$F(2, 136) = 54.76^{***}$	$F(6, 136) = 4.72^{***}$
LSS	4.18	4.18	4.12	3.20	3.10	3.90	3.70	3.40	4.20	3.42	3.47	3.95	$F(3, 72) = 3.22^*$	$F(2, 144) = 9.19^{***}$	$F(6, 144) = 1.50$

(Note: \*\*\*  $p < .001$ , \*\*  $p < .01$ ; \*  $p < .05$ )

Table 4.5 Age differences in children's ratings of physical, cognitive and social consequences for each disability

Disability	Consequence		
	Physical	Cognitive	Social
Blindness	$F(3, 73) = 3.90^{**}$	$F(3, 73) = 2.15$	$F(3, 72) = 4.23^{**}$
Minor PD	$F(3, 73) = 1.68$	$F(3, 73) = 8.67^{***}$	$F(3, 71) = 13.14^{***}$
Major PD	$F(3, 73) = 11.21^{***}$	$F(3, 73) = 16.12^{***}$	$F(3, 69) = 7.39^{***}$
NSLD	$F(3, 72) = 5.52^{**}$	$F(3, 71) = 6.69^{***}$	$F(3, 72) = 1.47$
ADHD	$F(3, 72) = 4.29^{***}$	$F(3, 69) = 5.02^{**}$	$F(3, 73) = 1.63$

(Note:  $^{***}p < .001$ ;  $^{**}p < .01$ )

Taking each type of analysis separately, significant age effects were found from tests on the effect of consequence type between age. For blindness, significant age differences were found for physical and social consequences. Post hoc analyses revealed pre-schoolers were more negative about the social consequences ( $p < .05$ ) and six to seven year-olds were more negative about physical outcomes ( $p < .05$ ). An age difference was found for major PD in relation to cognitive, physical and social tasks. The youngest age group was more negative about the cognitive ( $p < .05$ ) and social ( $p < .05$ ) abilities of a child with major PD but significantly more positive about physical consequences than any other age group. Age differences were evident for minor PD for cognitive and social tasks. The four to five year-olds ratings were significantly more negative on cognitive and social functioning ( $p < .05$ ) than all other age groups. Significant age differences were found for ADHD in cognitive and physical functioning. Pre-schoolers gave more negative ratings for physical tasks ( $p < .05$ ) than all other age groups. Both pre-schoolers and the oldest age group gave significantly more negative judgements on cognitive tasks ( $p < .05$ ) than six to seven or nine to ten year-olds. Age differences in cognitive and physical functioning were also found for NSLD. The eleven to twelve year-olds gave more negative ratings on cognitive tasks ( $p < .05$ ) for NSLD than all other age groups and the six to seven year-olds were more negative about physical functioning ( $p < .05$ ).

Table 4.6 Differences in children's competency ratings for each disability for 4-5, 6-7, 9-10 and 11-12 years.

Disability	4-5 years			6-7 years			9-10 years			11-12 years				
	ANOVA F(2, 32) = 1.86	Cog	Phy	Cog	Phy	Cog	Phy	Cog	Phy	Cog	Phy	Phy		
		vs Phy Soc	vs Soc	vs Soc	vs Soc	vs Soc	vs Soc	vs Soc	vs Soc	vs Soc	vs Soc	vs Soc	vs Soc	
Blindness		-	-	n.s	8.78***	10.99***	ANOVA F(2, 36) = 43.67***	n.s	8.50***	6.43***	ANOVA F(2, 38) = 17.64***	n.s	4.47***	6.11***
Minor PD	F(2, 32) = 12.49***	3.77**	4.64***	n.s	4.59***	3.90***	F(2, 34) = 10.50***	n.s	4.12***	5.10***	F(2, 38) = 17.51***	n.s	3.58**	7.28***
Major PD	F(2, 32) = 3.93*	n.s.	4.24***	n.s	22.36***	21.23***	F(2, 34) = 113.05***	15.90***	n.s	14.71***	F(2, 36) = 168.77***	42.14***	3.01**	11.40***
NSLD	F(2, 30) = .71	-	-	n.s	6.10***	7.77***	F(2, 36) = 13.83***	2.49**	6.87***	2.25*	F(2, 36) = 46.34***	6.43***	10.48***	2.24*
ADHD	F(2, 32) = 1.42	-	-	n.s	6.09***	3.94***	F(2, 30) = 18.98***	n.s	4.56***	6.51***	F(2, 36) = 24.36***	3.51**	3.08**	8.73***

(Note: \*\*\* p < .001; \*\* p < .01; \* p < .05)

Significant differences were found in consequence ratings within each age group (see Table 4.6). Only the pre-schoolers failed to give different competency ratings for each of the impairments examined. Significant differences for pre-schoolers were only found in their consequence ratings for minor PD and major PD. Post-hoc t-tests were carried out within each age comparing each consequence type. Every age group except pre-schoolers judged there to be physical and cognitive limitations to blindness but not social outcomes. Compared to the older age groups, the four to five year-olds gave more negative ratings for cognitive than physical tasks for minor PD. Whereas, the older age groups acknowledged physical limitations for major PD compared to cognitive and social consequences, pre-schoolers did not differentiate their physical and cognitive competency ratings for these impairments. Both nine to ten and eleven to twelve year-olds judged there to be cognitive and physical limitations to NSLD. Additionally, each age group except pre-schoolers thought there to be significantly more negative social outcomes for ADHD.

### **4.3.3 Summary of Key Findings**

In summary, across all ages, children were able to differentiate their consequence ratings appropriately for most disabilities. The emotional/behavioural difficulties received less favourable social ratings in comparison to judgements about cognitive and physical competence. The character with NSLD was judged to have more difficulty on cognitive tasks than physical or social ones. Likewise, major PD received more negative ratings on physical tasks. However, children did not differentiate appropriately for minor PD.

Developmental changes in children's consequential understanding of disability are discernible. Interestingly, in relation to major PD, the four to five year-olds perceived there to be more negative social and cognitive consequences but they were more positive about the physical consequences than any other age group. The youngest age group was also more likely to generalise the limitation of minor PD. They assigned more negative ratings for cognitive and social tasks than any other age group. They also extended the difficulties of the character with ADHD to physical areas of competence. For learning disabilities, both nine to ten year-olds and eleven to twelve year-olds judged there to be cognitive and physical limitations to NSLD, although the

oldest age group did give more negative ratings on cognitive tasks than any other age group. There were no age differences in ratings for Down syndrome.

#### **4.4 Discussion**

The aim of this study was to examine in a more detailed fashion, children's concepts of the consequences of disability. The findings suggest that, children of all ages, had a positive perception of the capabilities of children with different types of disabilities. Such findings are encouraging for issues surrounding educational and social inclusion. Moreover, the findings extend the work of Diamond (1994, Diamond & Hestenes, 1996) by revealing that even four year-old children can differentiate their competency judgements for certain types of disabilities and that there is an increasing degree of differentiation of consequences of disabilities with age.

##### ***4.4.1 Disability Differences in Consequence Understanding***

Children in this study appeared sensitive to limitations associated with physical disabilities suggesting that physical impairments are a relatively straightforward concept for children to grasp. This is in accord with suggestions by Conant & Budoff (1983) who found an early awareness of physical disabilities in young children. Children in this study also understood the consequences of emotional/behavioural impairments and the effect such difficulties may have on social functioning. This result is similar to Milich, Landau, Kilby & Whitten (1982) who found that even pre-schoolers had a negative social evaluation of a child with ADHD. Children across all ages showed an understanding of the competencies of learning disabilities maintaining that only cognitive functioning would be affected. This is an unexpected finding as previous research has argued that disabilities with primarily psychological symptoms are much more difficult for children to comprehend (Conant & Budoff, 1983; Lewis, 1995). However, Goodman (1989) found that eight to nine year-olds have an accurate conceptualisation of learning disabilities, viewing such disabilities as traits that are abstractly defined and irreversible. Additionally, children in this study did not expect social functioning to be compromised by the presence of learning difficulties. This is an interesting finding since earlier research suggests learning delayed children have deficiencies in using peer-related social behaviours (Guralnick & Groom, 1985, 1987). Despite having little or no prior experience of learning disabilities, children in this



study did not over generalise the effects of learning difficulties from one area of consequence to another.

#### ***4.4.2 Age Differences in Consequence Understanding***

Unlike previous research, this study investigated and found age differences in children's understanding of the competencies of children with disabilities. Much of the differences evident were between pre-school age and older age groups. Pre-schoolers appeared to have a different conception of major PD than all other age groups. The four to five year-olds were more optimistic about the physical competencies of a major PD and more pessimistic about cognitive functioning. These findings are difficult to interpret as the type of disabilities that have salient, physical cues are generally easier for young children to understand (e.g., Conant & Budoff, 1983; Diamond, 1994). It could be that, in contrast to work by Diamond (1994) and Diamond & Hestenes (1996), pre-schoolers in this study had little experience of disabilities and thus exhibited a general confusion about the effects of being in a wheelchair. It is worth noting that the six to seven year-olds in this study were not confused about the consequences of a physical disability. This could be due to the fortnightly contact this age group had with a child who was wheelchair bound. These findings are consistent with Maras & Brown (1992) who found that children with 'categorised' contact made accurate distinctions between physically disabled and non-disabled children.

However, the findings suggest that for several disabilities, pre-schoolers generalise the limitations in one set of consequences to another consistent with previous findings on older children (Maras & Brown, 1992). In this study, pre-schoolers perceived there to be cognitive and physical limitations of children with emotional/behavioural difficulties. They were also likely to extend the limitations of the child with blindness to the social areas of competence, a finding also shown in other work (Diamond & Hestenes, 1996). Interestingly, the implication of this finding is that young children do not just generalise the limitations of disabilities, which are less easily understood or have few visible cues. Moreover, the four to five year-olds were less likely than older age groups to differentiate between the consequences of disabilities. Thus although young children are aware of the competencies and limitations of children with difficulties, they lack sufficient knowledge to make a differentiated judgement. In

contrast to older children, pre-schoolers generalise the consequences of disabilities across several areas of competence.

Surprisingly, older children's conceptualisation of learning disabilities was not radically different from that of pre-schoolers. There were no age differences in children's understanding of Down syndrome and only the eleven to twelve year-olds made differentiated judgements on cognitive functioning for NSLD. This suggests that children reveal fundamental difficulties in understanding learning disabilities which is consistent with suggestions by Glasberg (2000). Future research should investigate how we can improve understanding of learning difficulties through experience or direct instruction.

#### **4.5 Summary and Conclusions**

In conclusion, although children were generally positive about the capabilities of children with disabilities, several age and disability differences in children's understanding were identified. Overall, children were aware of the specific consequences of physical, sensory, learning and emotional/behavioural disabilities. Young children however were more likely to generalise the limitations of a disability from one consequence area to another and gave less differentiated judgements than older children. This is a valuable contribution to the existing disability literature and in relation to the core domains of knowledge research, suggests young children cannot differentiate and co-ordinate their reasoning in an appropriate manner. However, it tells us less about the specific core knowledge domains that children use to reason about disability, since the methodology of this study did not afford these kinds of conceptual distinctions. That is, children's consequential understanding of disability does not tell us a great deal about the larger conceptual framework in which disability is placed. Consequently, Study 1b reported in Chapter 5 will examine whether children use their core knowledge domains to understand the causes, controllability and chronicity of disability.

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## CHAPTER 5

### **Study 1b: Children's Conceptions of the Causes, Controllability and Chronicity of Disability**

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This chapter reports the second part of the exploratory investigation into children's disability concepts. This study explores children's understanding of the causes, controllability and chronicity of disability and seeks to demonstrate how children of different ages use their core domains of knowledge to reason about disability. It also considers whether children can draw on several domains of knowledge to reason about disability and whether their disability concepts have a theoretical structure.

#### **5.1 Children's Concepts of Disability and Domain-Specific Cognition**

As reported in Chapter 2, a variety of research already supports the existence of three causal explanatory reasoning systems (Wellman & Gelman, 1992; Wellman et al., 1997; Hickling & Wellman, 2001). Prior to formal education, children readily develop causal and ontological ideas about the physical, psychological and biological worlds. However, rarely have studies investigated phenomena that could be conceptualised across the three domains of thinking. If children evidence three core domains of thought and if all could be used to reason about a single complex phenomena, then children must learn to co-ordinate and differentiate them in appropriate ways. Recently, research has begun to explore the co-ordination and flexibility of core domains of thought (Wellman et al., 1997) which highlights the importance of studies on children's multi-causal reasoning, for discussions surrounding domain-specificity.

However, to date, research on children's concepts of more complicated phenomena is lacking, especially from a domain-specific perspective. As argued in Chapter 2, disability as a research topic, is an especially promising candidate for such research. Asking children about their concepts of disability has several important functions. Firstly, asking children about their causal conceptions of disability will reveal the core domains of thinking in which disability is conceptualised. As discussed in Chapter 2 (section 2.4), children could draw on their naive physical, psychological or biological

knowledge to reason about disability and there may be important age differences in the domains of knowledge that children find useful in their conceptualisation of disabilities. Furthermore, children's ability to reason about the biological aspects of disability will add to current debates about the status and onset of naïve biological thinking (see Chapter 2, section 2.1.3). Given the recent findings reported in Chapter 2 on the biological to social shift in children's concepts of race and gender, it is possible that children's causal concepts of disability may also follow a similar developmental path.

Secondly, asking children about their causal conceptions of disability may also reveal the extent to which they can co-ordinate multiple causal frameworks. It is still unclear whether children can utilise their different causal reasoning systems appropriately when reasoning about complex phenomenon. Wellman et al. (1997) found that three and four year-old children could utilise and co-ordinate their core domains of thinking when explaining a variety of human acts. In explanations of inheritance, Korpan (1999) and Morris (1998) both found that by age seven, children could draw on a variety of different causal reasoning systems. It seems useful to ascertain whether children can draw appropriately on several core domains of knowledge to reason about disability. Indeed, this ability may depend on age given that in relation to consequences (Study 1a), younger children had difficulty differentiating their knowledge to different disability types.

Thirdly, taking a domain-specific approach to children's disability concepts may also reveal the extent to which children's disability concepts are theoretical. Recall in Chapters 1 and 2, that Gopnik & Meltzoff (1997), Carey (1995) and Wellman & Gelman (1992) have argued that everyday domain-specific knowledge is theory-like and that one hallmark of an intuitive theory is conceptual coherence. An example of conceptual coherence reported in Chapter 3 is children's false beliefs concepts in the domain of naïve psychology. Children's understanding of beliefs is inextricably linked with other mental state concepts (Slaughter & Gopnik, 1996). In relation to disability concepts, conceptual coherence may be found in children's ability to link their knowledge concerning causes, to their judgements about the controllability and chronicity of disability. In addition, the theory-like status of children's disability concepts may be influenced by age and disability type. All of these issues will be addressed in Study 1b.

### **5.1.1 Study 1b**

Study 1b examines children's disability concepts using a core domains framework, which will highlight not only the conceptual underpinnings children use to reason about disability but will provide insight into children's disability concepts more generally. This study included the same participants and vignettes as Study 1a and using a semi-structured interview schedule, children were asked about the causes, controllability and chronicity of disability. The specific aims of this study were to examine which core knowledge domains children use to reason about disability, whether their framework understanding of disability changes with age and whether children's disability concepts are fragmented in structure or theory-like.

## **5.2 Method**

### **5.2.1 Participants**

Participant information can be found in Chapter 4, section 4.2.2.

### **5.2.2 Materials**

#### Disability Vignettes

The vignettes included in the present study were as described in Chapter 4, section 4.2.3. After hearing each vignette, the participant was initially asked about the *causes* of the disability ("What do you think could have made X like that?"). If the child failed to respond, a cause prompt question followed – was he or she "born that way" or did "something happen which made him or her like that?". The order of alternatives was randomised for the prompt question. Children were then asked a *controllability* question (Judgement: "Could X (e.g., see) if he/she wanted to?" and Explanation: "How could X (e.g., see/not see) if he/she wanted to?") and a *chronicity* question (Judgement: "When X grows up to be an adult will he/she be able to (e.g., see)?" and Explanation: "How could X (e.g., see/not see) when he is an adult?").

### **5.2.3 Procedure**

As in Study 1a, primary aged children were interviewed individually in a small room separate from their regular classroom. The four to five year-old children were interviewed separately within a quiet area of the nursery classroom. Participants were first told they were going to hear some stories about children who have certain difficulties and would be asked questions about those difficulties. Every child was read

the vignettes one at a time in a random order. Each story ended with questions concerning the cause, controllability and chronicity of the disability presented in a fixed sequence. Responses were video and tape-recorded and transcribed for later analysis.

#### **5.2.4 Coding**

Two separate coding schemes were employed to categorise responses about firstly, children's causal explanations of disability and secondly, children's judgements and explanations about the controllability and chronicity of disability.

##### Causal Explanations

The causal explanation coding scheme was generated by two independent coders using content analysis (see Weber, 1985; Krippendorff, 1980). Table 5.1 shows the causal explanations identified in children's initial spontaneous responses. Two types of categories were initially created to indicate children's failure to give a causal explanation. The *Uncodeable* category was used if no response was offered to the causal explanation question or if the child indicated they did not know. *External descriptions* were those responses that indicated superficial external features of disability (e.g., referring to adaptive equipment), without reference to a cause. Causal explanations were categorised according to 'explanation modes' corresponding to core domains of knowledge described in cognitive development research (Wellman & Gelman, 1992; Hickling & Wellman, 2001; Bloch, Solomon & Carey, 2001). *Psychological* responses explained disabilities in terms of mental states or processes, such as the character's beliefs, intentions or desires. *Social/Environmental* explanations described disabilities in terms of social behaviour or social situations, for example growing up in an impoverished home environment or bullying at school. In contrast, responses appealing to accidental or physical contact events were coded as *Physical*. Explanations were coded as *Biological* if they referred to physiological systems or processes relevant to biological kinds, for example references to birth, illness and inheritance (see Table 5.1). The inter-rater reliability coefficient of 0.87 showed an acceptable degree of similarity between codings.

In view of the ongoing debate regarding onset of an autonomous biology, distinct from other domains of thinking (Siegal & Peterson, 1999; Medin & Atran, 1999; Au & Romo, 1999), a conservative coding criteria was applied in classifying biological responses.



Responses were classified as biological only if the explanations were generated without the use of the prompt question. However, it is possible that children who heard the 'born that way' prompt on some of the previous trials incorporated this idea into subsequent spontaneous explanations. A prompt was required on at least one trial in 36% of cases for four to five year-olds, 46% of cases for six to seven year-olds, 44% of cases for nine to ten year-olds and 11% of the eleven to twelve year-olds.

*Table 5.1 Categories and examples of children's causal explanations*

Category	Examples
Uncodeable	"don't know" "because..." <no response>
External Descriptions	"he needs glasses" "his eyes are different" "he can't walk very well"
Physical Accident	"she might've got it chopped off" "he maybe fell and broke his leg" "he could've been in a car crash"
Psychological	"it's in his mind" "because she doesn't want to play with people"
Social/Environmental	"maybe his mum and dad could've been like that and he just copies them" "he doesn't come from a good home" "she could've got bullied"
Biological	"he might've been born that way" "he might have had an ear infection" "she wasn't developed when she was born" "it got passed on....her mum was like that"

In the initial analyses, no multiple causal explanations were included. Only the 'highest' level response was taken for each child which credits children with the most sophisticated causal understanding they expressed. Therefore only one cause was recorded from each child for each type of disability. A separate analysis was conducted on multiple causal explanations offered by children.

### Controllability and Chronicity of Disability

Children's responses to the controllability and chronicity questions were coded separately for *judgements* and *explanations*. Children's judgements about the controllability and chronicity of the disability were coded as 'yes', 'no', 'maybe' or 'don't know' and were given numerical codes (yes=1, no=2, maybe=3, 4= don't know). The disability literature provided a useful scoring scheme for capturing children's explanations about the controllability and chronicity of disability, particularly the extent to which children think disabilities are internal and irreversible. The system was adapted from Goodman (1989) and includes the following categories shown in Table 5.2. In addition to these categories, two more categories were used to capture responses that did not fall into any of the above: (1) Uncodeable and (2) Superficial External Descriptions. The interrater reliability coefficient was 0.81.

*Table 5.2 Categories and examples of children's controllability and chronicity explanations*

	<u>Internal</u>	<u>External</u>
<u>Controllable</u>	Personal effort (e.g., intention, practice, paying attention)	Effort of others (e.g., medical intervention, special class)
<u>Uncontrollable</u>	Constitutionally fated (e.g., being born that way)	External fate (e.g., physical accident)

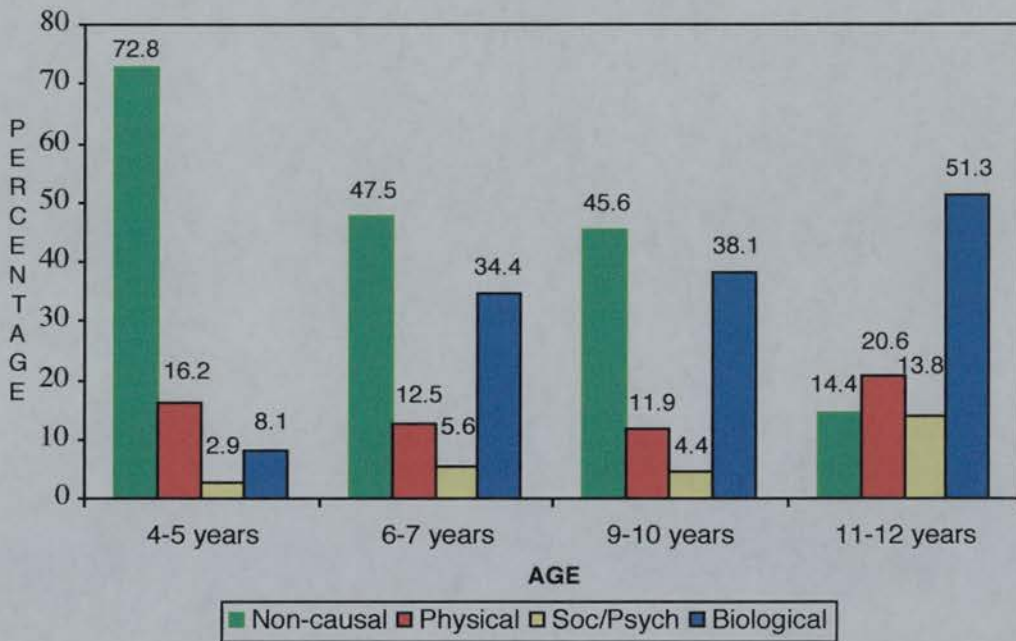
## **5.3 Results**

### **5.3.1 Causal Explanations of Disability**

Preliminary investigation of the data showed that there were too few purely psychological causal explanations to justify separate analysis. Since this category was similar in level of sophistication to social/environmental and both categories are often treated as related (see Carey, 1985), social/environmental and psychological explanations were collapsed into social/psychological causal explanations. Additionally, the 'uncodeable' and 'external descriptions' categories were combined into 'non-causal descriptions' since both responses failed to indicate a cause. Responses were categorised and ranked according to increasing levels of sophistication from 'non-causal descriptions' to 'biological' causal explanations. This is similar in format to

studies on illness understanding (Williams & Binnie, 2002) and knowledge of inheritance mechanisms (Bloch et al., 2001; Solomon et al., 1996). Although biological causal explanations may not be the most sophisticated response for all disabilities, such as ADHD (see Anastopoulos & Shelton, 2001), knowledge of biological causal principles is considered to be a later developmental achievement (Inagaki & Hatano, 1997; Wellman & Gelman, 1992; Au & Romo, 1999; Carey, 1995). As the data are inherently ranked and only reflect approximate levels of sophistication, they are analysed using non-parametric methods (Seigel & Castellan, 1988).

Figure 5.1 Percentage of causal explanations across all disability types



The results presented in Figure 5.1 shows there are several age-related changes in children's causal explanations across the different types of disability. A significant age difference, across disability types, was found in the use of non-causal descriptions to explain disabilities ( $H = 34.24$ ,  $df = 3$ ,  $p < .001$ ). Post hoc comparisons revealed that four to five year-olds were more likely than any other age group to give non-causal descriptions when explaining the cause of disabilities (4-5 year-olds versus 6-7 years:  $U = 64.5$ ,  $p < .001$ ; 4-5 year-olds versus 9-10 years:  $U = 83.0$ ,  $p < .01$ ; 4-5 year-olds versus 11-12 years:  $U = 11.5$ ,  $p < .001$ ). Children's use of biological causal explanations also

varied significantly with age ( $H = 24.74, df = 3, p < .001$ ). The four to five year-olds were less likely than any other age group to explain disabilities in biological terms (4-5 year-olds versus 6-7 years:  $U = 65.5, p < .001$ ; 4-5 year-olds versus 9-10 years:  $U = 55.5, p < .001$ ; 4-5 year-olds versus 11-12 years:  $U = 22.0, p < .001$ ). Age differences were also evident in the use of social-psychological causal explanations ( $H = 11.18, df = 3, p < .01$ ). The oldest age group was significantly more likely than the younger age groups to give such explanations (4-5 year-olds versus 11-12 years:  $U = 75.0, p < .001$ ; 6-7 years versus 11-12 years:  $U = 107.0, p < .01$ ; 9-10 years versus 11-12 years:  $U = 103.0, p < .01$ ). There was no significant age difference in the use of physical causal explanations.

### **5.3.2 Causal Explanations and Disability Type as a Function of Age**

Disabilities were analysed to see if they could be collapsed into sensory, physical, learning and behavioural categories. However, the rank correlation coefficients within disability categories were low, therefore each disability was examined separately. Table 5.3 shows that across all ages, children's causal explanations varied significantly as a function of disability type. Taking each age group separately, pre-schoolers seemed unable to differentiate their causal explanations to different types of impairment (*Friedman ANOVA* = 10.16,  $df = 7, p < .18$ ). There remained no significant differences in the causal explanations offered among the six to seven and nine to ten year-olds for each disability (6-7 years: *Friedman ANOVA* = 6.28,  $df = 7, p < .51$ ; 9-10 years: *Friedman ANOVA* = 5.98,  $df = 7, p < .54$ ).

However, the emergence of a more distinct pattern of responding can be observed among the six to seven and nine to ten year-olds (see Table 5.3). At these ages, the number of biological causes increased but were applied indiscriminately. It is not until twelve years, that children begin to tailor their causal explanations significantly to particular disabilities. Biological explanations are preferred for sensory and learning disabilities whilst social-psychological explanations are only given for behavioural disabilities.

Table 5.3 Number (percentages) of causal explanations as a function of disability type for each age and overall

Disability	Age												Overall***							
	4-5 years			6-7 years			9-10 years			11-12 years**			N/C	Phys	S/P	Bio				
Blindness	12	4	0	1	8	2	0	10	8	2	0	10	0	2	0	18	28	10	0	39
	(70.6)	(23.5)	(0.0)	(5.9)	(40.0)	(10.0)	(0.0)	(50.0)	(40.0)	(10.0)	(0.0)	(50.0)	(0.0)	(10.0)	(5.0)	(90.0)	(36.4)	(13.0)	(0.0)	(50.6)
Hearing Loss	9	5	0	3	8	3	0	9	8	3	0	9	2	5	0	13	27	16	0	34
	(52.9)	(29.4)	(0.0)	(17.6)	(40.0)	(15.0)	(0.0)	(45.0)	(40.0)	(15.0)	(0.0)	(45.0)	(10.0)	(25.0)	(0.0)	(65.0)	(35.1)	(20.8)	(0.0)	(44.2)
Physical Minor	6	9	0	2	7	10	0	3	10	7	0	3	1	12	0	7	24	38	0	15
	(35.3)	(52.9)	(0.0)	(11.8)	(35.0)	(50.0)	(0.0)	(15.0)	(50.0)	(35.0)	(0.0)	(15.0)	(5.0)	(60.0)	(0.0)	(35.0)	(31.2)	(49.4)	(0.0)	(19.5)
Physical Major	12	4	0	1	8	2	0	10	6	5	0	9	1	10	0	9	27	21	0	29
	(70.6)	(23.5)	(0.0)	(5.9)	(40.0)	(10.0)	(0.0)	(50.0)	(30.0)	(25.0)	(0.0)	(45.0)	(5.0)	(50.0)	(0.0)	(45.0)	(35.1)	(27.3)	(0.0)	(37.7)
Learning Disability (NS)	12	1	2	2	12	1	1	6	9	0	0	11	5	1	0	14	38	3	3	33
	(70.6)	(5.9)	(11.8)	(11.8)	(60.0)	(5.0)	(5.0)	(30.0)	(45.0)	(0.0)	(0.0)	(55.0)	(25.0)	(5.0)	(0.0)	(70.0)	(49.4)	(3.9)	(3.9)	(42.9)
Learning Disability (DS)	16	0	0	1	10	0	1	9	12	1	0	7	4	1	0	15	42	2	1	32
	(94.1)	(0.0)	(0.0)	(5.9)	(50.0)	(0.0)	(5.0)	(45.0)	(60.0)	(5.0)	(0.0)	(35.0)	(20.0)	(5.0)	(0.0)	(75.0)	(54.5)	(2.6)	(1.3)	(41.6)
ADHD	15	0	1	1	10	1	5	4	8	0	6	6	5	0	12	3	38	1	24	14
	(88.2)	(0.0)	(5.9)	(5.9)	(50.0)	(5.0)	(25.0)	(20.0)	(40.0)	(0.0)	(30.0)	(30.0)	(25.0)	(0.0)	(60.0)	(15.0)	(49.4)	(1.3)	(31.2)	(18.2)
Lacking in Social skills	15	0	1	1	12	1	2	4	12	1	1	6	6	1	10	3	46	3	14	14
	(88.2)	(0.0)	(5.9)	(5.9)	(60.0)	(5.0)	(10.0)	(20.0)	(60.0)	(5.0)	(5.0)	(30.0)	(30.0)	(5.0)	(50.0)	(15.0)	(59.7)	(3.9)	(18.2)	(18.2)

Note : (\*\* Friedman Anova = 22.31, df = 7, p < .01; \*\*\* Friedman Anova = 24.44, df = 7, p < .001)



### 5.3.3 Individual Response Patterns For Causal Explanations

To supplement the above findings, children were classified on the basis of their individual response patterns, (see, Solomon et al., 1996; Solomon & Cassimatis, 1999, Solomon & Johnson, 2000) to explore the extent to which they rely on one particular causal reasoning system across disabilities.

Children were categorised into four groups. The *Differentiated* pattern group included all those children who differentiated between disabilities in explanation type. Children were considered to have shown a *Differentiated* pattern if they explained at least 5 of the 8 disabilities causes appropriately (physical causal explanations for physical disabilities, biological explanations for sensory and learning disabilities and social/psychological explanations for behavioural disabilities). The '5 out of 8' criterion for the *Differentiated* pattern of responding adopted in this study is not as conservative as previous research on children's inheritance explanations (see Solomon et al, 1996). However, given the number of legitimate causal explanations that could be offered for the same disability, it was thought that a less strict criterion was still representative of differentiated causal knowledge. Three other categories were included to capture response patterns of those who were not classified as *Differentiated*. A number of children showed a bias towards biological causal explanations regardless of disability type. Subjects were considered to have shown a *Biological* bias if they judged at least 5 out of 8 disabilities to be biologically caused. Conversely, subjects were considered to have shown a *Non-causal* bias if they failed to indicate a cause for at least 5 out of 8 disabilities. Finally, any pattern not falling into the other categories was considered to be a *Mixed* pattern.

Table 5.4 shows between the ages of four and twelve, an increasing number of children exhibited the *Differentiated* pattern which shows an appreciation that different types of impairment require particular causal explanations ( $\chi^2 = 24.98, df = 3, p < .001$ ). An application of the binomial theorem, based on a 0.25 probability that a subject would show a *Differentiated* pattern by chance, indicates that 12 eleven to twelve year-olds ( $p < .01$ ) who showed this pattern is significantly more higher than would be expected by chance out of a group of twenty. There was no significant overall association between age and the *Biological* bias pattern or the *Mixed* pattern. However, there was a significant association between age and a *Non-causal* bias ( $\chi^2 = 16.04, df = 3, p < .001$ ),



with 12 four to five year-olds exhibiting this response pattern. Only two eleven to twelve year-olds exhibited this pattern which is significantly less than would be expected by chance ( $p < .01$ ).

*Table 5.4 Number (percentages) of children showing different response patterns by age*

<u>Pattern</u>	<u>Age</u>			
	<u>11-12 years</u>	<u>9-10 years</u>	<u>6-7 years</u>	<u>4-5 years</u>
Differentiated	12 (60.0)	4 (20.0)	1 (5.0)	0 (0.0)
Biological Bias	2 (10.0)	2 (10.0)	5 (25.0)	1 (5.9)
Non-Causal Bias	2 (10.0)	8 (40.0)	5 (25.0)	12 (70.6)
Mixed	4 (20.0)	6 (30.0)	9 (45.0)	4 (23.5)

#### **5.3.4 Multiple Causal Explanations**

Table 5.5 shows the number of individual children who offered more than one causal explanation for particular disabilities. The results reveal that with increasing age, children are more likely to offer multiple causes for disabilities. Most nine to ten year-olds and eleven to twelve year-olds gave multiple causal explanations that pertained to the biological and physical domains. However, as can be seen in Table 5.5, one nine to ten year-old did offer two biological type explanations. The oldest age group also tended to combine physical and biological explanations and gave a wider range of biological causes, including references to biological infection and inheritance. No multiple response at any age included a social/psychological causal explanation. Furthermore, the oldest age group gave multiple causal explanations on more occasions than the nine to ten year-olds. Most nine to ten year-olds gave multiple causal explanations for only one impairment, whilst half of the oldest age group gave multiple causes for more than one disability. Thus, there was an age trend in the use of multiple causal explanations of disability.

Table 5.5 Number and mode of multiple causal explanations given by each age group

	<u>Number of children giving multiple causes</u>	<u>Explanation Modes</u>	<u>Examples of multiple causal explanations</u>
<u>4-5 years</u> (N = 17)	0	-	-
<u>6-7 years</u> (N = 20)	0	-	-
<u>9-10 years</u> (N = 20)	4 (5)	• Bio/Phy	"he could've been born like that or he could've been in a car crash"
		• Bio/Bio	"it's just the way she was born or she might have an illness"
<u>11-12 years</u> (N = 20)	14 (28)	• Bio/Phy	"he could've been born with it or had an accident"
		• Bio/Bio	" he could've been born with it or had an ear infection"
		• Bio/Phy	"it might've been passed down but it's more like it was an accident"
		• Bio/Phy	"it could be a disease when he was born or an accident that did something to his legs"

Note: Figures in brackets are the number of occasions multiple responses were offered across children in each age

Bio = Biological; Phy = Physical

### 5.3.5 Perceived Controllability and Chronicity of Disability

Table 5.6 shows a significant age difference in children who judge disabilities to be controllable ( $H = 10.30, df = 3, p < .02$ ). Post-hoc analyses revealed that six to seven year-olds were much more likely to state a character could not change his disability compared with the four to five year-olds ( $U = 82.0, p < .007$ ) and eleven to twelve year-olds ( $U = 95.5, p < .004$ ). Moreover, there was a significant age difference in probabilistic judgements ( $H = 21.19, df = 3, p < .001$ ). The oldest children were significantly more likely to say the character might change his condition (4-5 year-olds versus 11-12 years:  $U = 93.5, p < .002$ ; 6-7 years versus 11-12 years:  $U = 118.5, p < .004$ ; 9-10 years versus 11-12 years:  $U = 118.5, p < .004$ ).

Table 5.6 Percentage of uncontrollability and chronicity judgements

	Uncontrollability	Chronicity
4-5 years	43.4	76.5
6-7 years	66.2	50.6
9-10 years	56.2	38.8
11-12 years	56.9	40.6
<i>Kruskal-Wallis Anova</i>	10.30, $df = 3^*$	23.26, $df = 3^{***}$

(Note:  $*p < .02$ ;  $***p < .001$ )

Table 5.6 also shows significant age differences in children who judge the disability to be no longer present in adulthood. Post-hoc comparisons showed that four to five year-olds are significantly more likely than any other age group to judge disabilities as transient states (4-5 year-olds versus 6-7 years:  $U = 65.5, p < .001$ ; 4-5 year-olds versus 9-10 years:  $U = 41.5, p < .001$ ; 4-5 year-olds versus 11-12 years:  $U = 45.0, p < .001$ ).

Children's explanations regarding controllability and chronicity were coded and analysed for age trends. Few significant trends emerged from the data. By seven years of age, children are significantly more likely than pre-schoolers to say the character could not change his disability because of internal uncontrollable reasons such as 'being born that way' ( $U = 63.5, p < .003$ ). Although most eleven to twelve year-olds think the character will be unable to change, a significant association was found between the

oldest age group and external controllable explanations ( $\chi^2 = 32.41, df = 6, p < .001$ ). Older children seem to appreciate that although impairment is chronic, there is possibility of change through seeking external intervention (e.g., medical help). No significant age difference was found in the use of internal controllable reasons.

Children of different ages also varied in the types of explanations they gave for why a character would no longer have his/her disability when an adult. The youngest age group were unable to give an explanation compared to the nine to ten year-olds ( $U = 53.0, p < .001$ ) and eleven to twelve year-olds ( $U = 36.0, p < .001$ ). Age differences in children's use of internal uncontrollable explanations fell just short of significance but six to seven year-olds had the highest mean rank than any other age group (48.88; compared to 33.56 pre-schoolers; 35.83 9-10 years; 36.92 11-12 years). A significant age difference was found in the use of external controllable explanations ( $H = 12.82, df = 3, p < .005$ ). The oldest age group are more likely than pre-schoolers ( $U = 74.0, p < .001$ ) and six to seven year-olds ( $U = 120.5, p < .02$ ) to say outside help (e.g., doctors, special teachers) could alleviate a disability.

### **5.3.6 Disability Differences in Judgements of Controllability and Chronicity**

Table 5.7 shows that children judged some disabilities to be significantly more controllable than others (*Friedman ANOVA* = 85.53,  $df = 7, p < .001$ ). ADHD and lack of social skills were perceived as being the most controllable impairments (79.2% and 83.1% respectively). Major physical disabilities (15.6%) and sensory disabilities (19.5% for blindness; 20.8% for hearing loss) are perceived as the least controllable whilst minor physical impairments (44.2%) and learning difficulties (45.5% for DS; 44.2% for NSLD) are perceived as moderately controllable.

Analysis of explanations showed that children prefer to explain ADHD in terms of intentional controllable means ( $\chi^2 = 41.75, df = 3, p < .001$ ). Indeed, over half of the children said the character with ADHD could change through personal effort. Internal controllable explanations were also the most popular for the character who lacked social skills ( $\chi^2 = 51.78, df = 4, p < .001$ ). Over half of the children thought they could change through personal effort alone. Most children also cited internal controllable reasons for non-specific learning disability and Down syndrome. The pattern of disability type and controllability is maintained across all age groups.

Table 5.7 Number (percentages) of children who think the character can change his/her disability

<u>Disability</u>	<u>Age</u>				<u>Total</u>
	<u>4-5 years</u>	<u>6-7 years</u>	<u>9-10 years</u>	<u>11-12 years</u>	
Blindness	7 (41.2)	3 (15.0)	5 (25.0)	0 (0.0)	15 (19.5)
Hearing Loss	8 (47.1)	2 (10.0)	3 (15.0)	3 (15.0)	16 (20.8)
Physical Major	3 (17.6)	1 (5.0)	5 (25.0)	3 (15.0)	12 (15.6)
Physical Minor	11 (64.7)	2 (10.0)	7 (35.0)	14 (70.0)	34 (44.2)
DS	10 (58.8)	7 (35.0)	11 (55.0)	7 (35.0)	35 (45.5)
NSLD	9 (52.9)	7 (35.0)	10 (50.0)	8 (40.0)	34 (44.2)
ADHD	15 (88.2)	15 (75.0)	14 (70.0)	17 (85.0)	61 (79.2)
LSS	14 (82.4)	17 (85.0)	15 (75.0)	18 (90.0)	64 (83.1)

Table 5.8 Number (percentages) of children who stated the character would not have his/her disability when an adult

<u>Disability</u>	<u>Age</u>				<u>Total</u>
	<u>4-5 years</u>	<u>6-7 years</u>	<u>9-10 years</u>	<u>11-12 years</u>	
Blindness	14 (82.3)	4 (20.0)	2 (10.0)	4 (20.0)	24 (31.2)
Hearing Loss	12 (70.6)	4 (20.0)	4 (20.0)	5 (25.0)	25 (32.5)
Physical Major	13 (76.4)	5 (25.0)	1 (5.0)	4 (20.0)	23 (29.9)
Physical Minor	12 (70.6)	3 (15.0)	3 (15.0)	8 (40.0)	26 (33.8)
DS	15 (88.2)	14 (70.0)	11 (55.0)	7 (35.0)	47 (61.0)
NSLD	15 (88.2)	17 (85.0)	14 (70.0)	8 (40.0)	54 (70.1)
ADHD	14 (82.4)	16 (80.0)	12 (60.0)	13 (65.0)	55 (71.4)
LSS	9 (52.9)	18 (90.0)	15 (75.0)	16 (80.0)	58 (75.3)

Table 5.8 also shows significant differences in children's understanding of chronicity as a function of disability type (*Friedman ANOVA* = 45.86, *df* = 7, *p* < .001). Children judged lacking in social skills and non-specific learning disabilities as more transient than sensory disabilities (LSS versus blindness: *T* = -2.79, *p* < .01; LSS versus hearing loss: *T* = -2.59, *p* < .01; NSLD versus blindness: *T* = -3.90, *p* < .001; NSLD versus hearing loss: *T* = -3.30, *p* < .001) and physical disabilities (LSS versus physical minor: *T* = -2.67, *p* < .01; LSS versus physical major: *T* = -3.30, *p* < .001; NSLD versus physical minor: *T* = -3.31, *p* < .001; NSLD versus physical major: *T* = -3.62, *p* < .001).

Furthermore, across all ages children favour particular types of explanations when reasoning why learning disability ( $\chi^2 = 11.74$ , *df* = 4, *p* < .02) and lacking in social skills ( $\chi^2 = 13.43$ , *df* = 4, *p* < .01) are not chronic. The majority of explanations in each case were internal controllable. Children also seem to favour internal uncontrollable explanations when explaining why hearing loss ( $\chi^2 = 60.38$ , *df* = 5, *p* < .001) and blindness ( $\chi^2 = 58.39$ , *df* = 4, *p* < .001) are chronic.

### **5.3.7 Conceptual Coherence in Children's Disability Concepts**

In order to examine the coherence of children's disability concepts, participants were individually classified on the basis of their responses to the cause, controllability and chronicity questions. This coding scheme has been previously used to assess the theoretical status of children's inheritance concepts (Springer, 1995). Children received 2 points when their responses to the vignette were completely *coherent* (i.e. when children's causal explanation cross-referenced with their controllability and chronicity judgement). For example, to reflect a coherent response, the participant would need to state that the character who was born with a disability did not have intentional control over that disability and that the disability itself is chronic. Alternatively, if the character was judged as wanting to have the disability (social/psychological cause), the disability would need to be perceived as controllable and not chronic, for a coherent response to be granted. Children received 1 point when their responses were *mixed* (i.e. when their causal explanation cross-referenced with either the controllability or chronicity question) and received 0 points for *incoherent* responses (i.e. when their cause did not cross-reference with either their controllability and chronicity question or when a child failed to indicate a cause). An overall coherent score was produced for each child by



summing each child's points across the disabilities. Overall scores thus ranged from 0 to a maximum of 16 points.

Table 5.9 Number of coherent scores for each disability and age group

	Age Group														
	4-5 years			6-7 years			9-10 years			11-12 years			Overall		
Coherent Scores	2	1	0	2	1	0	2	1	0	2	1	0	2	1	0
<u>Disability</u>															
Blindness	1	2	14	10	1	9	10	1	9	10	9	1	31	14	32
Physical Minor	3	5	9	8	4	8	10	0	10	17	2	1	37	11	29
NSLD	1	1	15	1	3	16	2	5	13	8	1	11	12	10	55
ADHD	2	0	15	7	0	13	7	3	10	11	2	7	27	5	45
Hearing Loss	3	4	10	10	2	8	7	3	10	11	8	1	31	17	29
Physical Major	0	4	13	8	4	8	10	3	7	13	3	4	31	14	32
DS	0	0	17	2	7	11	1	14	5	4	3	13	7	14	56
LSS	2	0	15	3	2	15	2	1	17	12	1	7	19	4	54
Overall Mean	0-16			0-16			0-16			0-16					
Coherent Score	2.35			6.10			5.80			10.10					

The results from Table 5.9 show age differences in the frequency of coherent responses, overall and by disability. In line with Springer (1995), a parametric test of significance was used to assess the effects of age and disability on overall coherence scores. A two-way ANOVA revealed a significant main effect of age, ( $F(3, 76) = 16.26, p < .001$ ). Post-hoc scheffé tests showed that four to five year-olds gave significantly more incoherent responses than any other age group ( $p < .05$ ). The oldest age group were more likely to give cohesive responses than any other age group ( $p < .05$ ). An analysis was also conducted on differences in coherence scores as a function of disability type. The ANOVA revealed a significant main effect of disability ( $F(7, 511) = 12.27, p < .001$ ). Significant disability differences were found in children's coherent responses ( $F(7, 399) = 11.93, p < .001$ ). A series of post-hoc t-tests found that children gave the least cohesive responses for Down syndrome (blindness:  $t(57) = -6.13, p < .001$ ; physical minor:  $t(57) = -6.84, p < .001$ ; hearing loss:  $t(57) = -6.63, p < .001$ ; physical major:  $t(57) = -6.30, p <$

.001; LSS:  $t(57) = -2.18, p < .05$ ; ADHD:  $t(57) = 4.21, p < .001$ ). The most coherent responses were found physical and sensory disabilities. No age x disability interaction effect was found.

## **5.4 Discussion**

The aim of Study 1b was to investigate whether children utilise and co-ordinate their core knowledge domains when reasoning about the causes, controllability and chronicity of disability. This was examined using an open-ended interview structure and has yielded many interesting findings regarding the different aspects of children's disability concepts. The remainder of this chapter will firstly discuss the findings on children's causal explanations of disability and will consider how this relates to their core knowledge domains. Children's understanding of the controllability and chronicity of disability will then be examined and the theoretical status of children's disability concepts will be discussed. Finally, potential strengths and limitations of the open-ended verbal methodologies will be considered.

### **5.4.1 Causal Explanations**

These preliminary findings show that children can offer causal explanations of disability that correspond to their core knowledge domains. Physical and biological causes feature in children's explanations of disability whereas social/psychological causes occur far less frequently. Overall, children do not seem to find the psychological domain a useful framework for understanding the causes of disability.

In addition, there are several age-related changes in children's causal understanding of disability. Specifically, by age seven, children are far more likely to offer biological causes of impairments than younger children. However, it should be noted that children's biological causal explanations of disability and in particular, reference to 'birth' as a mechanism, could have been influenced by the prompt question on previous trials. Consequently, it is unclear the extent to which children understand the biological mechanism of 'being born' with a disability. Yet, their biological explanations do not seem embedded within a psychological framework. Although it was not the aim of this thesis to determine when a core domain of biology develops, the results do suggest a pre-occupation with biological causes of disability in middle childhood. If viewed with caution, these results are consistent with Carey's (1995)

suggestion that by middle childhood, children increasingly engage in biological reasoning.

The findings also show that children's initial conceptions of disability are not social or psychologically driven. In fact, contrary to Carey (1985) social/psychological causal explanations were more prevalent in late childhood and were limited to emotional/behavioural difficulties. This is in accord with more recent research reported in Chapter 2, on children's concepts of gender (Taylor, 1996) race (Hirschfeld, 1995) and disordered behaviour (Maas et al., 1978), reported in Chapter 3. In each of these instances, children's initial conceptions are biologically grounded and only later do they appreciate the causal role of the environment. In addition, in the present study, children of all ages were able to offer physical causal explanations of disability. Indeed, four to five year-olds provided more physical causes for disability than biological ones. This is in accord with previous studies on children's disability concepts (Diamond, 1993; Sigelman & Begley, 1987) and suggests that conspicuous and concrete causes offer enticing explanations of disability for young children.

Only older children are able to exploit several causal-explanatory systems when reasoning about disability. This is consistent with previous studies that showed flexibility in children's causal reasoning systems when explaining various phenomena (Wellman et al., 1997; Korpan, 1999; Morris, 1998). By age eleven, more children can spontaneously produce multiple explanations for different disabilities, including biological and physical causes. Interestingly, social/psychological causal explanations of disability were never offered as 'one cause among many'. This is in contrast to a recent study by Inagaki & Hatano (1999) who found that (Japanese) college students believed that both psychological (e.g. depression) as well as biological/physical factors (e.g. imbalanced diet) would make some contribution to diseases. Social/psychological causes were only offered for particular disabilities indicating that older children have the ability to differentiate simultaneously between appropriate and inappropriate causes of disability.

In contrast to previous research (Wellman et al., 1997; Hickling & Wellman, 2001), younger children were unable to produce multiple causal explanations. Although young children can reason about particular causes for different disabilities, it seems

they are unable to think about more than one type of cause for the same disability. As suggested in Chapter 2, the ability to reason multi-causally about a particular disability seems to develop at a later age than the ability to engage in just one form of causal reasoning. This does not seem to be purely attributable to verbal ability. Even the six to seven year-olds and nine to ten year-olds, who gave fewer 'non-causal' responses compared to the youngest age group, rarely gave multiple causes for the same disability. This finding has implications for how children would conceptualise other complex phenomenon besides disability, which are not easily categorised into specific domains of reasoning. One issue for future research is to determine the mechanism by which older children can draw spontaneously upon different core reasoning systems in order to explain disability.

#### **5.4.2 Controllability and Chronicity**

The present study found that young children perceive disability to be more controllable and less chronic than older children. This is in accord with several studies which show young children's tendency to overestimate human competence in a variety of domains such as memory (Flavell, Miller & Miller, 1993; Flavell & Green, 1999) and interpretation (Carpendale & Chandler, 1996). However, it should be highlighted that that four to five year-olds were not more inclined than older children to give internal controllable reasons. Although younger children may over-estimate the ability to control a disability they do not necessarily believe this is achieved through personal effort.

By seven years, children are aware disabilities are not controllable through intentional means and often said the characters described in the vignettes could not change because they were 'born that way'. This is perhaps more evidence, that in middle childhood, children reason about disabilities in increasingly biological ways. However, it is not until late childhood that children become probabilistic in their judgements about the controllability and chronicity of disability. As mentioned in the previous section, this could be due to a greater awareness of the role of the environment in the causation and alleviation of disabilities. In the present study, older children were more likely to suggest external help as a means of change. Indeed, Kalish (1998) has argued probabilistic judgements become more prevalent with age in understanding illness and the present findings suggest this may generalize to disability.

The type of disability also has an effect on children's perceived controllability and chronicity. The emotional/behavioural disabilities are seen as most controllable. It is suggested that these disabilities have behavioural indicators that are salient to children and as such the origins and outcomes are considered to be controllable through behaviour alone. This is consistent with previous findings from Maas et al. (1978), in which younger children judged disordered behaviour to be controllable through personal effort.

Surprisingly, many children misunderstood the chronicity of learning disability stating it was a temporary condition that would disappear with transition into adulthood. Indeed, Conant & Budoff (1983) argued that children are less aware of disabilities that are psychological in origin. Intuitions about the controllability-uncontrollability of mental states seems to undergo a period of rapid development after the pre-school years (Flavell et al., 1993). As discussed in Chapter 3, previous research suggests that understanding the permanency and irrevocability of disability is not thought to develop until seven or eight years of age (Lewis, 1993; 1995). The fact that many children have misconceptions surrounding learning and behavioural disabilities is a concern considering many children with these disabilities are integrated into mainstream schools. An interesting question for further study is how direct experiences of disability interact with children's developing conceptions of disability? This issue will be explored directly in Study 2 and is reported in Chapter 6.

#### ***5.4.3 Theory-like Understanding of Disability***

In order to develop a systematic and principled concept of disability, children must learn to co-ordinate their causal explanations of disability with their knowledge about the stability of the condition. In the present investigation, the four to five year-olds gave the least coherent responses in their understanding of disability. This could be due to methodological reasons. Perhaps young children did not deem it important to keep their answers consistent during the interview. This is in line with Sigelman & Begley's (1987) findings that providing young children with causal information about disabilities had no effect on judgements of controllability (see Chapter 3 section 3.2.2). However, it also raises the possibility that young children do not have a coherent and theoretical understanding of disability.



The oldest children displayed a much more coherent understanding of disability, suggesting that the ability to reason in a theory-like way about disability develops with age. Naïve theories allow children to explain phenomena in a coherent and principled way and the present findings may indicate that children do not develop a naïve theory of disability until eleven years of age. Indeed, this suggestion is further supported by the individual patterns of children's causal explanations. No pre-school child showed a *Differentiated* judgement pattern in their causal explanations. Most four to five year-olds showed a *Non-Causal* bias in their causal explanatory patterns and many children displayed a *Mixed* pattern of responding. This could reflect a general confusion about causal mechanisms of disability. It is suggested that although young children may have psychological and biological knowledge at their disposal, they do not use these in a principled and theory-like fashion when reasoning about disability. In contrast, older children are beginning to differentiate in their understanding of the causes of disability. They seem to be much more flexible in their reasoning than younger children who tended to over apply one particular cause to all disabilities. These findings are consistent with those of Study 1a which showed that younger children, although aware of the consequences of disability, lacked sufficient knowledge to make a differentiated judgement. The combination of results from both Studies 1a and 1b indicates that the ability to think flexibly and coherently about various aspects of disability appears in later childhood.

Interestingly, in addition to age, the type of disability also seemed to affect the coherence of children's disability concepts. Children's perceptions of the controllability of learning disability were inconsistent with their types of causal explanations for this disability. For example, a large number of explanations given by children referred to biological causes as the reason for learning difficulties. Yet, despite this, many children thought a learning disability was controllable through personal effort. As discussed earlier, children appear to have fundamental difficulties in their understanding of learning disabilities, which in this instance, is reflected in their fragmented pieces of knowledge.

#### **5.4.4 Methodological Note**

This study has provided us with some early insights into how children conceptualise disability and the role that core knowledge domains play in children's disability



concepts. The findings have highlighted age differences in children's ability to coordinate more than one causal-explanatory framework when reasoning about disability. In addition, the theoretical status of children's disability concepts appears to be influenced by age and disability type. Together, these findings are an original contribution to existing research on children's disability concepts.

The open-ended verbal methodology employed in this study however has raised several important issues for discussion. Firstly, this method was particularly advantageous in examining the extent to which children can explicate their concepts of disability. Not surprisingly, some of the younger children had difficulty causally explaining disabilities. There are two potential reasons for this finding. Firstly, young children may have little causal knowledge of disabilities evidenced by the large number of responses from the four to five year-olds that were 'non-causal'. Many four to five year-olds described superficial features of disabilities rather than indicating a causal origin. For example, when asked what could have made the character blind, many young children replied "it's cause he needs glasses". This supports findings by Diamond & Hestenes (1996) in which four to five year-olds often referred to adaptive equipment (e.g., wheelchairs) in their comments on disabilities. Additionally, as discussed in Chapter 2, young children are often said to be 'perceptually seduced' by typical features, especially in relation to their understanding of social categories (Keil, 1989; Aboud, 1988). Pre-school children seem to be swayed by characteristic features that are easily observable but which lack any causal relevance.

However, given the large volume of research into children's physical, psychological and biological causal reasoning systems, it would seem doubtful that young children did not have any intuitive ideas about the causes of disability (Siegal & Peterson, 1999; Wellman & Gelman, 1992; Sperber, Premack & Premack, 1995). It is more likely that, in contrast to older children, the four to five year-olds found it difficult to produce an open-ended causal explanation of disabilities. In reaction to Piaget's classic interview studies it has been thought that articulating verbal explanations is an especially demanding task for young children and hence one that distorts rather than reveals basic modes of thought (see Bullock, Gelman & Baillargeon, 1982; Kalish, 1996). Indeed, fixed-choice response methods are now used extensively in research on young children's conceptual development (e.g., Hatano & Inagaki, 1999). Although young

children may lack explicit knowledge of causal mechanisms of disability, it is possible they may have intuitive notions of appropriate causes that could be revealed through an explanation preference task than open-ended procedures. This possibility is explored in Study 2.

### **5.5 Summary and Conclusions**

The results from this study have shown the usefulness of adopting a domain-specific approach to investigate children's disability concepts. Children's causal concepts of disability are mainly drawn from the physical and biological domains with social/psychological causal reasoning of disability emerging only in later childhood. In contrast to Carey's view (1985; 1995) children's biological reasoning is not initially subsumed within a social/psychological framework. Interestingly, children's ability to draw upon multiple causal frameworks to reason about disability is not evident until nine years. This is also the age at which children can tailor their causal explanations to particular disability types. The notion of children's disability concepts as theoretical is also an interesting and novel contribution to the literature. The present results suggest that a theory-like concept of disability does not emerge until eleven years of age, as prior to this, children's understanding of the various aspects of disability do not link in a cohesive manner. Together, these findings show that the ability to reason about disability in a principled, flexible and cohesive manner develops in later childhood.

The results from Study 1b are based on children's explicit understanding of disability. It is possible that young children may show a greater awareness of the causes of disability if allowed to express their knowledge non-verbally. Thus, although young children may find it hard to explicate their concepts of disability, they may exhibit implicit and intuitive knowledge of disability. This possibility is examined in Study 2.

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## CHAPTER 6

### Study 2: Children's Causal Conceptions of Disability

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#### 6.1 Children's Understanding of the Causes of Disability

Study 1b showed that children can provide causal explanations of disability which are accessible to verbal report and that there are age differences in the kinds of causes of disability that children offer. A central finding of Study 1b to this chapter, is that the four to five year-olds gave many 'non-causal' responses. It would be premature to conclude from this that young children know little about the causes of disability based on their tendency to give these non-causal responses. It is more likely that the youngest children in Study 1b found it demanding to give a verbal causal explanation of disability. Many recent studies indicate that young children have an implicit understanding of what the world is like far earlier than is revealed in their explicit and verbal thoughts (Inagaki & Hatano, 2002). As Chapter 1 noted, young children often invoke a domain of causal understanding prior to displaying any detailed knowledge of phenomena in that domain (Wellman & Gelman, 1992; 1998; Keil, 1998; Wilson & Keil, 1999).

Despite young children's difficulty in providing verbal causal explanations, Wellman & Gelman (1992) argue that children can use their framework understandings to interpret phenomena even in the absence of specific knowledge. Similarly, according to Keil (1999; 2000), children can have a sense of causal potency in a domain prior to having any insight into specific mechanisms, through the operation of cognitive constraints and modes of construal. In relation to the biological domain, young children clearly do not have access to conscious theories of all aspects of biology yet they still have strong expectations about what causal mechanisms are operating in the biological domain (Inagaki & Hatano, 1993; Keil, 1992; Springer & Keil, 1991).

In an attempt to tap less explicit knowledge, new forced-choice methods have been adopted, especially in the domain-specific literature (e.g. Springer & Keil, 1991). These have shown that young children can choose the most appropriate causal explanations

from amongst a set of presented alternatives even if they lack knowledge of specific mechanisms. Springer & Ruckel (1992) allowed children to consider competing causal explanations for illness rather than asking children to provide explanations themselves. This resulted in children consistently rejecting naïve psychological explanations in favour of biological causes, such as germs. Similarly, when Inagaki & Hatano (1993) devised an explanation-preference task for the question “Why do we eat food every day”, six year-old children were much more likely to endorse vitalistic (biological) reasoning as opposed to intentional (psychological) causality. Thus, when a different methodology is employed, children often exhibit a much higher level of understanding at an earlier age.

In addition to an alternative methodology, children may also display more sophisticated causal knowledge of disability if they have direct contact with those with disabilities. Several investigators have argued that children with classroom contact with peers with disabilities do exhibit a greater conceptual understanding of disability. As reported in Chapter 3, Diamond (1994) demonstrated that participation in a classroom with a hearing-impaired peer significantly improved young children’s understanding of hearing loss. Young children in inclusive settings were also more likely than other children to state that physical and sensory disabilities would persist into adulthood (Diamond et al., 1997). According to Diamond et al., understanding the more complex aspects of disability may be more easily learned in an inclusive setting. Together, the findings from these studies have shown that children’s disability concepts may be influenced by their social experiences, specifically direct contact with disabled peers.

If children’s understanding of the most complex aspects of disability would be more readily acquired in an integrated environment, then this should be evident in relation to children’s causal conceptions of disability. Indeed, previous research within the domain-specific tradition has demonstrated the advantages of social experience in the acquisition of complex conceptual knowledge. For example, Inagaki & Hatano (2002) propose a variety of social practices that may be influential in the development of naïve biological knowledge, including raising animals and plants, visiting a zoo or botanical garden, and joint reading of picture books on animals or plants. As noted in Chapter 2, Inagaki (1990) found that young children who had actively engaged in raising a

goldfish at home had richer factual and conceptual knowledge about goldfish than children of the same age who had never raised any animal. Inagaki, Hatano & Namiki (in an ongoing study, yet to be published) propose that a visit to the zoo may provide children with a framework in which to conceptualise the animal kingdom. In a recent study, Inagaki & Oshima (2001) examined whether the joint reading of a book on atopic disease would help young children understand the disease. Children aged six years, with and without an atopic skin condition, were read a picture book about atopic skin disease and given a comprehension test after the reading. The results indicated that many non-atopic children understood the content of the book although they did not have as deep a conceptual understanding as the atopic children. The difficulty, however, with this study is establishing which factor lead to the greater conceptual understanding: joint reading of the picture book or experiencing the disease. Overall, these studies suggest that a variety of social experiences can lead to advancements in children's conceptions of the biological world. As a consequence of this research, an aim of Study 2 is to examine the effects of classroom contact with disabilities on children's causal conceptions of disability.

### **6.1.1 Study 2**

Study 2 will investigate, in more depth, the development of children's causal explanations of disabilities using an explanation preference task. Participants were presented with descriptions of four children each with a particular disability and were asked to consider the appropriateness of physical, biological and social/psychological causes. Each cause presented in this study is taken from the most frequent spontaneous explanations generated by children in Study 1b. Furthermore, the effect of classroom contact on children's causal understanding of disability is investigated. This study addresses two key research questions. Firstly, do children, in particular four to five year-olds, show a bias in preferring certain causes of disability over others and which types of causal explanations are deemed most appropriate? Secondly, do children's causal ratings change with age and as a function of classroom experience with disabilities?



## **6.2 Method**

### **6.2.1 Participants**

In total, 79 children from three age groups were included in the study. There were 26 four to five year-olds (mean age = 4, 11; range: 4,5 - 5,2) 26 six to seven year-olds (mean age = 7,1; range: 6,4 - 7,3) and 27 ten to eleven year-olds (mean age = 10,4; range: 10,3 - 11,4). As important age differences were found in Study 1b, four year-olds, seven year-olds and eleven year-olds were also included in Study 2. The children were recruited from two inner-city schools and one school from a middle-class suburban area of Edinburgh through a process of parental written consent. In contrast to the first study, half of the participants in each age group had, at the time of data collection, daily classroom contact with at least one child with a speech/learning difficulty (but no other disabilities) thereby allowing the possible influence of experience of disability on conceptual development to be explored. This information was collected from the head teachers from all the participating schools. In addition, information about contact with peers with disabilities that children may have out with the school setting was collected via the parental consent letters. Across both high and low classroom contact groups, a third of parents reported that their child has some level of contact with disabilities out with the school setting (e.g., a neighbour who was learning disabled). Only one pre-school child had an immediate family member with a disability.

### **6.2.2 Materials**

#### Disability Vignettes

In this study, children were asked to listen to an audio-tape of a 'teacher' describing four children in her classroom who were of the same age as the participant. The taped description of each target child, always a boy, outlined his disability in concrete terms. The four disabilities chosen from Study 1a and b were; (a) physical disability; PD (described as confined to a wheelchair and unable to walk or run); (b) blindness (not being able to see, having to be lead around); (c) learning difficulty; LD (takes longer to learn, cannot remember well and takes longer to finish work); and (d) attention deficit hyperactivity disorder; ADHD (gets excited quickly and can only pay attention for few minutes). Each vignette (see appendix IV) included both generalised descriptions of the disability and one specific example of it. Each specific example described a positive social interaction. The vignettes were designed to be of the same length and detail in their descriptions of disabilities. For example:



One thing to tell you about Andrew is that he isn't able to move his legs so he can't use them to get around. He's got no feelings in his legs so he can't run or walk. This means he has to use a wheelchair to get around. On Friday, Andrew's friends were playing a running game in the playground so they helped push him in his wheelchair.

### Causal Explanation Rating Task

After hearing about each of the four target children, participants rated nine possible explanations for their likelihood as causes of disability. Table 6.1 outlines the 3 causes used that pertain to each of three intuitive domains: social/psychological, biological and physical. Recall that in the previous study (see Chapter 5. Section 5.4.1), it was unclear whether children understood 'being born' with a disability as a uniquely biological phenomenon. Consequently, in the present study, emphasis was placed on the biological process of malformation in relation to the 'birth' cause (see Table 6.1).

Participants rated each cause on a 1-to-3 response choice scale with the options 'likely', 'maybe' and 'unlikely'. The options, developed through extensive piloting, were graphically displayed on a poster board in the format of a 'thumbs up, thumbs down' game (see Appendix IV). The rating procedure was explained to ensure the child demonstrated understanding of the scale. Unless the participant responded 'maybe', subjects were further asked to rate confidence in their response by stating whether they were 'very sure' or 'not so sure' about their answers. This resulted in a 1-to-5 response scale that has been used previously to examine children's causal conceptions (see Taplin, Goodenough, Webb & Vogl, 1999; Sigelman & Begley, 1987).

### **6.2.3 Procedure**

Each child was interviewed individually in a separate room from the classroom. The order of the four vignettes was decided by each participant to ensure randomisation and the causal explanations were also presented in a randomised order. Using the scale, participants rated each causal explanation. The order of sure/unsure questions was randomised by the experimenter.

Table 6.1 Causal explanations

EXPLANATION MODE	CAUSE
<u>Social/Psychological</u>	
He is (disability) because he wants to be like that	Intentional
He is (disability) because he comes from a really bad home where is mum and dad always shout at him	Upbringing
He saw someone who was (disability) and he decided to copy them	Copy Behaviour
<u>Biological</u>	
He had been playing with a friend who was (disability) and he caught bugs from him which made him like that	Contagious Illness
His mum is also (disability) so the mum passed it onto him when he was growing inside her as a baby	Inheritance
When he was growing in his mum's tummy he didn't grow properly and was born (disability)	Birth
<u>Physical</u>	
He is (disability) because he was playing and got dirt in his eye (blindness)	Minor Trauma
He is (disability) because he was playing and fell over onto his leg (physical disability)	
He is (disability) because he fell over and banged his head (learning disability) (ADHD)	
He is (disability) because a firework blew up in his eye (blindness)	Major Trauma
He is (disability) because a car hit his legs when he was running across the road (physical impairment)	
He is (disability) because he hit his head in a car accident (learning disability) (ADHD)	
He is (disability) because he fell off a fence and broke his arm	Irrelevant

Note: Minor and Major physical causes are disability-specific

### 6.3 Results

In line with Springer & Keil (1991), children's causal ratings are analysed using parametric statistics as it was reasoned that the response choices conformed to an interval scale. This type of analysis is also consistent with previous studies using similar forced-choice response scales (see, Sigelman & Begley, 1987; Hatano & Inagaki, 1999; Taplin et al., 1999; Williams & Binnie, 2002). Two sets of analyses are presented.

Firstly, differences in *overall* causal ratings (across the disability types) will be described. Within this analysis, age differences in children's overall causal ratings will be presented. Secondly, children's causal ratings will be analysed for *disability differences* both across the ages and between age groups. The causal ratings reflect children's preferences for causal explanations and a higher score indicates children did not think the cause was a likely explanation of disability. Although half of the children included in the study had classroom contact with disabled peers, no significant effect of classroom contact was found on overall causal ratings ( $F(1, 73) = .03, p < .87$ ), on age differences in causal ratings ( $F(2, 73) = 1.85, p < .07$ ) or on causal ratings as a function of disability type ( $F(24, 1848) = .83, p < .70$ ). A separate analysis was also conducted on the effects of family contact with disabilities but no significant results were found ( $F(1, 77) = 2.62, p < .11$ ). The data are therefore analysed in relation to the whole sample.

### **6.3.1 Age Differences**

Table 6.2 illustrates mean differences in children's causal ratings across disability types, both as a function of age and across all ages. A mixed model ANOVA found significant cause effects ( $F(8, 608) = 77.37, p < .001$ ), age differences ( $F(2, 76) = 6.28, p < .01$ ) and a significant age x cause interaction ( $F(16, 608) = 7.35, p < .001$ ). Post-hoc *t*-tests were conducted within each 'explanation mode' (see Table 6.3). Across all ages and disabilities, 'major physical' causes received more favourable ratings than 'minor' or 'irrelevant injuries'. The 'birth' cause also received significantly more favourable ratings than 'illness' and 'inheritance' explanations. Children did not show a preference for 'illness' over 'inheritance' causes. 'Intentional' causes were given significantly less favourable ratings than 'upbringing' but not 'copy' behaviour. Overall, 'birth' and 'major physical' causes were the most preferred causal explanations of disability with neither being favoured over the other. 'Intentional' and 'irrelevant physical' causes were the least favoured causal explanations with equally low ratings.

Table 6.2 Mean causal ratings for each age group and overall

Age	Causal Explanations								
	<u>Social/Psychological</u>			<u>Biological</u>			<u>Physical</u>		
	Intentional	Upbringing	Copy	Illness	Inheritance	Birth	Minor Trauma	Major Trauma	Irrelevant Trauma
4-5 years	3.74	3.56	3.71	2.97	3.45	2.87	2.61	2.23	3.39
6-7 years	4.39	4.32	4.41	3.27	3.79	2.27	3.22	2.57	4.38
10-11 years	4.50	4.07	4.44	4.49	3.96	1.92	3.11	2.05	4.74
Total	4.22	3.98	4.19	3.59	3.74	2.34	2.98	2.28	4.18

Table 6.3 Mean difference in causal ratings within each age group

	4-5 years	6-7 years	10-11 years	Overall
<b>One-way ANOVA</b>	$F(8, 200) = 10.62^{**}$	$F(8, 200) = 27.69^{***}$	$F(8, 208) = 61.96^{***}$	$F(8, 624) = 68.13^{***}$
<b>Post-hoc t-tests</b>				
<b>Social/Psych</b>				
Intentional vs Upbringing	n.s.	n.s.	$t(25) = -2.06^*$	$t(25) = -2.14^*$
Intentional vs Copy	n.s.	n.s.	n.s.	n.s.
Copy vs Upbringing	n.s.	n.s.	n.s.	n.s.
<b>Biological</b>				
Birth vs Illness	n.s.	$t(25) = 3.63^{***}$	$t(25) = 11.31^{***}$	$t(25) = 6.85^{***}$
Birth vs Inheritance	$t(25) = 2.49^*$	$t(25) = -7.87^{***}$	$t(25) = -12.16^{***}$	$t(25) = -10.47^{***}$
Illness vs Inheritance	$t(25) = 2.25^*$	$t(25) = -2.63^{**}$	$t(25) = 2.70^{**}$	n.s.
<b>Physical</b>				
Minor vs Major	$t(25) = 2.24^*$	$t(25) = 2.45^*$	$t(25) = 6.57^{***}$	$t(25) = 5.83^{***}$
Minor vs Irrelevant	$t(25) = -3.54^{**}$	$t(25) = -4.34^{***}$	$t(25) = -9.67^{***}$	$t(25) = -9.06^{***}$
Major vs Irrelevant	$t(25) = -6.81^{***}$	$t(25) = -9.47^{***}$	$t(25) = -15.12^{***}$	$t(25) = -15.19^{***}$

(Note: \*\*\* denotes  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ )

To examine preferences in causal ratings within each domain, a series of one-way ANOVAs were completed for each age (see Table 6.3). The results showed that four to five year-olds, six to seven year-olds and ten to eleven year-olds exhibited clear preferences between causal explanations within domains. Post-hoc *t*-tests revealed no difference in four to five year-olds preferences between social/psychological causal explanations. In relation to biological causes, the youngest age group rated 'birth' as more probable cause of disabilities than 'inheritance'. Indeed, 'inheritance' was their least favoured explanation even over 'contagious illness'. 'Major physical' explanations were preferred by four to five year-olds as causes of disabilities and they opted for 'irrelevant injuries' the least. Similarly, the post-hoc tests showed that the six to seven year-olds did not rate any of the social/psychological causes significantly differently and 'birth' was the most preferred biological causal explanation. 'Inheritance' was the least favoured biological cause. Consistent with the youngest age group, the post-hoc tests revealed that the six to seven year-olds thought 'major physical traumas' were more likely to cause disabilities than 'minor' or 'irrelevant injuries'. The oldest age group did show a preference for certain social-psychological causes. Although such causes were rated as being generally inappropriate, the older age group responded that 'upbringing' was a more possible cause than 'intentional' reasons. The older age group also rated 'birth' as a highly likely cause for a disability and 'contagious illness' as the least likely biological cause. 'Major physical traumas' were the most popular physical cause.

A series of one-way ANOVAs comparing age groups were computed to investigate the age x cause interaction effect. Significant age differences were found for 'intentional' cause ( $F(2, 76) = 6.72, p < .01$ ), 'copy' cause ( $F(2, 76) = 6.56, p < .01$ ), 'upbringing' cause ( $F(2, 76) = 5.39, p < .01$ ), 'contagious illness' cause ( $F(2, 76) = 12.38, p < .001$ ), 'birth' cause ( $F(2, 76) = 6.67, p < .01$ ) and 'irrelevant trauma' cause ( $F(2, 76) = 16.91, p < .001$ ). Post-hoc *t*-tests revealed that four to five year-olds judged the 'intentional' ( $p < .05$ ), 'copy' ( $p < .05$ ) and 'irrelevant trauma' ( $p < .05$ ) causes more favourably than any other age group. However, it should be noted that the four to five year-olds ratings for such causes (means: 3.74, 3.71 and 3.39, respectively) indicated that they were unsure as to the role of social/psychological causal mechanisms for disabilities. Both six to seven year-olds and ten to eleven year-olds judged 'birth' to be a more appropriate cause of disabilities than four to five year-olds ( $p < .05$ ). The ten to eleven year-olds rated



'contagious illness' explanations lower than six to seven year-olds or four to five year-olds ( $p < .05$ ) suggesting they were more aware that disabilities are not contagious.

### **6.3.2 Disability Differences**

Table 6.4 shows the mean causal ratings for each disability. Across all ages, a two-way repeated measures ANOVA found a significant cause  $\times$  disability interaction ( $F(24, 1872) = 7.45, p < .001$ ). To investigate this more fully, a series of one-way ANOVAs were conducted for each causal explanation to establish whether certain causes were favoured for particular disabilities (see Table 6.4).

Significant differences in causal ratings for the disabilities were found in relation to 'intentional', 'copy behaviour', 'upbringing', 'birth' and 'major trauma' explanations. Taking each cause separately, 'intentional' explanations were given more favourable ratings for ADHD than any other disability, although children were generally unsure about this explanation as a cause of ADHD (blindness:  $t(78) = -6.27, p < .001$ ; LD:  $t(78) = -2.59, p < .01$ ; PD:  $t(78) = -5.89, p < .001$ ). 'Intentional' explanations were favoured least for blindness and PD. Participants also judged 'copy behaviour' explanations as more appropriate for ADHD than blindness ( $t(78) = -4.83, p < .001$ ), LD ( $t(78) = -2.07, p < .05$ ) and PD ( $t(78) = -3.51, p < .001$ ). 'Upbringing explanations' were preferred more as causes for ADHD (blindness:  $t(78) = 4.80, p < .001$ ; PD:  $t(78) = -6.08, p < .001$ ) and LD (blindness:  $t(78) = 4.80, p < .001$ ; PD:  $t(78) = -5.59, p < .001$ ). It should be noted however that although social/psychological causes were more favoured for ADHD than other disabilities, children were still unsure about the appropriateness of these causes. Only one biological explanation received different causal judgements depending on the disability. Participants judged 'birth' causes to be least likely for LD (blindness:  $t(78) = -2.11, p < .04$ ; physical disability:  $t(78) = 2.48, p < .02$ ). No difference was found between LD and ADHD for this cause. Additionally, only 'major trauma' received different causal judgements for each disability. A 'major trauma' was thought to be the least likely cause of ADHD compared to all the other disabilities (blindness:  $t(78) = 3.56, p < .001$ ; PD:  $t(78) = 4.69, p < .001$ ; LD:  $t(78) = 3.39, p < .001$ ).

Table 6.4 Mean causal ratings for each disability

	Causal Explanations								
	<u>Social/Psychological</u>			<u>Biological</u>			<u>Physical</u>		
Disability	Intentional	Upbringing	Copy	Illness	Inheritance	Birth	Minor Trauma	Major Trauma	Irrelevant Trauma
Blindness	4.65	4.48	4.63	3.63	2.77	2.13	3.08	2.04	4.32
Physical Disability	4.67	4.57	4.57	3.67	2.71	2.09	2.94	1.87	3.96
Learning Disability	4.08	3.51	3.99	3.47	2.80	2.66	2.84	2.24	4.13
ADHD	3.47	3.38	3.58	3.58	2.84	2.51	3.08	2.96	4.30
One-way Anova	$F(3, 234) = 17.98^{***}$	$F(3, 234) = 19.74^{***}$	$F(3, 234) = 14.57^{***}$	n.s.	n.s.	$F(3, 234) = 2.95^*$	n.s.	$F(3, 234) = 8.80^{***}$	n.s.

As shown in Table 6.5, a series of one-way ANOVA's and post-hoc t-tests were conducted for each disability separately to examine differences in preferences for explanations within each domain. The results showed that participants preferred certain causal explanations for blindness, PD, LD and ADHD. In relation to blindness, children gave significantly higher ratings for 'major physical' causes than 'minor' and 'irrelevant traumas'. 'Birth' was the most popular biological explanation for blindness. All social/psychological causes were rated as equally unpopular. A similar pattern was observed for PD. 'Major physical traumas' were judged the most appropriate physical cause. 'Birth' was rated more highly than 'inheritance' or 'contagious illness' explanations. As for blindness, social/psychological causes were judged to be inappropriate explanations for why someone may have a PD. Although social/psychological causes were not rated favourably for LD, children did show a differential preference for such causal explanations. A poor 'upbringing' was judged to be the most likely social/psychological cause. 'Contagious illness' explanations were thought to be an unlikely cause of a LD compared to 'inheritance' and 'birth'. In line with blindness and PD, 'major traumas' are judged to be the most appropriate physical cause of LD. A similar pattern was observed in children's causal ratings of ADHD. 'Major traumas' were rated higher than 'irrelevant injuries' but no difference in ratings was found between 'major' and 'minor' accidents. 'Illness' explanations were judged to be the least likely biological cause of ADHD. Children did not give significantly different social/psychological causal ratings for ADHD.

The results also showed a significant age x disability effect on children's causal ratings ( $F(48, 1824) = 1.66, p < .001$ ). A series of repeated measures ANOVAs showed only an age x disability effect for 'major physical' ( $F(6, 228) = 2.98, p < .01$ ) and 'birth' ( $F(6, 228) = 2.16, p < .05$ ) cause. One-way ANOVAs were conducted within each age group for both causes. The results showed that only six to seven year-olds ( $F(3, 75) = 6.74, p < .001$ ) and ten to eleven year-olds ( $F(3, 78) = 11.90, p < .001$ ) rated the disabilities differently on 'major physical' causation. The oldest age group rated this as least plausible for ADHD (PD:  $t(26) = 5.71, p < .001$ ; and blindness:  $t(26) = 4.42, p < .001$ ; and LD:  $t(26) = 3.85, p < .001$ ). The six to seven year-olds rated 'major physical traumas' as equally unlikely for ADHD and LD.

Table 6.5 Disability differences in mean causal ratings

	Blindness	Physical Disability	Learning Disability	ADHD
<u>One-way ANOVA</u>	$F(8, 624) = 48.51^{***}$	$F(8, 624) = 54.03^{***}$	$F(8, 624) = 16.63^{***}$	$F(8, 624) = 9.83^{***}$
<u>Post-hoc t-tests</u>				
<b>Social/Psych</b>				
Intentional vs Upbringing	n.s.	n.s.	$t(78) = 2.51^{**}$	n.s.
Intentional vs Copy	n.s.	n.s.	n.s.	n.s.
Copy vs Upbringing	n.s.	n.s.	$t(78) = 2.19^*$	n.s.
<b>Biological</b>				
Birth vs Illness	$t(78) = 6.23^{***}$	$t(78) = 6.08^{***}$	$t(78) = 3.08^{**}$	$t(78) = 4.75^{***}$
Birth vs Inheritance	$t(78) = 2.64^{**}$	$t(78) = 2.84^{**}$	n.s.	n.s.
Illness vs Inheritance	$t(78) = 4.20^{***}$	$t(78) = 5.06^{***}$	$t(78) = 3.15^{**}$	$t(78) = 4.12^{***}$
<b>Physical</b>				
Minor vs Major	$t(78) = 4.70^{***}$	$t(78) = 4.69^{***}$	$t(78) = 3.25^{**}$	n.s.
Minor vs Irrelevant	$t(78) = -5.39^{***}$	$t(78) = -4.34^{***}$	$t(78) = -5.92^{***}$	$t(78) = -5.36^{**}$
Major vs Irrelevant	$t(78) = -9.20^{***}$	$t(78) = -9.19^{***}$	$t(78) = -8.25^{***}$	$t(78) = -6.04^{***}$

(Note: \*\*\* denotes  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ )

For the 'birth' cause, only four to five year-olds gave significantly different ratings for each disability ( $F(3, 75) = 3.49, p < .02$ ). Among the four to five year-olds, 'birth' was thought to be the least likely explanation for LD (PD:  $t(25) = 2.16, p < .05$ ; blindness:  $t(25) = -2.71, p < .01$ ; ADHD:  $t(25) = -2.77, p < .01$ ). There were no age differences in children's ability to differentiate between the disabilities on the remaining causes.

## **6.4 Discussion**

Although Study 1b provided valuable information on children's spontaneous causal explanations of disability, due to the open-ended questioning procedure, it is unlikely it captured the full extent of young children's causal knowledge. Consequently, Study 2 intended to further explore children's causal understanding of disability using an explanation preference task. Furthermore, this study investigated the effects of classroom contact with disabilities on children's conceptual understanding of disability. The aims of the present study were to ascertain whether children, especially the youngest participants, had a preference for some causal explanations of disability and whether such a preference was influenced by age and classroom contact with disabilities.

### **6.4.1 Children's Preferences for Causal Explanations of Disability**

The results show that children do have a bias in preferring certain causal explanations of disabilities. Children of all ages rated biological and physical type explanations as significantly more appropriate causes of disabilities than social/psychological ones. This is similar to the findings from Study 1b. Taken together, these results provide a further indication that disabilities are not thought to be social or psychologically caused, even by younger children. There is currently great debate (see Chapter 2) as to what might constitute an early but distinct form of biological thought independent of psychological and physical reasoning (Inagaki, 1997; see also Medin & Atran, 1999). At the very least, these data show that young children have a sense that disability should be causally explained in terms of biological and physical causes as opposed to psychology, even if they lack the means to articulate this. However, a key challenge for future research will be to examine what sorts of knowledge enable children to prefer some classes of explanations over others even if they lack insight into specific mechanisms.

An interesting finding was that children were able to differentiate between various *types* of biological and *types* of physical causes of disability. Children rated 'birth' as the most appropriate biological cause of disabilities. Even the four to five year-olds thought it possible that babies could be born with disabilities as a result of a biological malformation (and therefore the biological prompt was unlikely to be a distorting factor in Study 1b). Interestingly, the youngest children also thought 'contagious illness' was a more plausible cause of disabilities than 'inheritance'. They seemed to over-generalise their notions of germs to be causal agents of disability. This supports earlier research noted in Chapter 2, that although children can limit the method of transmission of germs to physical contact, their conceptions of germs themselves and what they can transmit seem to be much less constrained (Keil et al., 1999). By age ten years, children are aware that not all illnesses are infectious and notions of contagion and contamination seem to no longer be the central feature of children's illness concepts (see Kalish, 1999). The most consistent age difference to emerge was that only the oldest age group were able to differentiate between types of social/psychological causes of disabilities. They were more likely to judge a 'poor upbringing' as a possible cause of disabilities compared to 'intentional' causes. This finding, together with Study 1b, suggests only older children are aware of the possible role of the environmental factors as a causal agent of disability. This supports earlier research discussed in Chapter 3 that only older children cite social/environmental factors in their causal explanations of emotional/behavioural disorders (Maas et al., 1979).

#### **6.4.2 Causal Potency**

Young children's preferences for certain causal explanations of disability indicate that they can have a sense of how disabilities can be causally explained even if they are ignorant of actual mechanisms. It is unlikely four to five year-olds know the precise mechanisms involved in being born with a disability or contracting disability through an illness-like process, yet they had a strong bias to rate these causes more favourably than 'inheritance'. This is likened to the notion of causal potency, as discussed in Chapter 1.

A series of recent studies has found that children, prior to formal schooling, have a sense of causal potency in a domain before having insight into specific mechanisms (Keil et al., 1999; Wilson & Keil, 2000). For example, in the realm of biological thought



pre-school children evidence only a rudimentary understanding of germs as causes of contagious disease yet they have strong expectations about disease and contagion (Kalish, 1999; Keil et al., 1999). Additionally, young children know very little about the precise mechanisms of inheritance or reproduction yet they have intuitive beliefs about how and what properties are inherited (Williams & Tolmie, 2000; Williams & Affleck, 1999; Hirschfeld, 1996; Springer & Keil, 1989). In these instances, it seems possible to have some relevant causal knowledge without any concrete idea of the mechanisms involved. The findings from Study 2 suggest this could also be the case for disability. However, it should be noted that young children still have much to learn about the causes of disability.

#### **6.4.3 Tailoring of Causes to Disabilities**

In contrast to Study 1b, children of all ages were able to tailor their causal ratings to particular types of disabilities. For example, social/psychological causes were viewed more favourably for ADHD than for blindness or physical disability. This ability to differentiate causes was evident even among pre-school children who did not apply causes indiscriminately to all disabilities, as was seen in Study 1b. It seems therefore that by four years of age, children are neither entity-based in their explanations (restricting disabilities to one causal reasoning system) nor widely confused (indiscriminately applying causes to all disabilities). This difference in findings between the studies may be largely due to the methodologies employed and the level of knowledge being tapped (i.e., explicit vs implicit knowledge). In Study 1b young children may have been so concerned with spontaneously generating a cause that they did not differentiate between different disability types. However, when the task demands are reduced, by presenting children with causal explanations, the four to five year-olds showed an impressive early tailoring of causes to disabilities. The implication of this finding is that given an appropriate methodology, even young children show the beginnings of more differentiated concepts of disability. However, children must come to convert such theory-like recognition into explicit understandings that are open to verbal report and the process by which this is done has still not been fully investigated.

In relation to children's multiple causal explanations, the methodology used here does not allow us to reliably establish whether children can reason about different causes of disability simultaneously. The forced-choice response scale required children to

endorse different causes individually. Many four to five year-olds thought both physical and biological causes were appropriate explanations of disability and this could suggest the ability to engage in multi-causal reasoning of disability. However it is still not clear whether children thought about each cause independently or in conjunction with one another. Even if young children could think about different causes for one disability, the implicit nature of this understanding would make it difficult to establish empirically.

#### **6.4.4 The Effect of Classroom Contact**

Although half of the children in this study had daily classroom contact with at least one child with a speech and learning difficulty, such experience did not affect children's *causal* understanding of disability. This is inconsistent with previous studies showing that early experiences of disability can shape children's factual knowledge of disabilities (Diamond & Hestenes, 1994). However, recent findings by Glasberg (2000) suggest experience may not affect children's knowledge of disabilities, especially when the experience is with disabilities that children find difficult to conceptualise. This could also have been the case in the present study. Children's contact with learning difficulties did not influence their causal understanding of disabilities. Previous studies have demonstrated children's difficulties in conceptualising learning disabilities (Conant & Budoff, 1983) and this difficulty may persist even in the face of direct classroom experience with learning difficulties.

The results from the present study are also in contrast to findings from Inagaki & Hatano (1997) who stress the importance of direct experience in shaping naïve biological knowledge (see Chapter 2 section 2.1.3). However, in other areas of conceptual development (e.g., inheritance concepts, Williams & Affleck, 1999), social experience or the provision of facts does not always lead to improvement in conceptual knowledge. Although future studies should aim to establish the types of experiences that can shape children's knowledge of disabilities, the present results demonstrate that cognitive causal frameworks exert a powerful influence over children's understanding of disabilities regardless of direct experience. The interplay between core conceptual frameworks and everyday experience in shaping children's conceptions requires further attention.

However, this study is unable to provide any firm conclusions on the role of experience more broadly. A potential limitation of this study is that the precise contact pattern between children with and without disabilities is not known as observation in the classroom did not take place. There was a lack of detail about the content or quality of the interaction between typically developing children and those with disabilities and therefore the classroom experience may have been quite limited. Contact patterns can vary in relation to the frequency of classroom interactions and the types of interactions that children are engaged in. Although half of the participants in Study 2 did have classroom contact with speech and learning difficulties, it is unclear whether this was categorised contact or decategorised contact (Maras & Brown, 1992). As Chapter 3 noted, decategorised contact describes a process whereby integration is taking place but children with disabilities are not identified as members of a particular group. Therefore, if in the present study, children with disabilities had never been identified and if no classroom based discussions had ever taken place about disabilities, this may have resulted in the lack of experiential effects.

It would thus be premature to conclude that classroom contact with disabilities has no effect in shaping children's disability concepts. The findings from this study only showed that *causal* understanding of disability is not easily influenced by limited social experience but there may be other aspects of children's disability concepts that are shaped by more extensive classroom contact. For example, in line with Diamond et al., (1997), children's knowledge of the consequences and chronicity of disability may be influenced by an inclusive classroom setting. Furthermore, although not discernible from the methodology used in this study, social experiences with disabilities may enable children to explicate and verbalise their causal concepts of disability. This possibility should be explored with additional research.

## **6.5 Summary and Conclusions**

This study has found that children demonstrate a preference for physical and biological causes of disability, which is consistent with Study 1b's findings. These results are further confirmation that children do not find naïve psychology a useful domain for conceptualising disabilities. Furthermore, the forced-choice methodology employed in this study has allowed the younger children to show their causal knowledge of disability. The four to five year olds also preferred certain physical and biological

causes of disability which suggests they have a sense of how disabilities should be causally explained even if they lack detailed knowledge of the mechanisms involved. The youngest children also showed, in contrast to Study 1b, an impressive early tailoring of causes to particular disability types. The results from Studies 1b and 2 highlight the contrasting findings that can be obtained by employing two different methodologies in relation to one research topic. Forced-choice explanation tasks have previously been criticised for their difficulty in “making different explanation types comparable with respect to the informativeness of the explanation and the familiarity with the information it contains” (Carey, 1995, p.297). However, this method has proved useful in the present and previous research not only for demonstrating children’s implicit causal understandings but also for selecting meaningful fixed-choice responses (Springer & Ruckel, 1992; Hatano & Inagaki, 1994).

Surprisingly, this study also found no effect of classroom contact with disabled peers on children’s causal conceptions of disability. The causal-explanatory frameworks that are evident early in childhood and that children use to conceptualise disability may be relatively unaffected by direct social experience with disability. Consequently, there is a need to establish other factors that may influence children’s disability concepts. One such factor, which is considered to influence *attitudes* towards disability, is language. There has been considerable research, in the disability literature, about the possible influence of labelling on children’s and teachers’ attitudes towards others with disabilities. Concurrently, researchers working in the area of conceptual development have for some time been interested in the effects of language on social category understanding (Markman, 1989; Rothbart & Taylor, 1992). Yet, to date, these disparate strands of research have never been unified. Chapter 7 will therefore describe a final empirical study that explores the effects of labelling on children’s *conceptions* of disability. The aims of Study 3 are to ascertain whether children’s understanding of disability can be influenced by the linguistic label assigned, and to explore the relationship between language and children’s causal-explanatory frameworks.

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## CHAPTER 7

### Study 3: The Effects of Labels on Children's Conceptions of Disability

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Interestingly, Study 2 did not find any significant effects of classroom contact on children's causal understanding of disability and consequently there is a need to identify additional experiences that may shape children's concepts of disability. One such experience that has received much research attention in the disability literature is language (Dunn, 1968; Mercer, 1971; Wood & Valdez-Menchaca, 1996). The role of language and how this influences children and teachers' attitudes towards those with disabilities has become a key research issue. What is not clear, however, is the role of language in shaping children's *conceptions* of disability. The fact that no research has addressed this issue is surprising given that conceptual development research has highlighted the effects of language on social category understanding (Markman, 1989; Gelman & Heyman, 1999). Furthermore, Inagaki & Hatano (2002) very recently have identified linguistic variables that may contribute to the acquisition of naïve biology concepts. Consequently, it is possible that language may influence children's disability concepts. The final study in this thesis will examine the effects of disability labels on children's conceptions of disability. The aims of this study are to investigate the role of language in shaping children's *conceptions* of disability and more specifically, to ascertain whether language influences the causal-explanatory framework within which disability is conceptualised.

#### 7.1 Language and Disability

There has been widespread concern over the way language shapes perceptions of disability (Dunn, 1968; Mercer, 1971; Graham & Leone, 1988). This is reflected in the attempts to eradicate terminology such as 'cripple' or 'spastic' and the change in reference from 'disabled people' to 'people with disabilities'. Moderating the role of language is more complex than the removal of offensive words and the use of labels and how this affects perceptions of children with disabilities is a core controversy in special education (Wood & Valdez-Menchaca, 1996).



Much concern has long been expressed about the detrimental effects of labelling a child as disabled (Mercer, 1971; Dunn, 1968). Critics of the labelling process have attributed several negative consequences to the assignment of disability labels, including lower teacher expectations and a disregard for individual differences (Blatt, 1972; Dunn, 1968). Some of the strongest arguments against adopting the labelling process have been based on the viewpoint that labelling produces a condition of self-fulfilling prophecy and has an adverse effect on teacher, parents and peer expectations of the labelled child (Dunn, 1968). Investigators have demonstrated that teachers and peers respond negatively to a child identified with a special need such as a learning disability, attention deficit hyperactivity disorder or developmental delay (Foster & Ysseldyke, 1976; Foster, Schmidt & Sabatino, 1976; Ysseldyke & Foster, 1978).

A considerable amount of research exists on the labelling process and many have emphasised the negative effects of labelling children as disabled. Much of the research has focused on how labels affect teachers' or children's attitudes towards others with disabilities (Wood & Valdez-Menchaca, 1996; Cornett-Ruiz & Hendricks, 1993; Graham & Leone, 1988; Gottlieb, 1974; Seitz & Geske 1976; Foster et al., 1976). However, there is currently no research that explores the extent to which disability labels influence children's *conceptions* of disability. Indeed, many of the more recent studies on children's disability concepts (see Chapter 3) actively avoided using disability labels, instead providing general descriptions to children about peers with disabilities (Diamond, 1993; Sigelman & Begley, 1987; Lewis, 1995), as in Studies 1a/1b and 2. Although this previous research has provided valuable information about children's disability concepts, it is unclear to what extent labelling the disabilities could have altered ideas about the causes and irrevocability of disabilities. It does seem remarkable that parallels have never been drawn between the disability research and the conceptual development literature, which for many years now has been interested in the effects of labels on social category understanding (Markman, 1989; Rothbart & Taylor, 1992; Gelman & Heyman, 1999).

## **7.2 Language and Conceptual Development**

Research within the conceptual development tradition has shown that the linguistic form in which a category (e.g., biological, social) is expressed may have important effects on perceptions of that category (Markman, 1989; Gelman & Markman, 1986). For example, many properties that may be considered transient states (e.g., Mary



always does her homework) may seem more enduring when expressed in the form of a label (e.g., Mary is a hard worker). Thus, giving a label may emphasise the defining features of that individual in ways that other information would not (Gelman & Heyman, 1999). Furthermore, there are many different forms that a label can take, including common nouns (e.g., slob), adjectives (e.g., lazy) or diagnostic phrases (e.g., has attention deficit hyperactivity disorder) and there may thus be important differences in the type of information that these labels convey. Evidence in fact suggests that there is an association between whether a category is richly structured or arbitrary and whether it is referred to by a noun or an adjective. In particular, Markman (1989) argues that a concept referred to by a noun may have considerable inferential depth. In a series of adult studies, she found that people expect a noun label to support more inferences, to provide fundamental essential information about the object, to provide information about the identity of the object and that the information is enduring and permanent. However, there is little developmental research to complement these adult studies.

An exception is recent research by Gelman & Heyman (Gelman & Heyman, 1999; Heyman & Gelman, 2000), who have carried out a number of studies specifically examining how language affects children's understanding of social categories. Gelman & Heyman (1999) investigated how language effects children's inferences about novel social categories. They hypothesised that children would make more inferences about a social category when referred to by a noun label as opposed to a verbal description. Children aged five to seven years learned about a characteristic of a hypothetical person (e.g., "Rose eats a lot of carrots"). Half of the children were then given a noun label for each character ("She is a carrot-eater") whereas half heard a verbal predicate ("She eats carrots whenever she can"). The children were then asked four questions about the stability of the characteristic (eating carrots). They found that children judged properties as significantly more stable over time and contexts when referred to by a noun label than when referred to by a verbal predicate. Although the linguistic distinction is subtle, it does seem to convey to the child important information about feature stability. In particular, Gelman & Heyman's findings show that language can be especially powerful for understanding novel social categories.

Despite the ongoing debates surrounding the effects of labelling children as 'disabled', no previous research has examined how language influences typical

children's understanding of disability. Intuitively however it would seem highly plausible that linguistic labels might exert a powerful influence over children's inferences about disability. For example, one can refer to a disability using a noun label (e.g., he's a slow learner) and this may provide significantly more information to a child than simply describing the disability (e.g., he is slower at learning). A similar effect may also be found with a diagnostic possessive label (e.g., he has Down syndrome), although no research to date has explored this issue. Furthermore, it is unclear as to what type of information such labels could convey. In Gelman & Heyman's (1999) 'carrot-eater' study, children were only asked to judge the stability of the attribute. However, labels could also provide information about the causal origins of disability, such as whether they are inborn or acquired. If labels do have an influence on the causal-explanatory framework which children use to reason about disability then this would suggest an important relationship between language and domain-specific knowledge. The role of language and its influence on the development of core domains of knowledge has rarely been investigated.

### **7.3 Language and Core Knowledge Domains**

Arguably, the acquisition of physical, psychological and biological knowledge could be influenced by language given that one of the primary functions of this form of communication system is the sending and receiving of information. By the time children have become competent language users they, like adults, have come to rely heavily on language as a major source of knowledge (Tager-Flusberg, 1993). Yet the role that language plays in shaping children's core domains of thought has to date never been fully explored.

In relation to naïve psychology, there has been increased interest in examining how the development of language relates to a theory of mind (Dunn, 1994; Bartsch & Wellman, 1995; de Villiers & de Villiers, 2000; Tager-Flusberg, 2000; Woolfe, Want & Siegal, 2002). One proposal is that theory of mind performance is closely tied to the development of children's language skills, particularly proficiency in syntax (de Villiers & de Villiers, 2000). Another proposal is that children's exposure to talk about mental states gives rise to theory of mind reasoning (Dunn, 1994; Siegal, Varley & Want, 2001). According to this view, the more children are exposed to talk about thoughts and other invisible mental processes, the earlier they develop a theory of mind.

Linguistic variables are also thought to contribute to the acquisition of naïve biological knowledge (Inagaki & Hatano, 2002). Stavy & Wax (1989) showed that within Israeli culture, plants are attributed a different life status in comparison to animals as a result of the Hebrew words for 'animal' and 'plant'. The Hebrew word for 'animal' is very close to that for 'living' and 'alive', yet there is no such related term for 'plant'. A similar outcome was also found in Japanese culture where linguistic factors contribute to children's judgements about the life status of inanimate objects (Inagaki & Hatano, 2002). Each of these studies focuses only on the role of language in shaping one sub-domain of knowledge: namely theory of mind beliefs in naïve psychology and living kind concepts in naïve biology. It remains unclear whether language can influence the causal-explanatory framework within which disability is conceptualised. Consequently, the present study will directly explore the influence of labelling on how children conceptualise disabilities.

### **7.3.1 Study 3**

The purpose of Study 3 was to explore the role of language in shaping children's disability concepts using a similar format to Gelman & Heyman's (1999) 'carrot-eater' study. In particular, this study investigated whether the form of the label itself is sufficiently powerful to produce differing ideas as to the causes, controllability, chronicity and perceived differences of disability. Participants aged four to eleven years heard five passages describing children with disabilities and were subsequently given a noun label, a diagnostic label or a general description. Each participant was then asked questions regarding their conceptions of the particular disability. The aims of the study were to ascertain the possible influence of labels on children's understanding of different aspects of disability and the extent to which the labelling process is moderated by age and type of disability. It was hoped that the present study would not only add to recent research on children's language and cognitive development but also highlight practical and educational considerations surrounding the use of disability labels more generally.

## **7.4 Method**

### **7.4.1 Participants**

A total of 93 children participated in this study (see Table 7.1). Children were randomly assigned to one of three conditions: the noun label condition, the diagnostic label condition and the description condition. Children were recruited from three state nurseries and two primary schools through a process of opt-in

written parental consent (see Appendix I for sample copy). Half of the pre-school children had nursery/home contact with children with language difficulties, non-specific learning difficulties, autism and Down syndrome. None of the older children had classroom contact with a child with a disability. However, information collected from the parental consent letters indicated that 11 participants aged six to seven years and three subjects aged ten to eleven years had contact with people with disabilities outside the school setting.

*Table 7.1 Participant information*

	Noun Label	Diagnostic Label	Description	Overall
4-5 years	10 (4.6) <i>4.4 – 5.0</i>	10 (4.6) <i>4.4 – 5.1</i>	10 (4.7) <i>4.5 – 5.2</i>	30 (4.6) <i>4.4 – 5.2</i>
6-7 years	11 (7.2) <i>6.8 – 7.5</i>	11 (7.1) <i>6.9 – 7.4</i>	11 (7.1) <i>6.8 – 7.5</i>	33 (7.1) <i>6.8 – 7.5</i>
10-11 years	10 (10.8) <i>10.5 – 11.4</i>	10 (10.7) <i>10.4 – 11.2</i>	10 (10.6) <i>10.5 – 11.1</i>	30 (10.7) <i>10.4 – 11.4</i>
Overall	31	31	31	93

Note: Figures in brackets indicate mean age in years  
 Italicised figures indicate age range in years

#### **7.4.2 Materials**

Each participant received five item sets which are outlined in Table 7.2. For each set, participants heard a three-sentence description, followed by a set of four test questions. The three-sentence description included the character's name and age, a description of the particular disability and either a noun label, a diagnostic label or a description.

In line with Studies 1a/1b and 2, a broad range of disabilities were selected (emotional/behavioural, learning difficulty, sensory disability and physical disability) in order to contrast children's understanding of different types of disabilities. Real diagnostic medical labels were used instead of more familiar disability labels so that participants would be more likely to make inferences based on the label rather than on prior knowledge or experience with the disability (see also Gelman & Heyman, 1999). An imaginary label (mopia) was also included in

line with previous research on children's understanding of novel social categories (Heyman & Gelman, 2000).

Table 7.2 Five item sets

John is nine years-old. John is always on the go. He is a hyperactive child (noun label condition) He has hyperactivity (diagnostic label condition) He is on the go all the time (descriptive phrase condition)
Tom is seven years-old. Tom is slower at learning things. He is a Down syndrome child (noun label condition) He has Down syndrome (diagnostic label condition) He is slower to learn things in class (descriptive phrase condition)
David is eight years-old. David's eyes see everything fuzzy He is an astigmatic (noun label condition) He has astigmatism (diagnostic label condition) His eyes make him see everything all fuzzy (descriptive phrase condition)
Chris is ten years-old. Chris keeps bumping into things. He is a dyspraxic (noun label condition) He has dyspraxia (diagnostic label condition) He bumps into things all the time (descriptive phrase condition)
Andrew is eight years-old. Andrew has a thumb missing on his hand. He is a mopic (noun label condition) He has mopia (diagnostic label condition) His hand has got a thumb missing (descriptive phrase condition)

The four test questions for each item set concerned the cause, chronicity, controllability and perceived differences of the disability. Each participant was first told they would be asked to think about what made the character that way by rating the appropriateness of three different causes of disability (see Table 7.3), in the same five point format as Study 2 (see Chapter 6 section 6.2.2). The set of explanations comprised one that described an underlying biological cause (birth), one physical cause (physical major) and one social/psychological cause (upbringing), all taken from Study 2. Each type of cause was rated as most popular in Study 2. Only the physical causes are tailored for specific disability types (see Table 7.3).



Table 7.3 Causal explanations

CAUSE	EXPLANATION TYPE
"When he was growing in his mum's tummy he didn't grow properly and he was born like that"	Biological
"He is (disability) because he comes from a really bad home where his mum and dad always shout at him"	Social/Psychological
"He is (disability) because a firework blew up in his eye" (astigmatism)	Physical
"He is (disability) because he hit his head in a car accident" (Down syndrome, hyperactivity, dyspraxia)	
"He is (disability) because he had a bad accident that cut it off" (mopia)	

Note: Physical causes only are disability-specific.

In addition, as in Study 1b, participants were asked for their judgements regarding *controllability* of the disability ("Could X (e.g., see) if he wanted to?"), *chronicity* of the disability (e.g., "When X grows up to be an adult will he be able to ((e.g., see))?" ) and *perceived differences* between themselves and the described character ("Do you think X sounds the same as you or different to you?"). Responses regarding controllability, chronicity and were coded as 'yes', 'no' or 'don't know' and were given numerical codes (yes = 1, no = 2 and don't know = 3). In contrast to Study 1b, no child gave a "maybe" response. Responses to the perceived differences question were also given numerical codes (1 = same, 2 = don't know and 3 = different).

### 7.4.3 Procedure

All children were tested individually during a 10-minute session. The six to seven and ten to eleven year-olds were interviewed in a separate room from their class and the four to five year-olds were tested in a quiet corner of the nursery. Each child received all five item sets and were asked all four test questions. The items were provided in a different random order for each participant. The causal question was always presented first because it required use of the 5-point scale. The remaining questions were presented in a random order.



## 7.5 Results

As in Study 2, children's causal ratings were analysed using parametric statistics and the causal ratings reflect children's preferences for each of the causal explanations. Results are first presented in terms of differences in *overall* causal ratings (across all disability types) for each labelling condition and age group. Children's causal ratings will then be analysed for *disability differences*. Preliminary analyses revealed no significant effects of gender at any age or any significant effects of contact amongst the four to five year-olds, so these variables were not included in further analyses.

### 7.5.1 Causal Ratings

Table 7.4 indicates labelling and age effects on mean causal ratings. Overall causal ratings were entered into a 3 (label condition: noun label, diagnostic label and description) x 3 (age: 4-5 years, 6-7 years, 10-11 years) mixed model two-way ANOVA. The results showed no significant effect of labelling on any of the causal explanation types.

Table 7.4 Mean causal ratings as a function of age and labelling condition

<u>Age</u>	<u>Cause</u>	<u>Label Type</u>			<u>Overall</u>
		Noun Label	Diagnostic Label	Description	
4-5 years	Biological	3.44	2.44	2.96	2.93
	Physical	1.90	2.30	2.36	2.19
	Soc/Psy	4.32	4.72	4.86	4.63
6-7 years	Biological	2.75	2.51	2.13	2.46
	Physical	2.64	2.42	1.93	2.33
	Soc/Psy	4.62	4.64	4.51	4.59
10-11 years	Biological	1.84	2.36	2.70	2.30
	Physical	1.80	2.34	2.10	2.08
	Soc/Psy	4.24	4.40	4.36	4.33
Overall	Biological	2.68	2.43	2.58	2.56
	Physical	2.13	2.35	2.12	2.20
	Soc/Psy	4.40	4.59	4.57	4.52

However, there was a significant main effect of cause ( $F(2, 168) = 144.39; p < .001$ ). A series of paired t-tests revealed that the biological and physical causal explanations received more favourable ratings than the social/psychological cause (biological vs social/psych;  $t(92) = -16.09; p < .001$ ; physical vs social/psych;  $t(92) = -22.92; p < .001$ ). These data are consistent with findings from both Studies 1b and 2.

### 7.5.2 Disability Differences in Causal Ratings

Table 7.5 shows the mean causal ratings for each disability type and labelling condition. In order to examine disability differences, children's causal ratings were entered into a 5 (disability: astigmatism, dyspraxia, Down syndrome, hyperactivity and mopia)  $\times$  3 (label condition: noun label, diagnostic label and description)  $\times$  3 (age: 4-5 years, 6-7 years, 10-11 years) ANOVA. There was no effect of labelling on children's causal ratings for different disabilities. Physical causal explanations were preferred for mopia and astigmatism, whilst both biological and physical causes were rated favourably for dyspraxia, Down syndrome and hyperactivity. Social/psychological causes were the least preferred for all disabilities, although in line with Study 1b, the social/psychological mean causal ratings were higher for the learning (Down syndrome) and emotional/behavioural disability (ADHD). In addition, a significant age  $\times$  disability interaction effect was found for causal ratings ( $F(16, 720) = 2.54, p < .001$ ). A series of repeated measures ANOVA's showed an age  $\times$  disability effect for the social/psychological cause only ( $F(8, 360) = 5.48, p < .001$ ). One-way ANOVAs were conducted within each age group for the social/psychological ratings. The results showed that only the six to seven year-olds ( $F(4, 128) = 19.68, p < .001$ ) and ten to eleven year-olds ( $F(4, 116) = 19.02, p < .001$ ) rated the disabilities differently on social/psychological causation. The six to seven year-olds thought the social/psychological cause was most plausible for Down syndrome (astigmatism:  $t(32) = 5.28, p < .001$ ; mopia:  $t(32) = -5.28, p < .001$ ; hyperactivity:  $t(32) = -3.12, p < .01$ ; dyspraxia:  $t(32) = -5.28, p < .001$ ). The ten to eleven year-olds judged this cause to be most appropriate for both Down syndrome (astigmatism:  $t(29) = 5.56, p < .001$ ; mopia:  $t(29) = -5.56, p < .001$ ; dyspraxia:  $t(29) = -4.76, p < .001$ ) and hyperactivity (astigmatism:  $t(29) = 5.35, p < .001$ ; mopia:  $t(29) = -5.35, p < .001$ ; dyspraxia:  $t(29) = 3.76, p < .001$ ).

Table 7.5 Mean causal ratings as a function of disability and labelling condition

Cause	<u>Disability</u>																			
	Astigmatism			Dyspraxia			Down Syndrome			Hyperactivity			Mopia							
	NL	DL	D Overall	NL	DL	D Overall	NL	DL	D Overall	NL	DL	D Overall	NL	DL	D Overall					
Biological	2.26	2.10	2.03	2.12	2.74	2.45	2.74	2.65	2.23	1.90	2.26	2.94	2.84	3.19	2.98	2.81	2.52	3.03	2.78	
Physical	2.03	1.58	1.26	1.62	2.26	2.42	2.45	2.38	2.63	3.00	2.61	2.63	2.74	2.94	2.84	2.84	1.32	1.84	1.45	1.54
Soc/Psy	4.74	4.94	4.94	4.87	4.65	5.00	4.94	4.86	3.65	4.00	3.55	3.73	4.06	4.00	4.45	4.17	4.90	5.00	5.00	4.97

Note: NL: Noun Label; DL: Diagnostic Label; D: Description

### 7.5.3 Controllability, Chronicity and Perceived Differences

The number of uncontrollable, chronic and perceived differences judgements for each age group and labelling condition across all disability types are shown in Table 7.6. In line with Study 1b, children's responses were analysed using non-parametric statistics. No significant effects of labelling were found in children's overall controllability, chronicity and perceived differences scores.

Table 7.6 Number of uncontrollable, chronic and perceived differences judgements for each age group and labelling condition

		<u>Label Condition</u>			
		Noun Label	Diagnostic Label	Description	Overall
<u>Age</u>	<u>Judgement</u>				
					(N = 30)
4-5 years	Uncontrollable	20	28	21	71
(n= 10	Chronic	30	31	26	76
per cond)	Differences	33	35	32	100
					(N = 33)
6-7 years	Uncontrollable	30	43	34	104
(n =11	Chronic	24	35	33	90
per cond)	Differences	36	39	34	105
					(N = 30)
10-11 years	Uncontrollable	27	31	35	91
(n = 10 per	Chronic	28	32	28	89
cond)	Differences	20	29	42	95
					(N = 93)
Overall	Uncontrollable	77	102	90	269
(n = 31 per	Chronic	82	98	87	267
cond)	Differences	89	103	108	300

There was a significant age effect on children's judgements about controllability ( $H = 8.91, df = 2, p < .01$ ). Post hoc analysis revealed that the four to five year-olds were more likely to judge the disabilities as controllable (4-5 year-olds versus 6-7 year-olds:  $U = 310.0, p < .01$ ; 4-5 years versus 10-11 year-olds:  $U = 292.0, p < .02$ ). This is consistent with Study 1b's results. Although there were no significant age

differences in chronicity responses, Table 7.6 shows that the four to five year-olds were more likely judge disabilities as transient conditions. There was no age x label interaction in children's overall controllable, chronic and differences scores.

The only labelling effect that was found in the present study was on children's judgements about the controllability of dyspraxia. Children's perceptions of whether dyspraxia is controllable was influenced by the label assigned ( $H = 11.10$ ,  $df = 2$ ,  $p < .001$ ). Children who heard the diagnostic label were much more likely to perceive dyspraxia as uncontrollable (noun label vs diagnostic label:  $U = 324.0$ ,  $p < .01$ ; diagnostic label vs description:  $U = 283.50$ ,  $p < .001$ ).

Across all labelling and age groups (Table 7.7), there was a significant effect of disability on judgements of controllability (*Friedman ANOVA* = 14.50,  $df = 4$ ,  $p < .01$ ) and chronicity (*Friedman ANOVA* = 10.55,  $df = 4$ ,  $p < .03$ ). Paired sample Wilcoxon tests showed that mopia (missing finger) and astigmatism were considered to be the least controllable disabilities. Mopia (missing finger) was also considered the most chronic disability. Age did have an influence on judgements of controllability for some disabilities. An age difference was found in children who judged mopia (missing finger) to be controllable ( $H = 16.29$ ,  $df = 2$ ,  $p < .001$ ). In contrast to older age groups, the four to five year-olds perceived this disability to be controllable (4-5 year-olds vs 6-7 year-olds:  $U = 310.5$ ,  $p < .001$ ; 4-5 year-olds vs 10-11 year-olds:  $U = 300.0$ ,  $p < .01$ ). Children's judgements about the controllability of astigmatism was also influenced by age ( $H = 8.13$ ,  $df = 2$ ,  $p < .02$ ). The youngest age group gave significantly more controllable scores than the older age groups (4-5 year-olds vs 6-7 year-olds:  $U = 354.5$ ,  $p < .01$ ; 4-5 year-olds vs 10-11 year-olds:  $U = 335.5$ ,  $p < .03$ ). Finally, there was no effect of labelling, age or disability type on perceived difference judgements for any of the disabilities.

Table 7.7 Number of uncontrollable, chronic and perceived differences judgements for each disability and labelling condition

	<u>Disability</u>																			
	Astigmatism			Dyspraxia			Down Syndrome			Hyperactivity			Mopia							
	<u>NL</u>	<u>DL</u>	<u>D Overall</u>	<u>NL</u>	<u>DL</u>	<u>D Overall</u>	<u>NL</u>	<u>DL</u>	<u>D Overall</u>	<u>NL</u>	<u>DL</u>	<u>D Overall</u>	<u>NL</u>	<u>DL</u>	<u>D Overall</u>					
Uncontrollable	21	23	26	70***	12	21	11	44	13	18	15	46	12	12	9	33	22	27	26	75***
Chronic	20	18	20	58	15	20	13	48	14	18	19	51	14	15	8	37	21	26	26	73***
Differences	21	25	29	75	22	24	22	68	25	24	24	73	25	22	23	70	23	22	24	69

Note: \*\*\* Paired sample Wilcoxon T-tests  $p < .001$ .



## **7.6 Discussion**

Overall, the results from this study indicate that labelling has little effect on children's conceptions of disability. That is, the form of a disability label alone does not have a strong influence on children's ideas about the cause, course and perceived difference of disabilities. These findings are in contrast to Gelman & Heyman's (1999) 'carrot-eater' study, which found that labelling, in the form of a noun, provides important information about the stability of novel characteristics. Furthermore, a failure to obtain a significant effect of labelling, at any age, in the present study indicates that children are not developmentally influenced by the presence of disability labels.

### **7.6.1 Lack of Labelling Effects**

One possible explanation for the general lack of labelling effects is that the assigned labels were not presented with enough potency. That is the labels may not have been presented for a sufficient length of time or in a salient context. However, this is unlikely given that the method of presentation was identical to that employed by Gelman & Heyman (1999). It is more likely that these non-significant results are due to the nature of the labels that were examined and the aspects of children's conceptions that were probed. In the 'carrot-eater study', Gelman & Heyman (1999) chose novel characteristics (e.g., carrot-eating, creature-believer) and consequently children were not simply retrieving rote meanings but were making use of a general linguistic rule. However, the present findings indicate that children's responses were not based on the linguistic form of the label. Although labels often have an influence on attitudes towards disability (Foster et al., 1976; Wood & Valdez-Menchaca, 1996; Cornett-Ruiz & Hendricks, 1993), it is possible that disability labels have little influence on children's core understanding of disability. That is, children may have already formed fundamental conceptions about disabilities that are impervious to subtle changes in linguistic form. The results from both Study 2 and the present findings indicate that children's causal conceptions of disability are not easily influenced by experiential factors such as limited classroom contact or language in the form of labelling.

An implication of these findings is the difficulty in ascertaining which factors could shape children's causal conceptions of disability. The fact that labelling has little influence on the way children causally construe disabilities suggests that this particular form of language is not a factor in activating a particular causal-

explanatory framework. This is not to suggest that language has no role in triggering a causal reasoning system or foundational knowledge domain (see Stavy & Wax, 1989; Inagaki & Hatano, 2002), but the particular linguistic form in which disability is expressed, does not. Future research should examine more closely not only the links between language and disability but also how the development of language relates to the acquisition of core knowledge domains.

The present study did find one labelling effect on children's disability concepts. When children were given a diagnostic label for dyspraxia they were much more likely to perceive this disability as uncontrollable. This result may have been a chance finding given that no other significant results were found. However, it could also be argued that assigning a diagnostic label to this particular disability conveyed information about stability in a way that a simple description did not. There is a need for further research to explore the possible influence of diagnostic labelling on children's disability concepts. It may be that the diagnostic information contained in the label is more important to children rather than the diagnostic label itself. That is, if children are told about an illness or disability in diagnostic terms, then this may influence their conceptions of that particular condition.

The finding that disability labels were generally unsuccessful in shaping children's conceptions of disability has important practical and educational implications. In the last few years there has been a shift away from labelling disabilities to providing general descriptions. For example, the Down Syndrome Educational Trust encourage people to refer to 'children with Down syndrome' rather than 'a Down's child', as they argue labels affect how we think and behave towards people with disabilities. Although few would disagree with the attempts to eradicate such derogatory terminology, the role of labelling used by parents and educators may be minimal in shaping children's understanding of disability. What remains unclear is whether the effect of disability labels would be more apparent after a prolonged period of exposure, especially in the context of conversations with significant others (Dunn, 1994). If children lack existing knowledge about a disability or do not even construe a particular condition as a disability, then the influence of labels on their disability concepts may be more manifest. Furthermore, there may be other important aspects of language that play a more influential role in shaping children's disability concepts and these will need to be examined with future research.

### **7.6.2 *The Replication of Key Findings from Studies 1b and 2***

Although the findings from Study 3 do not indicate any significant labelling effects on children's disability concepts, they are important for confirming the reliability of results obtained in Studies 1b and 2. As in Study 1b and 2, children showed a preference in the present study for physical and biological causes of disability over social/psychological causal explanations. This provides further support for the notion that children find naïve physics and naïve biology useful domains in which to conceptualise disabilities. In addition, children were also able to tailor their causal ratings to particular disabilities. Interestingly, younger children were unable to tailor the social/psychological cause to different disabilities, which may indicate as suggested in Study 1b, their uncertainty about the role of such causes in disability.

Study 3 also found age differences in children's judgements about controllability. In confirmation of Study 1b's results, the youngest children had a tendency to conceptualise disabilities as controllable. The younger children were also more likely to say that the disabilities would not persist into adulthood, although this age difference was not significant. Also consistent with Study 1b is the finding that physical and sensory disabilities are considered to be the least controllable and most chronic impairments. Together, the findings from the present study confirm many of the key results from Studies 1b and 2. This highlights the reliability of the findings across the empirical studies of this thesis.

### **7.7 Summary and Conclusions**

In conclusion, the results from the present investigation suggest that the language used to refer to disabilities is not especially critical to children of any age and does not influence the causal conceptual framework within which disability is understood. However, there may be a possible influence of diagnostic labelling on children's disability concepts that warrants further investigation. Importantly, key findings from both Studies 1b and 2 were replicated in the present study. Children showed a preference for physical and biological causes of disability over social/psychological ones and children's judgements about the controllability of disability differed as a function of age and disability type. Although labelling did not influence children's disability concepts in this study, the role of language in shaping children's understanding of disability should still be pursued. Several issues for future research are whether diagnostic phrases are more inferentially

potent in comparison to other labels. In addition, the role of other aspects of language in the development of disability concepts should be ascertained (e.g., whether exposure to talk about disability influences concepts of disability). Such findings may have important implications in our conversations with children about disabilities.

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## CHAPTER 8

### General Discussion and Conclusions

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The theoretical approach underlying research reported in this thesis contends that prior to formal education, children acquire three core domains of knowledge which they use to reason about everyday phenomena; a naïve physics, a naïve psychology and a naïve biology. Each domain of thought is organised around distinctive ontological categories and causal reasoning frameworks. Much of the research to date has examined only those concepts that fall neatly into one foundational knowledge domain, which although highlights the early onset of concepts in each domain, does not tell us about how children reason about less easily categorised phenomena.

Children readily encounter phenomena that can be conceptualised in more than one domain and only recently have researchers begun to examine how children might coordinate their core knowledge domains. This thesis attempted to make considerable headway on this issue by investigating children's concepts of disability. The studies presented in this thesis had two broad aims. Firstly, to examine the role of children's core domains of knowledge in their reasoning about disability. Secondly, to provide a more comprehensive overview of the content, structure and development of children's disability concepts. This chapter attempts to synthesise the results from the three empirical studies and discuss them in terms of children's disability concepts and what they tell us about domain-specific cognition. The following section will provide a brief summary of the results and the remainder of the chapter will discuss the content, structure and acquisition of disability concepts in childhood.

#### **8.1 Summary of Empirical Findings**

The first study reported in this thesis was an exploratory investigation into the development of children's disability concepts and was separated into two parts. Study 1a specifically examined children's understanding of the consequences of disability and was designed to extend previous work by Diamond and colleagues (Diamond, 1994; Diamond & Hestenes, 1996) by including a wide spectrum of disabilities and a broad

range of ages. The results found that across all ages, children had a conceptualisation of the consequences of physical, learning, sensory and emotional/behavioural disabilities. In addition, age differences were found in Study 1a. The four to five year-old children had a tendency to generalise the limitations of a disability from one set of consequences to another. In comparison to older age groups, they were also less able to tailor the consequence types to specific disabilities. While the results from Study 1a extended previous disability concept literature, it did not inform us of the conceptual basis of children's disability concepts.

Consequently, Study 1b examined which core domains of knowledge children use to reason about the causes, controllability and chronicity of disability using a semi-structured interview format. The aims of Study 1b were to ascertain which domains of knowledge children use to reason about disability, whether their understanding of disability changes with age and whether children can draw upon several causal-explanatory reasoning systems to conceptualise disability. The 'causal' results showed significant age differences in children's causal conceptions of disability. Although four to five year-old children found it hard to give a causal explanation of disability, by age seven, the number of biological causal explanations increased significantly. Social/psychological causes figured more prominently among older children. Indeed, only older children were found to engage in multi-causal reasoning of the same disability. In relation to controllability and chronicity of disabilities, four to five year-old children were much more likely to judge disabilities as controllable and transient states. By age seven, children were significantly more aware of the immutability of disability. The findings also suggest that the ability to think flexibly and coherently about disability appears in later childhood. The coherence of children's disability concepts increased significantly with age and in line with Study 1a, older children were more able to differentiate their causes to particular disabilities. However, given the reliance on open-ended verbal techniques, Study 1b may have somewhat underestimated young children's causal understanding of disability. Therefore, Study 2 investigated in more depth, children's causal concepts of disability.

In Study 2, children were asked to consider the appropriateness of physical, biological and social/psychological causes of disability, using an explanation preference paradigm. Furthermore, the effect of classroom contact on children's causal concepts



was explored. The aims of Study 2 were to firstly ascertain whether the four to five year-olds would show a bias in preferring certain causes of disability and which types of causes would be deemed appropriate. Secondly, it aimed to establish whether children's causal ratings would be influenced by age and classroom contact with disabilities. The results showed that children of all ages preferred biological and physical type explanations of disability in comparison to social/psychological causes. Interestingly, even the four to five year-old children showed a preference for some biological causes of disability over others. In contrast to Study 1b, young children were able to differentiate their causal ratings to particular types of disabilities. These results highlight the methodological differences between Studies 1b and 2. Additionally, there was no significant effect of classroom contact with disabilities on children's causal conceptions of disability. This surprising finding signalled the need to establish whether other environmental factors may influence children's disability concepts. Consequently, Study 3 examined the potential role of language in shaping children's concepts of disability.

The purpose of Study 3 was to investigate the role of language labels in shaping children's understanding of disability and to ascertain whether language influences the causal-explanatory framework within which disability is conceptualised. In particular, this study examined whether the form of a disability label is sufficiently powerful to produce differing ideas as to the causes, controllability, chronicity and perceived differences of disability. The results indicated that labelling has little significant effect on children's conceptions of disability at any age. The form of the label in which disability is expressed does not influence the way in which it is conceptualised. However, consistent with Study 2, children showed a preference for physical and biological causes of disability over social/psychological causal explanations. The results also confirmed findings from Study 1b that young children conceptualise disabilities as more controllable and less chronic. These findings highlight the reliability of key results found in previous empirical chapters.

The remainder of this chapter will discuss these findings in terms of the content and development of children's causal concepts of disability with reference to their core domains of knowledge. The structure of children's disability concepts as theoretical or fragmented will then be considered. The origins and acquisition of disability concepts

will be discussed and reference will be made to the role of cognitive constraints, social experiences and the linguistic environment in the development of disability concepts. Finally the educational implications of these findings and the limitations of the present thesis will be examined. The potential for future research in this area will also be considered.

## **8.2 Children's Causal Concepts of Disability: Content and Development**

According to the core knowledge view (see Chapter 1, section 1.2.3), a domain of knowledge has two components. Firstly, it acts as an ontological guide to partition the world. Secondly, it functions as a causal-explanatory framework for reasoning about everyday phenomena (Hirschfeld & Gelman, 1994). The reported findings on children's causal concepts of disability provide a rich source of information on children's disability concepts. They are also particularly informative of the larger conceptual framework within which disability concepts are placed elucidating the content and development of children's core knowledge domains.

It is clear from the results of this thesis that children's causal concepts of disability emerge by the age of four years. This is consistent with the age at which Diamond (1993; 1996) observed the emergence of causal explanations of disability amongst children. In particular, she found that physical causal explanations were offered with some regularity amongst four year-old children. The results from Studies 1b and 2 have also shown that young children verbalise and endorse physical causal explanations of disability, such as traumas and accidents. In addition, children have been shown in this thesis to reason about the origins of disability in biological ways, especially around seven years of age. Although young children in Study 1b found it difficult to verbalise a biological explanation, in Study 2 the four year-olds showed a preference for particular biological causes (birth) over others (inheritance). This result is consistent with Sigelman & Begley (1987) who found that five year-olds also mentioned biological causes (birth defects) when explaining why someone might be in a wheelchair.

Not only are these findings interesting in terms of children's knowledge about disabilities, but they also highlight the core knowledge domains with which children conceptualise disability. The evidence from Studies 1b and 2 show that both naïve

physics and naïve biology are central to young children's causal concepts of disability. It is not until later in development that children begin to see the usefulness of naïve psychology in their conceptualisation of disabilities. Social/psychological causes of disability became more prominent by eleven years of age and were limited to emotional/behavioural disabilities. These findings have ramifications for a key issue in core knowledge research: the status and development of naïve biological knowledge.

The most current and vehement debate regarding children's core knowledge is the status and onset of naïve biology as an autonomous domain of thought (see Chapter 2, section 2.1.3). Although it was not the aim of this thesis to investigate the naïve biology debate a range of findings are highly relevant to this issue. This thesis has shown that biological causal explanations do figure in young children's reasoning about disability and that in contrast to Carey (1985; 1995), they are not initially subsumed within the social/psychological domain. Indeed, social/psychological reasoning did not appear until eleven years of age. By middle childhood, many children in Study 1b were aware that someone could be born with a disability and some mentioned causes of disability that were akin to illness concepts (e.g., ear infections) and inheritance concepts (e.g., disabilities being passed from mother to child). Carey (1995) has argued that an autonomous domain of biology does not emerge until seven years of age, as prior to this, children have no knowledge of specific biological mechanisms. Although it is not clear from the reported findings if younger children do understand any specific biological mechanisms of disability, they did show a preference for the 'birth' explanation, which is an unequivocal biological mechanism. That is, the four to five year-olds in Study 2 not only accepted biological explanations for disability but also attributed disabilities to processes that involves some malformation of growth prior to birth. At the very least, these data show that an awareness of the biological nature of disabilities emerges prior to formal education. Furthermore, there appears to be a biological to social shift in causal understanding of disability which has been previously noted in children's gender and racial concepts and understanding of emotional/behavioural disorders (Hirschfeld, 1995, Taylor, 1996; Maas et al., 1978). The present findings indicate a similar shift may also occur in children's disability concepts.

In discussing the data on children's causal concepts, it seems important to draw a distinction between the explicit causal explanations offered in Study 1b and the implicit causes that were endorsed in Study 2. In Study 1b, young children often failed to produce an explicit verbal causal explanation and therefore it could have been assumed they had little or no knowledge of disability causes. However, when given an explanation-preference task young children can clearly demonstrate an awareness of appropriate causal origins of disability that is not yet amenable to verbal report. The methodological differences between these two studies have raised some interesting issues about the nature and development of young children's causal concepts. More specifically, it highlights the distinction between implicit and explicit causal concepts of disability.

Young children's initial causal understanding of disability appears to be relatively implicit. Despite research on both implicit and explicit cognition, characterising the differences between these types of knowledge has proved elusive (Keil, 1999). There is a tendency to characterise implicit knowledge as less complex and more perceptually grounded. In particular, the ability to express thoughts in language is often said to represent a major change in cognition (Vygotsky, 1934). A common view is that if children cannot verbalise a belief then they probably do not have such a belief (Keil, 1999). If adopting this view of explicit knowledge, Study 1b's results would suggest that young children have little idea as to the causes of disability. The four to five year-olds frequently failed to give a causal explanation while in contrast, the oldest age group rarely gave 'non-causal' responses. However, it is not always clear whether non-explicit responses are representative of non-existent beliefs. As Keil (1999) points out: "children's inabilities to talk about a wide range of phenomena, ranging from aspects of biology to number have been taken as evidence for lack of any knowledge or understanding in those areas" (p. 174). Furthermore, Karmiloff-Smith (1992) argues that children can have cognitive representations or beliefs that are available to conscious access but not to verbal report. In a similar vein, young children may have knowledge about the origins of disability that are reflected in their awareness, but that cannot be expressed to others.

From the results of Study 2, there is little doubt that four year-old children have implicit knowledge of causes of disability prior to an explicit recognition of mechanisms.

Although the youngest children were largely unable to express an explanation as to the origins of disability (Study 1b), they do have implicit beliefs about the appropriateness of various causal explanations (Study 2). The implication from Study 2 is that there is little developmental change in children's causal concepts, since older children showed similar preferences in their causal judgements to younger children. This is not to imply there are no differences in disability concepts between four and eleven year-olds, but those differences may have little to do with their contents. The present data suggest that young children initially have an implicit knowledge of causes of disability that with increasing age becomes more accessible to verbal report. This implicit to explicit shift in how knowledge is represented is also the cornerstone of Karmiloff-Smith's RR model (1992).

Coupled with the implicit nature of children's causal concepts of disability, it could also be suggested from the reported findings that children's initial causal understanding of disability is relatively abstract, only later becoming more concrete when they acquire specific knowledge about causal mechanisms. Despite the long-standing intuitive appeal of the concrete to abstract shift proposal (Werner, 1948; Vygotsky 1934/1986), causal understanding of disability may well be an exception to this view. This proposal does not contradict the suggestion by Lewis (1995) of a concrete to abstract shift in the types of disabilities that children find easy to conceptualise (see Chapter 3, section 3.2.1). The abstract to concrete shift proposal in this thesis relates specifically to children's causal understanding of disability.

How could young children have an abstract insight into the causes of disability prior to a concrete one? Although this may seem counter-intuitive, there is evidence from the present findings and previous domain-specific research that allows for an abstract insight into complex phenomena prior to a concrete one. As Study 2 illustrated, young children appear to have a sense of what causes disability prior to having any detailed knowledge about causal mechanisms of disability. Even the four to five year-olds judged the 'birth' explanation to be a more accurate cause of disabilities than 'inheritance', despite having no formal education on either pre-natal development or genetics and being unable to verbalise this explanation. In addition, despite having never been taught about the causes of disability, younger children still rejected intentional causal explanations. As Wilson & Keil (2000) note, "you might be able to



choose appropriately between competing explanations for reasons that are not obvious even to yourself, simply because one explanation just seems to fit better" (p.97). These results support the notion of causal potency discussed in Chapter 1, where children can have some form of explanatory insight in a domain prior to knowing anything specific about phenomena within that domain (Keil et al., 1999; Wilson & Keil, 2000). In discussions about naïve biology, Keil et al. (1999) have argued that children have abstract expectations about biology prior to understanding anything concrete about biological phenomenon (see Chapter 2, section 2.1.3). The present data suggest this could also be the case for disability.

Children can have an abstract insight into a domain as a consequence of their modes of construal (Keil, 1992; 1994) or foundational knowledge domains (Wellman & Gelman, 1998). The modes of construal or foundational domains do not embody specific beliefs about phenomena but embody biases for certain kinds of explanations over others by constraining the type of input that children utilise (Keil, 1992). A similar process may also apply to children's early causal understanding of disability. The existence of foundational knowledge domains and their accompanying causal-explanatory frameworks may help orientate children towards particular explanations of disability. There are an indefinitely large number of possible causal explanations of disability, yet the reported findings show that children selectively favour some over others. Even young children, for example, did not pay particular attention to superficial features of the vignettes, such as whether the wheelchair bound child is wearing a red sweater (Study 1b) or if he plays with his friends on a Friday (Study 2). The point is, that children can use their core reasoning systems to filter out irrelevant explanations, which is essential for the acquisition of even a basic causal understanding of disability. Thus, children may acquire a framework understanding of disability even in the absence of specific knowledge (Wellman & Gelman, 1998). However, it is still necessary to establish how children learn to combine different causal explanatory knowledge systems when providing insight into complex phenomena such as disability. This seems to be a much more difficult task and one that is only mastered later in childhood.

If children do initially have an abstract insight into the causal nature of disabilities, by what process does this develop into a concrete and explicit causal understanding of



disabilities? One plausible interpretation of how children proceed from understanding to explanation is that children's language ability improves with age, which makes it easier for older children to articulate explanations about complex phenomena. Although this may make the process of articulation easier, it fails to explain how children proceed from understanding to explanation. Indeed, even adults with all their linguistic skill rarely have access to explanations for all phenomena. For example, Keil (2000; cited in Wilson & Keil, 2000) has demonstrated college students' inability to give coherent causal explanations for a variety of familiar devices, such as toilets and contact lenses. Thus, most adults assume they have a fully mechanistic understanding of how something works but when forced to make this understanding explicit through explanation, their assumptions are groundless (Wilson & Keil, 2000).

The progression from an abstract to a concrete understanding of causes will lead children to acquire a deeper conceptual understanding of disability, that allows them to specify explicitly and concretely, explanations for disability. It is not clear however whether this type of progression is akin to conceptual change, as discussed in Chapter 1 (Carey, 1995; Gopnik & Meltzoff, 1997; Karmiloff-Smith, 1992). The present findings do indicate that children's core causal conceptions remain stable, which would contradict a strong conceptual change view. The causal frameworks within which disability are conceptualised at age four are not abandoned in favour of new ones when those concepts are made explicit and concrete in later childhood. Thus, the abstract to concrete shift proposal in causal understanding is unlikely to be a radical conceptual change as espoused by Carey (1985) and Gopnik & Meltzoff (1997). A conceptual change (as opposed to conceptual development) in children's causal concepts of disability is only evident when children reach late childhood and begin to see the relevance of social/psychological explanations of disability, as evidenced in Studies 1b and 2. It takes a few years for children to recognise that naïve psychology may be a useful domain in which to conceptualise some disabilities and this may be considered a kind of conceptual change, similar to a relevance shift (Keil, 1999).

### **8.3 The Structure of Children's Disability Concepts**

Many researchers consider children's domain-specific knowledge to be theory-like with everyday knowledge being structured as an intuitive theory (see Chapter 1, section 1.4.2). The hallmarks of an intuitive theory are conceptual coherence and a specific

causal explanatory system (Wellman, 1990; Carey, 1995). This thesis examined the cohesion of children's disability concepts and the extent to which children reason about disability in a differentiated way. Although Wellman & Gelman (1992, p.368) argue that "the charge of coherence is perhaps a difficult one to assess empirically", Study 1b has provided important data on whether children's beliefs about disability cross-reference one another as opposed to whether contradictory beliefs are held. In addition, results from Study 1a and 2 found that children's reasoning about different aspects of disability becomes increasingly flexible and differentiated with age.

Study 1b showed that the disability concepts held by the youngest children were not cohesive. That is, their causal explanations of disability did not match up with their judgements about controllability and chronicity. This result may have somewhat under-estimated young children's disability concepts since they found it difficult to verbalise any causal explanation of disability. In contrast, the older children did have more cohesive beliefs about disability. This finding has implications for the structure of children's disability concepts as theoretical. If the function of an intuitive theory is "to offer principled and coherent predictions and explanations" (Inagaki & Hatano, 2002, p.15), then data from Study 1b shows that a theory-like understanding of disability does not emerge until late childhood. In order to be granted theoretical knowledge of disability however, a 'strict' criterion had to be met in this study (Inagaki & Hatano, 2002). Study 1b required children to offer a causal explanation whereas other researchers judge children to possess a naïve theory even if they cannot offer explanations themselves (Inagaki & Hatano, 2002). However, it was thought that meeting this strict criterion provides stronger evidence for a theoretical concept of disability. Consequently, it appears from the present finding that a theoretical structure to children's disability concepts is not evident until approximately eleven years of age.

In addition to an increase in the theoretical status of children's disability concepts, the structure of their explicit concepts becomes increasingly differentiated and access to knowledge about disabilities becomes more flexible. Indeed, Karmiloff-Smith's (1992) RR model describes a similar process whereby children's cognitive representations become gradually more flexible and manipulable. The ability to draw on several causal-explanatory systems simultaneously when reasoning about disability explicitly was only observed amongst the oldest age group. This is an interesting insight into

how children utilise their core knowledge domains when reasoning about complex phenomena. Although different causal-explanatory frameworks are available to young children, they are not able to use these in a simultaneous fashion to reason about disability. The findings from Study 2 however show that young children can implicitly accept several different causes of disability and this may indicate their ability to reason about multiple causes of disability. Yet in relation to consequences, young children failed to apply their knowledge of disabilities in a principled manner. Study 1a found that the four to five year-olds tended to generalise the consequences of a disability from one developmental domain to another and in Study 1b, they were unable to differentiate their causal explanations for particular disability types.

These findings demonstrate a gradual increase with age in the principled and flexible nature of children's explicit disability concepts and stand in contrast to Wellman et al. (1997), who found that by age three children could differentiate and co-ordinate their core reasoning systems in appropriate and flexible ways. Moreover, contrary to similar findings by Morris (1998) and Korpan (1999), the ability to engage in explicit multi-causal reasoning of disability did not appear in middle childhood. When reasoning about complex phenomena such as disability, explanations must be modified and interconnected as new causal mechanisms come to light (Keil & Wilson, 2000), but this ability does not seem to develop until late childhood. The conclusion is that young children often have fragmented and implicit pieces of knowledge about disability prior to having a more differentiated and cohesive theoretical concept of disability. Indeed, it is not surprising that young children possess a piecemeal understanding of disability. In relation to single domains of knowledge, such as biology, young children are thought to have a fragmented concept of living things (Carey, 1985; 1995), inheritance (Solomon et al., 1996) and illness (Solomon & Cassimatis, 1999). The cognitive demands will be even greater when children have to co-ordinate several foundational knowledge domains to reason about a single phenomenon, such as disability.

There is another sense in which children's disability concepts are fragmented. The reported studies have shown that no single disability concept exists in childhood but instead that children have a set of concepts each relating to specific disabilities. At certain ages, children's knowledge of some disabilities is more advanced than others and they seem to acquire concepts of particular disabilities in a specified order. At all

ages, children were able to reason about the causes, controllability, chronicity and consequences of sensory and physical disabilities. Consistent with suggestions from previous research (Diamond, 1993; Lewis, 1995; Conant & Budoff, 1983), sensory and physical impairments are amongst the first disability concepts to be acquired. In comparison, children's conceptions of learning disabilities take considerably more time to develop. This is in line with suggestions by Conant & Budoff (1983) and Lewis (1993; 1995), who have both highlighted children's conceptual difficulties with learning disabilities. Until the late primary school years, children generalise the consequences of learning disabilities from the cognitive to the physical domain (Study 1a). The implication is that learning disabilities seem to lead children to generalise and over-extend the limitations experienced by a child with a learning difficulty. Furthermore, the findings from Study 1b indicate a lack of cohesion in children's conceptions of Down syndrome. A full appreciation of the nature and course of learning disabilities may only be acquired later in childhood.

Yet, an understanding of emotional/behavioural difficulties may be an even later developmental achievement. Together, the findings have shown that children primarily conceptualise emotional/behavioural disorders using a social/psychological framework and this may be the reason for the later emergence of these concepts. This result is consistent with Maas et al. (1978), who found that older children construed emotional/behavioural disorders in social/environmental ways. However, it could also be that children understood the emotional/behavioural vignettes to be specific instances of behaviour as opposed to more persistent patterns of behaving. Thus, children may not even construe disordered behaviour as a disability at all. Future investigations need to establish by what criteria children classify something as a disability.

#### **8.4 The Origins and Acquisition of Disability Concepts**

The early acquisition of disability concepts is perhaps surprising given the complexity of disability as a phenomenon. Yet, these data show that children acquire disability concepts early in life and seemingly without systematic teaching. Several key issues in the acquisition of domain-specific knowledge may help in discussions about the origins and acquisition of disability concepts: cognitive constraints, social experiences and the linguistic environment.

A set of very early cognitive constraints is probably an important factor in the acquisition of disability concepts. As noted in Chapter 1, many researchers assume that the process of knowledge acquisition proceeds under a variety of cognitive constraints that direct and restrict children's attention towards relevant interpretations of a phenomenon (Keil, 1989; Gelman, 1990; Inagaki & Hatano, 2002). The early acquisition of disability concepts may be assisted by a set of constraints that serve to eliminate in advance, a large number of possible interpretations of the causes of disability. This discussion of cognitive constraints is not based on firm empirical evidence, as there have been no experimental studies focusing on constraints in the origins and acquisition of disability concepts. However, based on the present data, it can be surmised that some cognitive constraints are present to allow for an abstract insight into the causation of disabilities, prior to the acquisition of more concrete pieces of knowledge. The argument is not that children have an innate tendency to acquire disability concepts but rather they have an early onset of cognitive constraints that directs their attention towards relevant causal-explanatory frameworks, which in turn may assist in the acquisition of disability concepts.

The presence of cognitive constraints does not exclude the possible influence of social experiences in the acquisition of disability concepts. Indeed, as reported in Chapter 3, Diamond (1994) found that participation in a classroom with a hearing-impaired peer improved young children's understanding of hearing loss. Diamond et al. (1997) also found that young children in inclusive school settings were more likely than other children to understand the chronicity of physical and sensory disabilities. In contrast to these findings, Study 2 has shown that children's causal conceptions of disability are not easily influenced by social experiences with disabilities. Those with classroom contact with disabilities did not have a different nor more advanced conception of the causes of disability than children without such contact. This finding does not mean social experiences have no effect in shaping children's disability concepts. The contact that children in Study 2 experienced was limited and more extensive contact may have led to different results. Therefore Inagaki & Hatano's (2002) contention that social experiences are essential constituents in the enhancement of conceptual knowledge still stands.



Yet there are at least two possible interpretations that can be offered for the lack of experiential effects found in this thesis. Firstly, the origins of causal concepts of disability may not be social. Social experiences did not influence the causal framework within which disability is placed (Study 2) and therefore children's causal understanding may have more cognitive origins than social ones. If young children do initially have an abstract and implicit notion of the causes of disability then this indeed would suggest a greater role for cognitive constraints. This is not to deny that other aspects of children's disability concepts may have social origins (e.g., understanding the consequences of disability), but the causal framework in which disability is conceptualised appeared relatively impervious to experiences with disability. The acquisition of knowledge about the causes of disabilities may be more easily learned when children are given direct instruction about those origins. This is an issue that requires further research exploration.

Secondly, classroom contact with disabilities may not be the most effective social influence on causal concepts of disability. The mere presence of a child with a disability in a classroom may not be sufficient in generating ideas about disability especially when contact is limited to one particular disability. Furthermore, contact may have a limited effect if the disability is inconspicuous or less easily understood, as was the case in Study 2. Evidence of this comes from a recent study by Glasberg (2000) on children's autism concepts. She found that siblings of individuals with autism, and who therefore have extensive experience with a disability, did not have a more sophisticated conception of autism than would be expected on the basis of their current developmental level. As noted in Chapter 3, children's difficulty in acquiring concepts of autism may stem from the nature of the disability (Glasberg, 2000). Indeed, Swaim & Morgan (2001) found that children's attitudes and behavioural intentions towards a peer with autistic symptoms did not improve when given educational information about autism. Consistent with suggestions by Lewis (1993; 1995), a concept of learning difficulties is more difficult for children to acquire and therefore experience with this disability may not lead to an improvement in their conceptual knowledge.

The finding that classroom contact with disabilities has no significant influence on causal conceptions of disability makes it even more important to explore other factors that may contribute to the origins and acquisition of disability concepts. As discussed



in Chapter 7, one factor that is thought to influence attitudes towards disability is language. The role of language has also been explored in the conceptual development literature and to a lesser extent in domain-specific research. The data from Study 3 showed that the linguistic form in which a disability is expressed does not influence children's conceptions of disability. This is a somewhat surprising finding given that teachers' and peers' attitudes towards children with disabilities are often influenced by the assignment of disability labels and one may have expected similar effects on conceptions of disability (Wood & Valdez-Menchaca, 1996; Cornett-Ruiz & Hendricks, 1993; Graham & Leone, 1988).

One implication of this is that the factors that influence attitudes towards disability may be different to those that shape understanding of disability. That is, children's attitudes towards disabilities may develop in a different manner to their conceptual knowledge of disabilities. Further research is ultimately required to explore this possibility but it must also be noted that the labelling of disabilities is only one example of many possible linguistic influences in children's disability concepts. For example, Innes & Diamond (1999) explored the relationship between mothers' comments and children's ideas about disabilities. They found that mothers' verbalisations about children with disabilities were related to children's comments and questions. It may be important to examine the relationship between parents' communication with their children about people with disabilities and the acquisition of disability concepts in childhood.

Another linguistic factor that may influence the acquisition of disability concepts is vocabulary. For example, in Japanese culture, living kind concepts are influenced by word meanings (Inagaki & Hatano, 2002). It is not uncommon to find the Japanese assigning life status to inanimate objects. This is because, *kanji* (Chinese character) which represents life, can also mean 'fresh' and 'perishable' and can therefore be applied to inanimate objects such as wine and cakes. Similarly, Stavy & Wax (1989) have shown that within Israeli culture, linguistic factors influence the classification of plants as living kinds. The Hebrew word for 'animal' is similar to that for 'living' and 'alive' whereas the word for 'plant' has no obvious related terms and consequently Israeli children frequently categorise plants as non-living. The point is that the way a concept is understood is influenced by its associated words and this could also apply to disability. Parents or educators may use the term 'disabled' differently when

describing a particular person or group of people, which children may then use to reason about what constitutes a disability. For example, the term 'disabled' may be applied to those with minor difficulties (e.g. wearing glasses) or to more severe and specific difficulties (e.g. wheel-chair bound). Children's beliefs about what constitutes a disability may therefore be influenced by language in their environment.

It must be acknowledged that the findings on the acquisition of children's disability concepts are somewhat paradoxical. The contradiction is apparent when attempting to reconcile the age differences found in this thesis (Studies 1a and 1b) with the lack of social (Study 2) and linguistic experiential effects (Study 3) on children's disability concepts. On account of their ages alone, one can expect a younger and older child to have accumulated differential levels of both social and linguistic experiences with disability. It seems important however to draw a distinction between gradually accumulated knowledge that children may have about disabilities and more direct and limited social experiences with disability that may influence the way disability is conceptualised. This thesis did not find any effects of direct limited social and linguistic exposure to disabilities on children's conceptualisations, but it is acknowledged that children may be exposed to other indirect and more extended experiences that may shape their disability concepts.

### **8.5 Educational Implications**

The findings from Study 2 suggest that limited contact with disabilities does not influence the content, structure and development of children's disability concepts. This does not negate the importance of classroom inclusion of disabled peers, as this may be an important example of 'non-formal' education of disabilities. It does however become important to consider the role of formal education in children's disability concepts. This thesis shows that much of the conceptual groundwork is already present in the form of implicit concepts of disability and therefore it seems obvious that formal teaching should seize on this and exploit young children's intuitive knowledge. Formal teaching should be concerned with enhancing and resolving misunderstandings in children's disability concepts.

There is no easy answer however to how this should be accomplished. To date, there are no empirical studies that have attempted to improve children's conceptual

understanding of disabilities and taken into account children's prior knowledge of disabilities. Yet it seems important to recognise that children's initial causal concepts of disability are often guided by an abstract explanatory insight, based on core causal reasoning systems and cognitive constraints. As Keil & Silberstein (1996) note, teaching should consist of highlighting the relevance of established systems of explanation and then expanding upon them. It must also be remembered that providing formal teaching as to the origins of disability will not necessarily produce more accurate knowledge about other aspects of disability. As noted earlier, young children do not evidence much coherence in their disability concepts and therefore they should be encouraged to evaluate individual aspects of their beliefs about disability. In some cases, this may help theory-like concepts of disability to advance. In other instances, as Keil & Silberstein (1996) argue, it may help children recognise inconsistencies in their concepts and formal teaching can help to reduce these.

One method by which this could be achieved is collaborative learning. Many theorists argue that allowing children to discuss their concepts promotes a restructuring and refinement of their existing ideas (Doise, 1990; Hatano & Inagaki, 1997; Williams & Tolmie, 2000). In relation to biological knowledge, group discussions have been found to be extremely useful in advancing existing biological concepts (Hatano & Inagaki, 1997; Williams & Tolmie, 2000). For example, Williams & Tolmie (2000) found that discussion groups composed of children holding different naïve inheritance concepts experienced a greater improvement in their knowledge, compared to children in groups with individuals of similar ideas or children working independently. These discursive techniques could be used to encourage young children to explicate and advance their concepts of disability. Formal teaching may be a powerful tool in the development of disability concepts, as long as the content and structure of children's initial disability concepts are recognised. The domain-specific cognition approach has therefore much to offer discussions about the role of formal education in the advancement of children's disability concepts.

## 8.6 Limitations and Implications for Future Research

Apart from the specific limitations of each study already discussed in the relevant chapters, the broader limitations of this thesis require attention. The extent to which these findings can be generalised to other complex phenomena is questionable and therefore a potential limitation of this thesis. Given the lack of research into phenomena that span several core domains of knowledge, it is difficult to know whether some of the key findings in relation to children's disability concepts would also extend to other concepts. For example, in relation to disability, it would appear that children are not able to simultaneously draw upon several core domains of thinking until eleven years of age. Would this also extend to other complex phenomena? Many of the findings of this thesis, such as the abstract nature of young children's causal concepts of disability and the theory-like status of older children's disability concepts, do mirror developments in children's biological knowledge. In addition, the biological to social shift in causal understanding of disability is consistent with the development of children's gender and racial concepts (Taylor, 1996; Hirschfeld, 1995). Yet, it is still unclear if conceptions of an 'across-domain' phenomenon, such as disability, develop in any way differently from 'within-domain' phenomena (e.g., inheritance concepts in the biological domain). Future research will need to establish whether the main changes observed in the development of children's disability concepts are unique to disability or can be applied to other areas of conceptual development.

Another difficulty that was encountered in the present research was choosing a methodology that was appropriate for a wide age range of children. Although a semi-structured interview format was considered most appropriate given the exploratory nature of Study 1b, it probably under-estimated the youngest participants' knowledge of disability given the verbal requirements of this task. Yet it did allow the older children to express their beliefs about disability. However, the opposite limitation is found with the forced-choice format used in Studies 2 and 3. The older children were more constrained by this methodology but it did afford the youngest children the opportunity to express their knowledge about the causes of disability. This highlights the difficulty in designing suitable studies that aim to capture developmental trends in children's cognitive development. These difficulties are to some extent abated by the use of 'mixed methods' which provide complementary opportunities to produce more



ecologically valid and useful results (Lewis & Lindsay, 2000). The use of both open-ended and forced-choice techniques in this thesis led to a better characterisation of the development of disability concepts in childhood than either alone would have done.

Although 'mixed methods' were employed in this thesis, the framework for this research was largely quantitative. Yet, more qualitative methods could have yielded valuable insights into children's disability concepts (see Christensen & James, 2000). One such method is group interviewing and can be particularly useful at the exploratory stage of research (Dockrell, Lewis & Lindsay, 2000). Group interviews with children allow the possibility of discussions which can often generate new ideas among children and has the potential strength of a more natural style of interaction (Dockrell et al, 2000). Previous research on non-disabled and disabled students' views of inclusion in mainstream schools has also utilised discursive techniques in an attempt to explore pupils' discourses and observations about the complex process of inclusion and exclusion (Allan, 1999). In directly questioning how researchers frame knowledge about disability and education, Allan (1999) argues that a positivistic orientation of researchers often fails to situate children's perspectives in the context of their experiences, behaviour and interactions. Indeed, Rowan (1998) has been critical of research that builds up knowledge by establishing 'facts' and this has often led to the rejection of quantitative methods. However, it seems important that future research into children's concepts of disability should not abandon quantitative methods but also utilise qualitative approaches to explore the role of the school, political and cultural contexts in which disability concepts emerge. This will enable the use of complementary rather than competing methodological approaches to the investigation of children's disability concepts.

The present findings have raised several important issues that require further research attention. More work is required on the implicit and abstract nature of children's disability concepts. Firstly, the structure of these initial concepts deserves further scrutiny, especially in relation to their cohesiveness. Although younger children's explicit disability concepts are not theory-like, it is possible that they have more coherent implicit disability concepts. According to Kiel & Silberstein (1996), theoretical knowledge need not necessarily be fully stateable, although they recognise the danger in endorsing some kinds of non-verbal knowledge as theoretical. Similarly, Inagaki &

Hatano (2002) argue that young children can possess naïve theories even if they cannot offer explicit verbal causal explanations. Karmiloff-Smith (1992) also acknowledges that there are examples of theory-like knowledge (termed 'theories-in-action') which the child cannot encode linguistically. Thus, it is possible that young children could have the beginnings of theory-like knowledge even if they cannot verbally express this. Comparisons should be made between the structure of younger children's implicit disability concepts and the structure of older children's explicit concepts.

Secondly, the role of experiential factors in the acquisition of children's early disability concepts should be ascertained. Although not discernible from the present findings, social experience with disabilities may encourage the development of more explicit and cohesive concepts of disability. There may also be important differences in the types of social experiences that contribute to the development of disability concepts. For example, future research should compare the effects of classroom contact with disabilities with more prolonged and intensive contact experienced by siblings of individuals with disabilities. Relatedly, future research should aim to clarify the relationship between acquired and specific pieces of knowledge about disabilities and children's intuitive understanding of disabilities. Such research may have important implications for how and when we teach children about disabilities.

### **8.7 Concluding Comments**

The domain-specific view of cognitive development has offered unique insights into how children conceptualise disabilities. From as early as the pre-school years, young children do develop naïve concepts of disability. The content of their disability concepts is initially drawn from two main causal frameworks of understanding: naïve physics and naïve biology. Even young children can reason about the biological causal aspects of disability and this has implications for debates about the onset and development of naïve biological knowledge. Furthermore, the development of children's disability concepts seems to proceed from the implicit and abstract to the explicit and concrete. In later years, children's disability concepts become gradually more explicit and flexible in structure. Older children begin to co-ordinate their core cognitive reasoning systems in appropriate ways. Their causal concepts become increasingly tailored to specific disabilities and older children are more able to differentiate the consequences of different disabilities. This indicates that a theoretical



structure to children's disability concepts does not emerge until late childhood. Altogether, the findings from this thesis represent a unique and positive contribution to our knowledge about the content, development and structure of disability concepts in childhood. Concurrently, the study of disability concepts over a range of age levels has provided an advantageous opportunity to examine domain-specific theories of cognitive development.

In their endeavour to resolve issues such as the naïve biology debate or the structure of naïve psychology, many researchers have focused attention on phenomena that clearly fall within one domain of reasoning, without considering the plethora of concepts that span several core reasoning systems. In focusing on concepts of disability and utilising the domain-specific approach to cognition, the role of core knowledge domains in the conceptualisation of more complex phenomena has been explored. This research has the potential to lead to future investigations into the origins and influences on children's disability concepts. Furthermore, it offers insights into a range of educational issues, from inclusive practices to formal tuition, which may impact significantly on the development of children's understanding of disability.

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# **Appendix I**

**Local Educational Authority Research Permission Letter**

**Sample Copy of Parental Consent Form**

# ◆ EDINBURGH ◆

THE CITY OF EDINBURGH COUNCIL

EDUCATION  
QUALITY SERVICES

Lesley Smith  
Department of Education  
The University of Edinburgh  
St John's Land  
Holyrood Road  
Edinburgh  
EH8 8AQ

**Date** 10 November 1999

**Your ref**

**Our ref** Q/krb/rr

**Direct dial** 0131 469 3164

Dear Ms Smith

## **RESEARCH ACCESS TO CITY OF EDINBURGH SCHOOLS**

Thank you for your undated letter requesting permission to undertake research in schools in the City of Edinburgh. I have been asked to reply on behalf of the Education Department.

I have taken into account the information you supplied in your letter and note that you have already contacted Mrs Wendy Haywood, Head Teacher at Riccarton Primary School, who has agreed in principle to let you carry out research in the school. As it is the policy of the Department to leave final discretion on participation in research projects to Head Teachers and their staff, I am pleased to inform you that you have permission to undertake your research.

I would like to wish you every success with your thesis and look forward to receiving a copy of your completed findings in due course.

Yours sincerely



(Dr) Ken Bogle  
Resources Officer

Date: 11 March 2002

Dear Parent/Guardian

**Re: Children's Understanding of Disability**

I am currently a researcher at Edinburgh University and supply this letter to give a brief overview of the interviews I will be conducting at Curriehill Primary School.

For the past 3 years I have been investigating children's understanding of disability as part of my doctoral research. This final project is investigating the effect of disability labels on children's understanding. To investigate this, children will be interviewed for one five-minute session designed to elicit their ideas about disability. The session is done in the format of a game where children listen to 5 short stories of a child with a disability and then are asked questions about the children in the stories. This study is also interested in how contact with persons with disabilities may affect children's understanding.

Do not hesitate to contact me if further information is required.

Regards,



Lesley Smith  
0131.651.6487

---

**Tear Here**

**To be returned to class teacher**

If you allow your child to participate in this study please complete and return the tear-off slip to the class teacher.

Child's Name \_\_\_\_\_ Class \_\_\_\_\_

Does any member of your family have an disability? YES/NO (please delete)

If so, please state which family member: \_\_\_\_\_ (e.g., aunt)  
disability: \_\_\_\_\_ (e.g., blind)

If not, does your family have contact with someone with a disability? YES/NO

If so, please state which disability: \_\_\_\_\_

Signed by parent/guardian: \_\_\_\_\_

## **Appendix II**

### **Study 1a/1b Vignettes**

Blindness: Stephen has never been able to see very much and doesn't know what things look like. So, Stephen has to feel things so he know what shape they are and he has to be careful he doesn't bump into things because he can't see very well.

Hearing Loss: John has never been able to hear very well and can't hear noises like other children. He wouldn't be able to hear us talking. So, because John can't hear, he often watches things with his eyes a lot because he can't hear very much.

Physical Disability (Minor): Nicola has a thumb missing on her hand. Sometimes Nicola finds it hard to play games the other children play and it took her longer to learn how to tie her shoelaces. Nicola takes longer to draw and write than her classmates because she has a thumb missing.

Physical Disability (Major): Micheal can't feel his legs so he can't walk. Micheal gets around in a special chair so he is sometimes slower at getting around than other children. He wouldn't be able to go up and down stairs very easily. Micheal can only get to school or the shops if he has the chair.

Learning Disability (Non-specific): Claire takes longer to learn the alphabet and count numbers than the other children. Claire finds it harder to read and write. Often she forgets the rules to simple games and can't follow the teacher's instructions in the classroom.

Learning Disability (Down syndrome): Rachel takes longer to learn things than other children do and does things a little more slowly. Sometimes, Rachel doesn't want to join in a game and no-one ever makes her do it. Although Rachel takes longer to learn, she still feels the same things as other children.

ADHD: Chris doesn't pay attention or listen well in class. Sometimes Chris is so lively in his chair he falls out of it. Chris often disturbs the other children in class. He is quick to get angry and often gets into fights with other children.

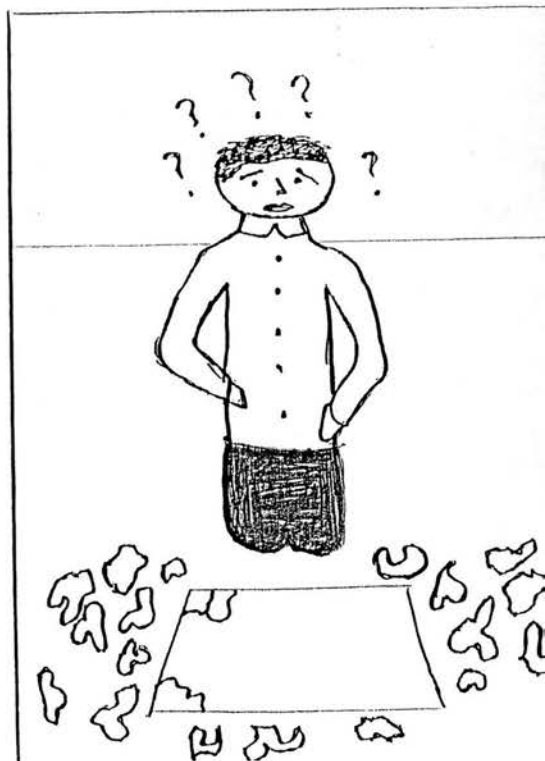
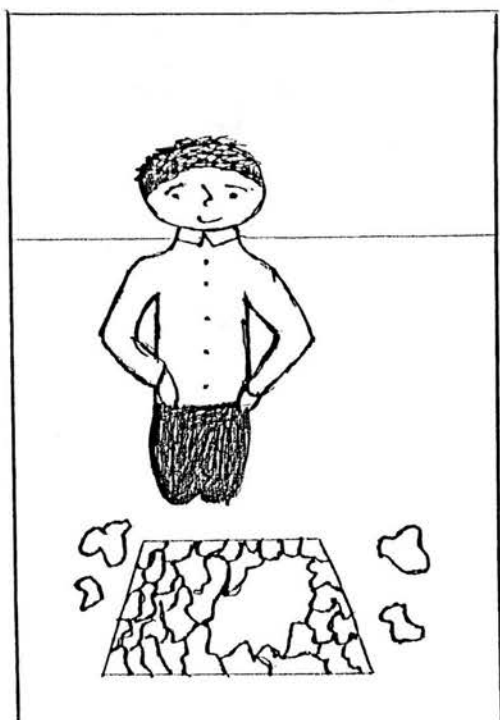
Lacking in Social Skills: Anna often won't look at you when you're talking to her. Sometimes she stares at people longer than she should. Anna is quite shy and usually doesn't like asking the other children if she can join in.

**Appendix III**  
**Study 1a Pictorial Stimuli**

Reading (cognitive)



Puzzles (cognitive)

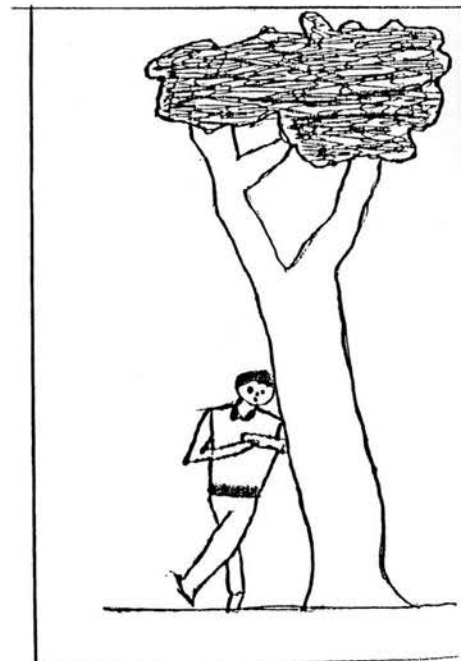
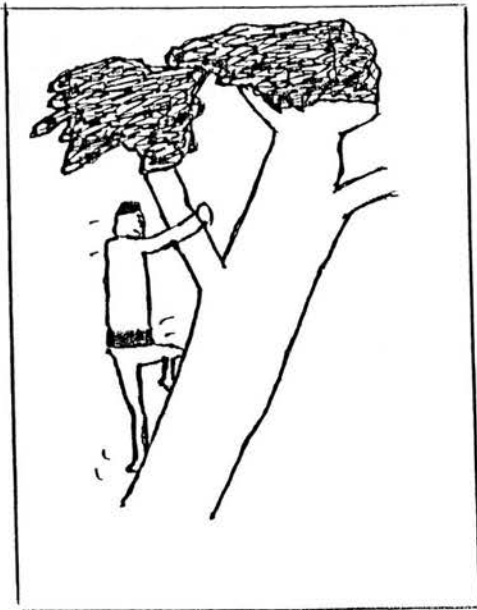




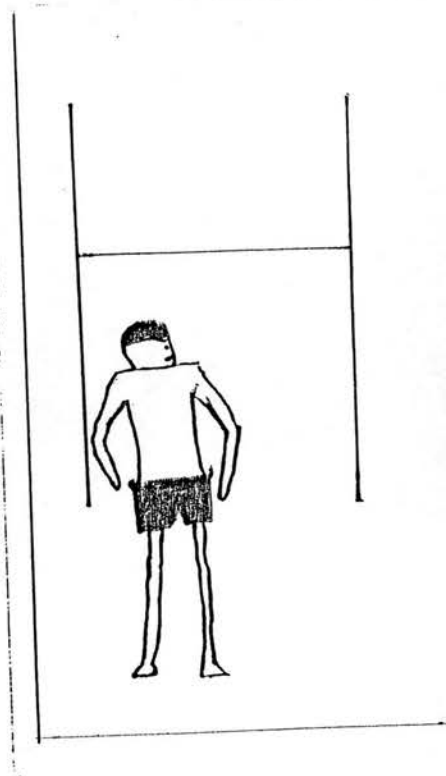
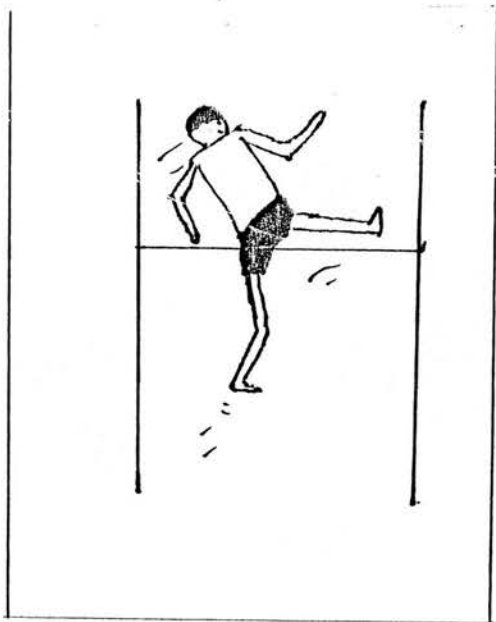
Counting (cognitive)



Climbing (physical)

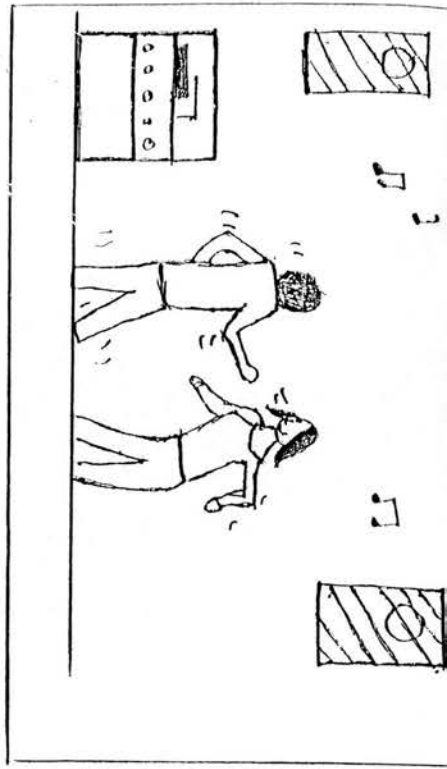
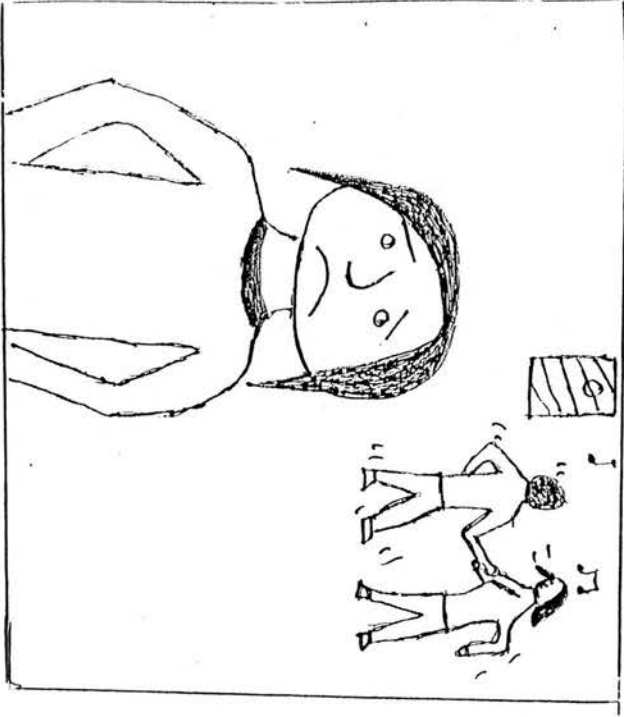


Jumping (physical)

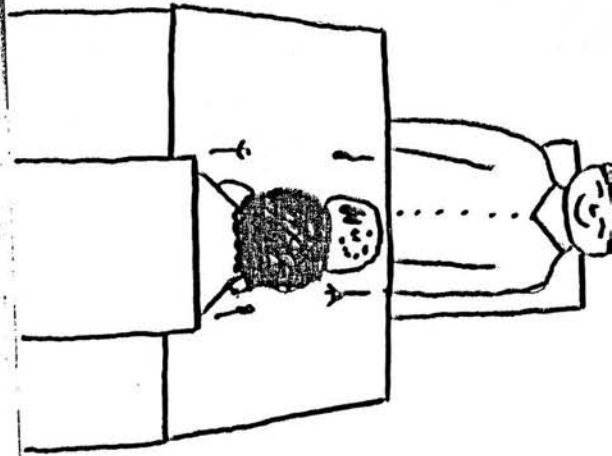
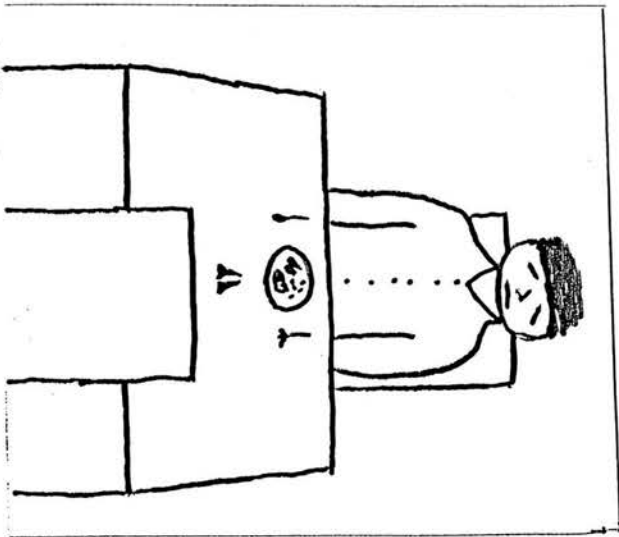


Running (physical)



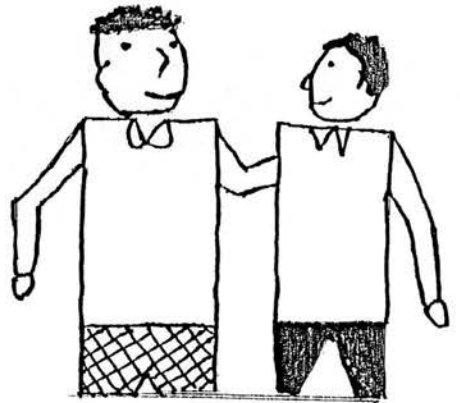


Invited to parties (social)



Invited to dinner (social)

Has friends (social)



## Appendix IV

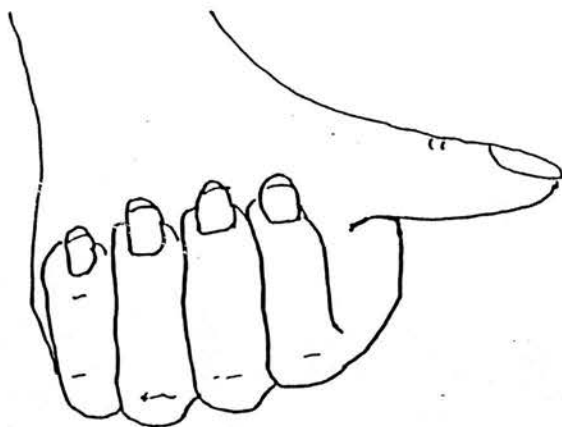
### Study 2 Vignettes and “Thumbs” Pictorial Stimuli

Blindness: One thing to tell you about Micheal is that his eyes don't work too well. This means that he can't see very much. Even if Micheal had his eyes open he wouldn't be able to see anything because it's like being in the dark. Last week, Micheal and his friend David were playing at breaktime. David had to lead Micheal around so he didn't bump into anybody.

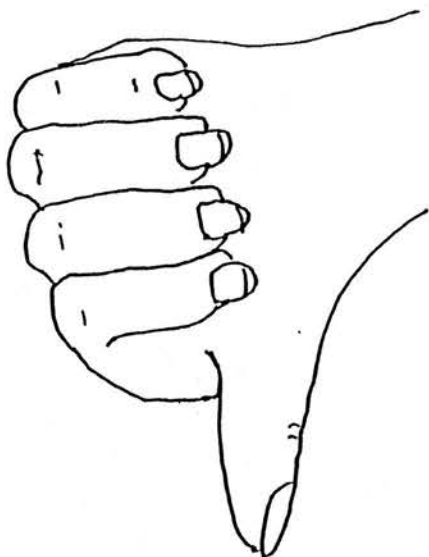
Physical disability (major): One thing to tell you about Andrew is that he isn't able to move his legs so he can't use them to get around. He's got no feeling in his legs so he can't run or walk. This means he has to use a wheelchair to get around. On Friday, Andrew's friends were playing a running game in the playground so they helped push him in his wheelchair.

Down syndrome: One thing to tell you about Robert is that it takes him longer to learn things and he often forgets what people say to him. Sometimes Robert doesn't understand or remember how he's told to do things in class. Yesterday in the classroom, a friend helped Robert finish his work because he was taking longer to finish and was sometimes making mistakes.

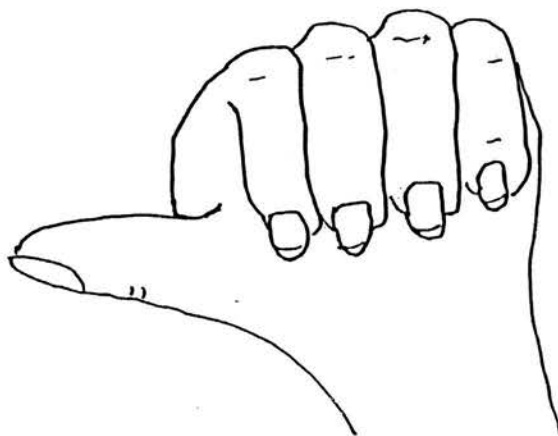
ADHD: One thing to tell you about Chris is that he gets excited really quickly and can only pay attention for a few minutes at a time. He gets up and out of his seat a lot and often does things without thinking about it. On Monday in class, Chris was doing a puzzle with his best friend. Chris couldn't seem to sit still and he left the puzzle without finishing it.



UNLIKELY



MAYBE



LIKELY



## Appendix V

Paper 1:

Smith, L.A., & Williams, J.M. (2001). Children's understanding of the physical, cognitive and social consequences of impairments. *Child: Care, Health and Development*, 27, 603-617.

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Correspondence

Lesley A Smith  
Department of Education,  
University of Edinburgh,  
St John's Land, Holyrood  
Road, Edinburgh EH8  
8AQ, UK  
E-mail  
Lesley.Smith  
@education.ed.ac.uk

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## Children's understanding of the physical, cognitive and social consequences of impairments

*L A Smith and J M Williams*

Department of Education, University of Edinburgh, Edinburgh, UK

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### Abstract

The present study explored typically developing children's ( $n = 77$ ) understanding of physical, cognitive and social competencies of children with impairments. Children in each of four age groups (4–5 years, 6–7 years, 9–10 years and 11–12 years) were interviewed to explore their ideas about the abilities of children with physical impairments (minor: missing thumb; major: wheel-chair bound), sensory impairments (vision and hearing), learning disabilities (non-specific and Down's syndrome) and emotional/behavioural difficulties (attention deficit hyperactivity disorder and lack of social skills). Significant age differences were found in children's judgements of the capabilities of children with impairments. Furthermore, children's understanding of the consequences of impairments varied as a function of disability type. Findings are discussed in relation to previous research on children's disability concepts and implications for inclusive education practices.

**Keywords:** children, concepts, impairments, consequences, inclusion, disability

### Introduction

Recently, researchers from a variety of disciplines have become interested in young children's concepts of disability. This focus on children's understanding is consistent with recent theoretical claims regarding young children's early competencies (e.g. Wellman & Gelman 1998; Keil 1999; Scholnick *et al.* 1999). Additionally, given the rise in inclusive practices, typically developing children

Child: Care, Health  
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PAGES 603–617

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are increasingly likely to interact with children with disabilities (Thomas *et al.* 1998). Consequently, typically developing children's attitudes, ideas and knowledge about impairments have become an important new area of research.

Much of the existing work in this field has examined children's attitudes towards non-typically developing peers (Lewis & Lewis 1987, 1988; Lewis 1995; Maras & Brown, 2000). The broad conclusion of this body of research on children's attitudes is that contact will have positive outcomes for children's attitudes towards children with disabilities (e.g. Maras & Brown 1996). Another strand of research has been concerned with children's understanding and misunderstanding of impairments relating to broader conceptual development (Conant & Budoff 1983; Diamond 1993; Lewis 1995). This suggests that children's understanding of impairments develops during the preschool years (Goodman 1989; Diamond 1993; Diamond & Hestenes 1996). For example, Conant & Budoff (1983) found that 3- to 5-year-olds were aware of physical and sensory disabilities but showed no expressed awareness of mental retardation. Awareness of mental retardation and psychological disturbance appeared only in the late primary school years. This finding suggests that young children can identify the presence of impairments in others and that preschoolers are more aware of impairments that have observable salient cues. Moreover, it has been shown that young children's developing conceptions of impairments are influenced by their own experiences (Diamond & Hestenes 1994; Diamond *et al.* 1997). Consequently, the study reported in this paper focuses on children who have had little prior experience of impairments and examines the development of their understanding of impairments cross-sectionally across age. In particular, the research presented here focuses on children's conceptions of the consequences of impairments.

Children's understanding of the consequences of impairments has rarely been the focus of research. Diamond (1994) explored how preschool children without disabilities think about the skills of their classmates with mild learning difficulties and severe physical disabilities. The results showed that children with disabilities were judged to have lower cognitive, language and physical competencies. Moreover, Diamond (1994) found that preschoolers were sensitive to differences as a function of disability type. The child with a physical impairment received lower ratings for physical competence. However, preschoolers rated the child with a learning difficulty as less competent on cognitive, physical and language tasks. This could reflect a general confusion about learning disabilities as suggested by Conant & Budoff (1983).

However, Diamond (1994) found that children with learning and physical

disabilities did not receive lower ratings on social competence than their typically developing classmates. Moreover, Diamond & Hestenes (1996) found that preschoolers rated their classmate with hearing loss more positively on social competence than in other areas. This is an interesting finding, given that considerable previous research suggests that children with disabilities are often socially isolated by peers without disabilities (e.g. Guralnick & Groom 1987; Diamond *et al.* 1993).

This study explores the ways in which typically developing children, with limited experience of disability, conceptualize the capabilities and limitations of children with different types of impairments. It extends previous studies by Diamond (1994) and Diamond & Hestenes (1996) by including a broader spectrum of disabilities and adopts a developmental perspective to children's conceptions of impairments. This study includes children aged 4–12 years who have little or no direct school or home experience of children with disabilities and examines their understanding of physical, cognitive and social competencies of children with different types of impairments.

## Method

### Participants

Seventy-seven children participated in the study (see Table 1). Children were recruited from a state nursery and a state primary school of middle-class socioeconomic status in east Scotland through a process of written parental consent. Response rates were high, as only a few parents of the younger aged children failed to return consent forms. No child had an immediate family member (parent, sibling) with an impairment. Only the 6- to 7-year-old age group had fortnightly contact with a child with a physical impairment who was included in the classroom.

Table 1 Participant  
information

	Maies	Females	Total	Mean age (range)
Preschoolers	7	10	17	4.6 (4.4–5.1)
6–7 years	7	13	20	7.3 (7.1–7.5)
9–10 years	12	8	20	9.1 (8.9–9.4)
11–12 years	9	11	20	11.1 (10.11–11.7)

## Materials

### *Impairment vignettes*

Eight vignettes were written (see Appendix), each describing a child of approximately 8 years of age who exhibited one of the following disabilities: physical impairments, missing thumb (minor PD) and wheel-chair bound (major PD); sensory impairments, blindness and hearing loss; learning disabilities, non-specific learning impairments (NSLD) and Down's syndrome (DS); and emotional/behavioural difficulties, attention deficit hyperactivity disorder (ADHD) and lacking in social skills (LSS). The disabilities were chosen to represent a broad spectrum of distinct types of impairments in the general population. The design of the vignettes is similar to those used by Maas *et al.* (1978), and descriptions of each impairment were adapted from Bowley & Gardner (1980). There were equal numbers of male and female characters, and all vignettes were designed to be of the same length and complexity. To maintain children's interest, they were shown a coloured photograph depicting the character in each story (with permission from Pettenuzzo 1987, 1988; Bryant-Mole 1994; Bryan 1996).

### *Competency ratings*

An adapted version of the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike 1984) was used (see Table 2). This measure required children to indicate how competent they believed someone else was in three domains: physical, cognitive and social. There were three items in each domain, and children were asked to indicate whether the

**Table 2** Adapted Pictorial Scale of Perceived Competence and Social Acceptance for Young Children

1. Do you think X is good at puzzles or not very good at puzzles? (cognitive competence)
2. Do you think X doesn't have many friends or does have a lot of friends? (social competence)
3. Do you think X is good at running or not very good at running? (physical competence)
4. Do you think X gets invited to parties or doesn't get invited to parties? (social competence)
5. Do you think X is not very good at climbing or is good at climbing? (physical competence)
6. Do you think X is good at reading or not very good at reading? (cognitive competence)
7. Do you think X is good at jumping or not very good at jumping? (physical competence)
8. Do you think X isn't very good at counting numbers or is good at counting numbers? (cognitive competence)
9. Do you think X gets invited to dinner at a friend's house or doesn't get invited to dinner? (social competence)

Child: Care, Health  
and Development

VOLUME 27  
NUMBER 6

2001

PAGES 603-617

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child in the vignette was 'good' or 'not very good' at each item (e.g. Is this girl good at running or not very good at running? Would this boy get invited to parties or not get invited to parties?). For each item, two sets of line drawings of children participating in the particular task were pointed to and described. One picture depicts a child with a high level of competence or acceptance, and the other picture depicts a child with a low level of competence or acceptance. Children were instructed to pick the drawing that best described the child in the vignette. This format is similar to previously adapted versions of the scale used by Diamond (1994) and Diamond & Hestenes (1996). However, to reduce task demands, the original scale was modified during piloting, and the standard four-point response format was replaced with a two-point response format using phrases 'good' and 'not very good' for each item. The child's judgement provides a score of 1 (the child is competent at the task) and 2 (the child would have difficulty performing the task). During piloting, it was found that the four-point scale was too demanding and time consuming for the youngest children. Moreover, the youngest children tended to ignore the intermediate responses on the four-point scale.

### **Procedure**

Primary-aged children were interviewed individually in a small room separate from their regular classroom. Preschool children were interviewed separately within a quiet area of the nursery classroom. Every child was read the vignettes outlined above in a random order. Children were presented with each of the consequences and the positive/negative response choices in a random order. Responses were video and tape recorded for subsequent analysis.

### **Results**

Impairments were analysed to see whether they could be collapsed into sensory, physical, learning and behavioural categories. However, the rank correlation coefficients within impairment categories were small; therefore, each impairment was analysed separately. The reliability of the consequence scales was assessed using Cronbach's alpha, and internal reliabilities were acceptably high: 0.79 for the physical domain; 0.79 for the cognitive domain; and 0.86 for the social domain. Consequently, judgements for each separate item were summed within their competency areas. This provides ratings ranging from 3 (competent) to 6 (has difficulty) for cognitive, physical and social consequences, for each impairment.

Child: Care, Health  
and Development

VOLUME 27  
NUMBER 6

2001

PAGES 603-617

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### Impairment differences

A repeated measures two-way ANOVA was computed to test for differences in consequence ratings across impairments. A significant main effect was found for consequence [ $F(2, 118) = 30.95; P < 0.001$ ], impairment [ $F(7, 413) = 23.40; P < 0.001$ ] and consequence by impairment [ $F(14, 826) = 36.66; P < 0.001$ ]. As shown in Table 3, a one factor within subjects ANOVA for each impairment separately showed an effect of consequence type for every impairment except hearing loss. Post hoc analyses (see Table 3) revealed that, for blindness, ratings were significantly more positive for social than for cognitive and physical consequences. Similar results were found from post hoc analyses on the child with Down's syndrome who received more positive social judgements than cognitive and physical ratings. The opposite results were found for ADHD. Children judged there to be more negative social consequences for the character with ADHD than cognitive and physical consequences. The description of a character who lacked social skills also received significantly poorer ratings for social consequences than cognitive and physical consequences. Ratings for NSLD were more negative for cognitive tasks than for physical and social tasks. Major PD received significantly more negative judgements on physical tasks than on cognitive and social tasks. In contrast, minor PD was judged more negatively on cognitive consequences than on physical and social consequences. Physical tasks were rated more negatively than social tasks.

### Age differences

The results from Table 4 show the mean competency ratings in each age group for different impairments. A two-way mixed measures ANOVA was completed for each impairment comparing consequence type (cognitive, physical and social) between ages (preschoolers, 6-7, 9-10 and 11-12 years). The results in Table 4 show significant age effects for hearing loss, minor PD, major PD, NSLD and LSS. A significant interaction effect of age and consequence rating was also found for blindness, minor PD, major PD, NSLD and ADHD. To examine the interactions in more depth, first, a series of one-way ANOVAs was conducted for each consequence type (physical, cognitive and social) between ages (preschoolers, 6-7 years, 9-10 years and 11-12 years) as shown in Table 4. Secondly, each consequence type was compared within age (see Table 5). Taking each type of analysis separately, significant age effects were found from tests on the effect of consequence type between age. For blindness, significant age differences were found for physical and social consequences. Post hoc

Child: Care, Health  
and Development

VOLUME 27  
NUMBER 6

2001

PAGES 603-617

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Child: Care, Health  
and Development

VOLUME 27  
NUMBER 6

2001

PAGES 603-617

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Table 3 Mean difference in competency ratings for different impairments across all ages

Impairment	Consequence type			One-way ANOVA			Post hoc <i>t</i> -tests		
	Ply	Cog	Soc	F	d.f.	P	Ply vs. Cog	Ply vs. Soc	Cog vs. Soc
	Blindness	5.01	5.05	3.67	73.89	150	0.001	NS	9.53*
Hearing loss	3.40	3.57	3.55						
Minor PD	4.03	4.32	3.39	38.80	148	0.001	2.46***	7.25*	8.52*
Major PD	5.75	3.47	3.66	202.46	144	0.001	16.69*	16.93*	NS
NSLD	4.11	4.69	3.32	47.56	146	0.001	3.71*	NS	10.28*
DS	4.12	4.35	3.42	21.78	148	0.001	NS	5.28*	6.50*
ADHD	3.54	3.82	5.04	48.49	142	0.001	NS	8.97*	7.22*
LSS	3.60	3.51	4.03	9.86	150	0.001	NS	3.17**	3.74*

\* $P < 0.001$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.05$ .

Child: Care, Health  
and DevelopmentVOLUME 27  
NUMBER 6

2001

PAGES 603-617

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Table 4 Age differences in mean competency ratings for different impairments

Impairment	Analyses																	
	Age						11-12 years						Mixed measures anova					
	Preschoolers		6-7 years		9-10 years		11-12 years		Age		Conseq		Age		Conseq		Age x Conseq	
Blindness	4.41	4.71	4.29	5.40	5.15	3.25	5.16	5.37	10.40	5.00	4.95	3.65	F(3, 70) = 0.42	F(2, 144) = 87.75*	F(6, 144) = 7.45*			
Hearing loss	4.00	4.24	4.06	3.21	3.16	3.11	3.32	3.53	3.74	3.21	3.37	3.37	F(3, 70) = 7.78*	F(2, 140) = 1.34	F(6, 140) = 0.84			
Minor PD	4.35	5.29	4.18	3.80	4.15	3.15	4.06	4.28	3.28	3.95	3.70	3.26	F(3, 71) = 10.48*	F(2, 142) = 41.85*	F(6, 142) = 2.83**			
Major PD	5.05	4.47	4.35	5.84	3.10	3.10	6.00	3.33	3.56	6.00	3.12	3.68	F(3, 69) = 4.10**	F(2, 138) = 341.78*	F(6, 138) = 19.00**			
NSLD	3.75	3.81	3.56	4.95	4.75	3.25	3.79	4.63	3.21	3.79	5.37	3.26	F(3, 70) = 2.68**	F(2, 140) = 59.30*	F(6, 140) = 9.42*			
DS	3.69	3.94	3.63	4.00	4.40	3.25	4.32	4.26	3.32	3.63	4.70	3.45	F(3, 71) = 1.27	F(2, 142) = 20.42*	F(6, 142) = 1.41			
ADHD	4.18	4.12	4.52	3.45	3.20	5.00	3.31	3.75	5.31	3.37	4.32	5.32	F(3, 68) = 1.56	F(2, 138) = 54.76*	F(6, 138) = 4.72*			
LSS	4.18	4.18	4.12	3.20	3.10	3.90	3.70	3.40	4.20	3.42	3.47	3.95	F(3, 72) = 3.22**	F(2, 144) = 9.13*	F(6, 144) = 1.50			

\* $P < 0.001$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.05$ .Child: Care, Health  
and DevelopmentVOLUME 27  
NUMBER 6

2001

PAGES 603-617

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Table 5 Age differences in children's ratings of physical, cognitive and social consequences for each impairment

Impairment	Consequence type		
	Physical	Cognitive	Social
Blindness	F(3, 73) = 3.90**	F(3, 73) = 2.15	F(3, 72) = 4.23**
Minor PD	F(3, 73) = 1.68	F(3, 73) = 8.67*	F(3, 71) = 13.14*
Major PD	F(3, 73) = 11.21*	F(3, 73) = 16.12*	F(3, 69) = 7.39*
NSLD	F(3, 72) = 5.52**	F(3, 71) = 6.69*	F(3, 72) = 1.47
ADHD	F(3, 72) = 4.29*	F(3, 69) = 5.02**	F(3, 73) = 1.83

\* $P < 0.001$ ; \*\* $P < 0.01$ .

analyses revealed that preschoolers were more negative about the social consequences ( $P < 0.05$ ), and 6- to 7-year-olds were more negative about physical outcomes ( $P < 0.05$ ). An age difference was found for major PD in relation to cognitive, physical and social tasks. The youngest age group was more negative about the cognitive ( $P < 0.05$ ) and social ( $P < 0.05$ ) abilities of a child with major PD but significantly more positive about physical consequences than any other age group. Age differences were evident for minor PD for cognitive and social functioning ( $P < 0.05$ ) than all other age groups. Significant age differences were found for ADHD in cognitive and physical functioning. Preschoolers gave more negative ratings for physical tasks ( $P < 0.05$ ) than all other age groups. Both preschoolers and the oldest age group gave significantly more negative judgements on cognitive tasks ( $P < 0.05$ ) than 6- to 7- or 9- to 10-year-olds. Age differences in cognitive and physical functioning were also found for NSLD. The 11- to 12-year-olds gave more negative ratings on cognitive tasks ( $P < 0.05$ ) for NSLD than all other age groups, and the 6- to 7-year-olds were more negative about physical functioning ( $P < 0.05$ ).

From Table 6, it can be seen that significant differences were found in consequence ratings within each age group. Preschoolers were the only age group that did not give different competency ratings for each of the impairments examined. Significant differences for preschoolers were only found in their consequence ratings for minor PD and major PD. Post hoc *t*-tests were carried out within each age group comparing each consequence type. Every age group except preschoolers judged there to be physical and cognitive limitations to blindness but not social outcomes. Compared with the older age groups, preschoolers gave more negative ratings for cognitive than physical tasks for minor PD. Whereas the older age groups acknowledged physical limitations for major PD compared with cognitive and social consequences, preschoolers did



Table 6 Differences in children's competency ratings for each impairment for preschoolers, 6- to 7-, 9- to 10- and 11- to 12-year-olds

Impairment	Preschoolers			6-7 years				
	ANOVA	Cog vs. Phy	Cog vs. Soc	Phy vs. Soc	ANOVA	Cog vs. Phy	Cog vs. Soc	Phy vs. Soc
Blindness	$F(2, 32) = 1.86$	-	-	-	$F(2, 38) = 54.25^*$	NS	8.78*	10.99*
Minor PD	$F(2, 32) = 12.49^*$	3.77**	4.64*	NS	$F(2, 38) = 11.49^*$	NS	4.59*	3.90*
Major PD	$F(2, 32) = 3.93^{***}$	NS	NS	4.24*	$F(2, 36) = 450.67^*$	22.36*	-	21.23*
NSLD	$F(2, 30) = 0.71$	-	-	-	$F(2, 38) = 30.57^*$	NS	6.10*	7.77*
ADHD	$F(2, 32) = 1.42$	-	-	-	$F(2, 38) = 21.27^*$	NS	6.09*	3.94*

\* $P < 0.001$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.05$ .

PD, physical disability; NSLD, non-specific learning disability; ADHD, attention deficit hyperactivity disorder.

not differentiate their physical and cognitive competency ratings for these impairments. Both 9- to 10- and 11- to 12-year-olds judged there to be cognitive and physical limitations to NSLD. Additionally, each age group except preschoolers thought there to be significantly more negative social outcomes for ADHD.

### Discussion

Children of all ages had a positive perception of the capabilities of children with different types of impairments. Such findings are encouraging for issues surrounding educational and social inclusion. Moreover, the findings extend the work of Diamond (1994) and Diamond & Hestenes (1996) by revealing that even 4-year-old children can differentiate their competency judgements for certain types of impairments, and there is an increasing degree of differentiation of consequences of impairments with age.

Children in this study appeared to be sensitive to limitations associated with physical impairments, suggesting that physical impairments are a relatively straightforward concept for children to grasp (see Conant & Budoff 1983). Children in this study also understood the consequences of emotional/behavioural impairments and the effect such difficulties may have on social functioning. This result is similar to that of Milich *et al.* (1982), who found that even preschoolers had a negative social evaluation of a child with ADHD. Children overall showed an understanding of the competencies of learning impair-

ANOVA	9-10 years			11-12 years			
	Cog vs. Phy	Cog vs. Soc	Phy vs. Soc	ANOVA	Cog vs. Phy	Cog vs. Soc	Phy vs. Soc
$F(2, 36) = 43.67^*$	NS	8.50*	6.43*	$F(2, 38) = 17.64^*$	NS	4.47*	6.11*
$F(2, 34) = 10.50^*$	NS	4.12*	5.10*	$F(2, 38) = 17.51^*$	NS	3.58**	7.28*
$F(2, 34) = 113.05^*$	15.90*	NS	14.71*	$F(2, 36) = 168.77^*$	42.14*	3.01**	11.40*
$F(2, 36) = 13.83^*$	2.49**	6.87*	2.25***	$F(2, 36) = 46.34^*$	6.43*	10.48*	2.24***
$F(2, 30) = 18.96^*$	NS	4.56*	6.51*	$F(2, 38) = 24.36^*$	3.51**	3.08**	8.73*

ments, maintaining that only cognitive functioning would be affected. This is an unexpected finding, as previous research has argued that disabilities with primarily psychological symptoms are much more difficult for children to comprehend (Conant & Budoff 1983). However, Goodman (1989) found that 8- to 9-year-olds have an accurate conceptualization of learning disability, viewing it as a trait that is abstractly defined and irreversible. Additionally, children in this study did not expect social functioning to be compromised by the presence of learning difficulties. This is an interesting finding, as earlier research suggests that learning-delayed children have deficiencies in using peer-related social behaviours (Guralnick & Groom 1985, 1987). Despite having little or no prior experience of learning disabilities, children in this study did not overgeneralize the effects of learning difficulties from one developmental domain of consequences to another. The role that experience plays in shaping children's views of the competencies of children with impairments is therefore another important area for future research.

Unlike previous research, this study investigated and found age differences in children's understanding of the competencies of children with impairments. Many of the differences evident were between preschool age and older age groups. Preschoolers appeared to have a different conception of major PD than all other age groups. Preschoolers were more optimistic about the physical competencies of a major PD and more pessimistic about cognitive functioning. These findings are difficult to interpret, as the type of impairments that have salient, physical cues are generally easier for young children to understand (e.g. Conant & Budoff 1983; Diamond 1994). It could be that, in contrast to

work by Diamond (1994) and Diamond & Hestenes (1996), preschoolers in this study had little experience of impairments and thus exhibited a general confusion about the effects of being in a wheel-chair. It is worth noting that the 6- to 7-year-olds in this study were not confused about the consequences of a physical impairment. This could result from the fortnightly contact that this age group had with a child who was wheel-chair bound.

However, the findings suggest that, for several impairments, preschoolers generalize the limitations in one set of consequences to another consistent with previous findings in older children (Maras & Brown 1992). In this study, preschoolers perceived there to be cognitive and physical limitations of children with emotional/behavioural difficulties. They were also likely to extend the limitations of the child with blindness to the social domain, a finding also shown in other work (Diamond & Hestenes 1996). Moreover, preschoolers were less likely than older age groups to differentiate between the consequences of impairments. Thus, although young children are aware of the competencies and limitations of children with difficulties, they lack sufficient knowledge to make a differentiated judgement. In contrast to older children, preschoolers generalize the consequences of impairments across several domains of ability.

Surprisingly, older children's conceptualization of learning disabilities was not radically different from that of preschoolers. There were no age differences in children's understanding of Down's syndrome, and only the 11- to 12-year-olds made differentiated judgements on cognitive functioning for NSLD. We contend that children reveal fundamental difficulties in understanding learning disabilities. Future research should investigate how we can improve understanding of learning difficulties through experience or direct instruction.

In conclusion, although children were generally positive about the capabilities of children with impairments, several age and impairment differences in children's understanding were identified. The relationship between children's understanding of the consequences of impairments and how salient this information is in friendship choices, for example, requires further attention. The findings that even young children develop ideas about children with impairments and that such ideas change with age provide us with an opportunity to develop age-appropriate interventions to instruct young children about the positive ways in which we are all alike and different.

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PAGES 603-617

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#### Appendix: Impairment vignettes

Visual impairment: Stephen has never been able to see very much and doesn't know what things look like. So, Stephen has to feel things so he knows what shape they are and he has to be careful he doesn't bump into things because he can't see very well.

Hearing loss: John has never been able to hear very well and can't hear noises like other children. He wouldn't be able to hear us talking. So, because John can't hear, he often watches things with his eyes a lot because he can't hear very much.

Physical impairment (minor): Nicola has a thumb missing on her hand. Sometimes, Nicola finds it harder to play games the other children play and it took her longer to learn how to tie her shoelaces. Nicola takes longer to draw and write than her classmates because she has a thumb missing.

Physical impairment (major): Michael can't feel his legs so he can't walk. Michael gets around in a special chair so he is sometimes slower at getting around than other children. He wouldn't be able to go up and down stairs very easily. Michael can only get to school or the shops if he has the chair.

Learning disability (non-specific): Claire takes longer to learn the alphabet and count numbers than other children. Claire finds it harder to read and write.

Often she forgets the rules to simple games and can't follow the teacher's instructions in the classroom.

Learning disability (Down's syndrome): Rachel takes longer to learn things than other children do and does things a little more slowly. Sometimes, Rachel doesn't want to join in a game and no-one ever makes her do it. Although Rachel takes longer to learn, she still feels the same things as other children.

Attention deficit hyperactivity disorder: Chris doesn't pay attention or listen well in class. Sometimes, Chris is so lively in his chair he falls out of it. Chris often disturbs the other children in class. He is quick to get angry and often gets into fights with other children.

Lacking in social skills: Anna often won't look at you when you're talking to her. Sometimes, she stares at people longer than she should. Anna is quite shy and usually doesn't like asking the other children if she can join in.