A Cognitive Linguistic Study of Categorisation and Uncertain Reasoning in the Representation of Degree Modifiers

by

David Christopher Ringwood

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF PHILOSOPHY

Department of Linguistics & English Language
University of Lancaster, UK

June 2006

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

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Degree modifiers (such as *very* and *really*) are common features of written and spoken language. In general, their effect is to moderate the perceived strength of the linguistic form on which they act, making them a useful and versatile tool of expression and emphasis. However, the cognitive mechanisms that underlie the conceptualisation of degree modifiers and the linguistic aspects of their use in combination with other classes of words are extremely complex. The ease and fluency with which they are used and the extent to which their effect is commonly understood is good evidence that, like many aspects of meaning, degree modifiers rely on commonly held beliefs and knowledge about the world around us. For this reason the whole area of linguistic categorisation and prototypes are central to understanding the role of degree modifiers, particularly given that assumptions about prototypical strengths of adjectives are exactly what degree modifiers seek to alter.

A core part of this study is the consideration of the role of uncertainty – not only uncertainty relating to the strength of the degree modifier, but also of the linguistic forms on which they act. More specifically, the inter-relationship between the perceived strength of degree modifiers and the certainty (or uncertainty) of the belief they express is a relatively unexplored yet intriguing area of linguistic research. The human mind constantly seeks to process as much information as possible for the least possible cognitive effort, yet this is difficult to achieve when reasoning with uncertain knowledge. By exploring the role and characteristics of degree modifiers, my aim is to illuminate how uncertain reasoning permeates many aspects of cognitive linguistic processing and how it relates to the conceptualisation and use of uncertain concepts in language.

ACKNOWLEDGEMENTS

This thesis represents many years of work and its completion is as much a function of persistence as inspiration. The ongoing support of many people contributed significantly over the years, and I am extremely grateful to all those who have helped and encouraged me over the course of this research.

I particularly want to acknowledge the importance of Tamara, Anya and Stacey in providing me with a genuine sense of motivation and direction.

I want to thank my supervisor Jonathan Culpeper for his many years of support, guidance and patience, all of which are truly appreciated. Without this support in particular I would have found it very difficult to keep going.

Finally, the support of my parents was of great personal value to me, and their unconditional belief in me will always be a source of strength.

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Introduction

The term 'degree modifiers' seems at odds with the everyday, commonplace way in which they are used. Indeed, many people would not know what the term itself even means. Degree modifiers such as *very*, *really* and *fairly* fit neatly into the natural flow of sentences and serve their purpose very efficiently. As the name suggests, degree modifiers are intended to influence the perceived strength of the linguistic form on which they act (known as the *header*).

The view is beautiful.
The view is *really* beautiful.

The addition of the degree modifier *really* above magnifies the header *beautiful* and illustrates just how lovely the view is. Examples such as these are very prevalent in everyday language, and their emphatic effect can be particularly strong when combined with intonational stress on the modifier. Degree modifiers then are useful, versatile tools of expression that appear to be very straightforward in nature.

The cognitive environment in which degree modifiers operate however is very complex, and the meaning that degree modifiers communicate depends on a number of factors. For example, it is not possible to fully appraise and understand the true nature of degree modifiers without also exploring their relationship with other linguistic forms, headers in particular. Furthermore, any study of the way in which people reason with degree modifiers requires a detailed exploration of the key cognitive elements involved in this area of linguistic processing. This is exactly the strength of utilising a cognitive linguistic approach to the research of degree modifiers, as it encompasses and integrates many of the critical components required to fully explore this intriguing area. Moreover, it makes it easier to include the whole

area of uncertain reasoning, which is an aspect of this study that I believe brings an element of added value to our understanding of degree modifiers.

Degree modifiers can also be included in a list of uncertainty markers although their use does not necessarily indicate uncertainty; ironically, it is this potential ambiguity about their role that can increase uncertainty about how the use of degree modifiers should be interpreted. In chapter three I will discuss various classes of adverbs, some of which act as degree modifiers, although it is important to point out, even at this stage, that my interest is in all classes of adverbs that can be associated with the certainty or uncertainty of a belief. For example, the word 'maybe' is not classified as a degree adverb, yet it does function as a degree modifier. A typology of degree modifying adverbs is discussed in section 3.2.2. The linguistic manifestation of uncertainty is likely to depend on the particular situation and the amount of relevant information available to the perceiver, but they will also be subject to existing beliefs and prior knowledge about the world, including culturally specific aspects.

This research is important for a number of reasons. It explores the inherently uncertain and often subjective nature of beliefs and provides a focused study of specific linguistic forms (i.e. degree modifiers such as quantifiers and intensifiers). The way in which I approach the subject of uncertainty in language is also an element of this thesis that I believe is of significance. Researchers often use uncertainty as an explanation for certain types of communicative failure, whereas I tend to see language as a communicative process that is largely successful *despite* its uncertain nature. The significance of this is that it treats uncertainty as an inherent and mainstream part of language, and therefore of linguistic research. It also makes full utilisation of the most current research available in cognitive linguistics, a fascinating area that has continued to expand and deepen our knowledge of language for several decades.

With all of these issues in mind my research questions are as follows:

1. What are the key cognitive linguistic elements that contribute to the communication of the meaning of degree modifiers, and what role does uncertain reasoning play in the conceptualisation and processing of these meanings?
2. What effect do different degree modifiers have on the perceptions of the strength of the header on which they act, and on the certainty of the belief that the degree modifier/header combination represent?
3. Can different headers actually influence the way degree modifiers themselves are perceived and if so how does this manifest itself?
4. What role do collocational or other lexical semantic aspects of language play in moderating the way in which the analysis of degree modifier/adjective combinations should be approached or interpreted?

The thesis consists of five chapters:

Chapter 1 outlines the historical context of cognitive linguistic research and introduces basic areas of linguistic theory relevant to this thesis. It establishes an initial understanding of the relationship between thought and language, and sets the scene for some of the work on categorisation and prototypical adjectives in chapter 2. It also raises the core subject of uncertainty and outlines some fundamental areas in which uncertainty influences the way language is represented and processed internally. Through this exploration it will become clear just how prevalent uncertainty is in language and linguistic processing, and how the cognitive linguistic system structures itself to cope with an element that otherwise would cause serious bottlenecks and monopolisation of cognitive resources.

Chapter 2 explores in some detail the key internal constructs that are used to represent our beliefs about the world around us. Specifically, it emphasises and explains the centrality of the roles of categorisational and prototypical belief structures

in the representation of degree modifiers and headers, and their relationship to the manner in which uncertain beliefs are represented and processed.

Chapter 3 focuses on developing the reader's understanding of degree modifiers, how and where they are typically used and the grammatical and pragmatic aspects that constrain or moderate their usage. In particular, this chapter deals with collocational aspects of degree modifier/adjective combinations, and explores the role of collocations in the preparation for and analysis of corpus data for the experiment.

Chapter 4 deals with the main experiment in this research. It begins with a detailed examination of the nature and characteristics of degree modifiers, and describes previous research on degree modifiers that will be used as part of this research. The experimental methodology is proposed and the experimental process and findings are presented. This experiment, based on previous methodologies employed by Paradis, C. (1997), measures the extent to which degree modifiers combine with adjectives to express varying strengths of beliefs. In this thesis I have modified the experiment by adding a second domain of analysis, i.e. where participants score how certain they feel about their score in addition to the primary strength score relating to their perception of the degree modifier. The precise experimental methodology is described in detail as is the method used to evaluate the results. The final results are presented and the chapter concludes with a discussion of the results and their implications.

Chapter 5 looks at the findings of the thesis as a whole and summarises the way in which this research has contributed to our understanding of the role of degree modifiers in the cognitive representation of social beliefs and person perception. It also identifies potential areas of future research and flags issues that should be addressed or considered in this area of linguistic research.

Chapter 1

Current Issues in Cognitive Linguistic Theory

1.1 Introduction

The aim of this chapter is to introduce relevant areas of cognitive linguistic theory and to provide an overview of the most recent developments in related theory. The first point of explanation has to be a definition of what cognitive linguistics actually is. Cognitive linguistics is a highly integrated multidisciplinary area of research that brings together many existing area of linguistic and psychological research. It is the study of how mind and language work together in areas such as semantics, syntax, language acquisition and language processing. This integrated approach is critically important in facilitating the inclusion of many differing yet converging areas of study in this thesis, and in this regard it is important to understand more about cognitive linguistics, its origins and the current state of the art. The ultimate foundations of cognitive linguistics can be found in many more traditional areas of linguistics and cognitive science, particularly in topics such as language, thought and conceptualisation.

1.2 The Development of Cognitive Linguistics

Cognitive linguistics is a multidisciplinary area of research that gained most prominence in the 1990's, although its origins can be traced back some considerable time. As the name suggests, the primary focus of this research area is the combination of linguistics and cognitive science, the latter already being a multi-disciplinary area of research. Cognitive linguistics focuses primarily on psychological aspects of language, as opposed to pragmatics, which deals with language meaning and usage in context. Although the exploration of meaning traditionally fell within the domain of

semantics, semantic theory was unable to fully account for differences between linguistic meaning and speaker meaning. Philosophers such as Grice, Searle and Austin (e.g. Grice 1975, Searle 1980 and Austin 1962) were at the forefront of the semantics-pragmatics debate, and are generally credited with shaping the foundations of current pragmatic theory. Since then, pragmatics has attracted a great deal of research interest and has diversified into its own areas of specialisation. Although cognitive aspects of language have always been acknowledged, cognitive linguistics did not really emerge as a specialisation until the late 1980's and the majority of research and publications associated with this new area have been produced from the 1990s onwards.

The aim of cognitive linguistic research is to explore the ways in which language acts as an instrument for organising, processing and communicating information. It deals with issues such as the conceptual interface between syntax and semantics, the relationship between language and thought, and the psychological context of linguistic performance. Like pragmatics, cognitive linguistics has become well established with the founding of the International Cognitive Linguistics Association and the distribution of their quarterly journal *Cognitive Linguistics*, which has been published since 1990.

The shift from behaviourism towards cognitivism in the 1960s and 1970s resulted in a greater emphasis on scientific experiments with quantifiable results (as opposed to introspection favoured by Structuralist psychologists such as Wundt or the observation of behaviour employed by Behaviourists such as Skinner). The increasing availability of new technology coupled with more advanced research and experimental methodologies also added to this momentum, and researchers were in a better position to evaluate and measure relationships between thought, language and speech.

Achieving quantifiable results was seen as an objective means of evaluating hypotheses, although the interpretation of results was often highly subjective.

1.2.1 The Early Roots of Cognitive Linguistics

Although cognitive linguistics is a relatively new approach to the study of language and cognition, its precursors were many and the study of language and thought attracted several academics, philosophers and researchers of note. For example, Ludwig Josef Wittgenstein (1889-1951), a British philosopher born in Austria, rejected the idea that words have definite of fixed meanings, and emphasised the *use* of language in creating meaning. He used the analogy of language as a game, and suggested that the mere ability to express thought in the forms of words does not give meaning to those words, because no action has yet been performed on them. Wittgenstein summed this idea up in his *Philosophical Investigations* (Stern 1995: 184):

> "Naming is not so far a move in the language game – any more than putting a piece on the board is a move in chess. We may say: *nothing* has so far been done, when a thing has been named".

By avoiding logic-based approaches to the exploration of meaning, such as Tarskian truth-conditional semantics, Wittgenstein was able to emphasise the negotiation of meaning in everyday use, rather than how meaning is represented in the human mind. Essentially, he took the view that mental processes in themselves cannot be directly 'translated' into language, because meaning is generated only through the contextualised and social use of language, where meaning becomes an entity that is understood or 'believed' between people. This in fact tends strongly towards the 'cognitive' view of language, i.e. that meaning is related to our knowledge of the world around us (Ungerer & Schmid 1996: xi).

An individual's internal representation of concepts, such as objects or sensations, is only meaningful if other people share an understanding of its associated linguistic form (e.g. chair, happiness) and attribute meaning to the *performance* of its linguistic form within a given context. Wittgenstein therefore largely rejected the notion that mental processes are expressed directly though linguistic form or are constituted in linguistic rules. This is interesting in that it illustrates two points: firstly, that context and shared understanding about that context are critical, and secondly, that language does not contain absolute meanings, rather its meanings have to be constantly negotiated and modified through use and experience. Words can therefore mean different things to different people in different contexts and, by implication, modifiers that shift the emphasis or certainty expressed in those words are also in part a function of the context in which they occur.

J.L. Austin (1911 – 1960), a British philosopher, claimed "the issuing of an utterance is the performing of an action" (Austin 1962: 6). A valuable aspect of Austin's work is the way in which it created a focus on *why* people use language, i.e. speech acts, which complimented the research of other philosophers such as H.P. Grice, who was interested in *how* language communicates meaning between interlocutors. Austin (1960:52) describes a speech act as an utterance and the "total situation in which the utterance is issued". In essence what this means is how language can be used in a variety of ways to communicate the intention behind the utterance, e.g. (from Thomas 1995: 51) a speech act of requesting someone to close the door could be communicated as:

- Shut the door!
- Could you shut the door?
- Did you forget the door?

This research marked a shift towards the exploration of the pragmatic use of language, and attracted increasing amounts of research. Pragmatics depends heavily on understanding language in context, and every individual's definition or perception of context is at least partly dependent on their knowledge of and beliefs about the world around them. This view of language was captured by D. Geeraerts in his Handbook of Pragmatics (Geeraerts 1995: 5): "Language, then, is seen as repository of world knowledge, a structured collection of meaningful categories that help us deal with new experiences and store old ones". However, cognitive linguistics was yet to develop its own identity and in part its development was linked to the emergence of new technologies, particularly from the 1950s onwards.

1.2.2 The Establishment of Cognitive Linguistics from the 1950s

Technological developments precipitated by WWII coupled with the greater emphasis on measurable results of experimentation created new and unprecedented research opportunities for most academic disciplines, including cognitive linguistics. Never before had it been so possible to combine various academic disciplines and to employ their principles in sophisticated computer-assisted experiments. Although computers at that time were rudimentary compared to the advanced machines of today, the advent of research into artificial intelligence was already underway, led by pioneers such as John McCarthy, Marvin Minsky, Allen Newell, and Herbert Simon (e.g. McCarthy 1958, Minsky 1968, 1975, Newell 1993, Simon 1977, 1995). In 1956 a symposium was held at Dartmore College at MIT, and speakers such as Noam Chomsky, Jerome Bruner and George Miller led the debate on new conceptualisations of cognitive and linguistic processes. The symposium had a profound effect on the

participants, and solidified the general feeling that a new science was emerging. Miller (1979) summed up the thoughts of many afterwards:

> "I went away from the symposium with a strong conviction, more intuitive than rational, that human experimental psychology, theoretical linguistics and computer simulation of cognitive processes were all pieces of a larger whole, and that the future would see progressive elaboration and co-ordination of their shared concerns".

Even Bruner dates the beginning of cognitive psychology from this very symposium (Bruner 1983). One of the most prominent and influential of these speakers was Noam Chomsky (Chomsky 1957, 1980, 1986, 1988), an American linguist whose work on the philosophy and theory of language has contributed greatly to linguistics. In contrast to Wittgenstein, Chomsky asserted that language is "fundamentally a system for expressing thought" (Windisch 1990: 18). In particular Chomsky was interested in the relationship between linguistic meaning, form and structure. This can be seen in his definition of 'grammatical competence', which he described as:

> "The cognitive state that encompasses all those aspects of form and meaning and their relation, including underlying structures that enter into that relation, which are properly assigned to the specific subsystem of the human mind that relates representations of form and meaning" (Chomsky 1980: 59).

Consequently much of Chomsky's research was devoted to exploring the relationship between the semantic and syntactic properties of language, and the way in which an apparently infinite combination of words can be used within a finite set of linguistic rules to create meaningful sentences in natural language (a fundamental principle in *transformational grammar*). Chomsky also asked other interesting questions, some of which went beyond the grammatical aspects of language:

> "To what extent... does the organisation of sound properly belong to the system of language rather than to other systems? Here there are real and

> significant empirical questions concerning perceptual categorisation and its possible special relation to language" (Chomsky 1980: 61).

Here Chomsky makes several important points, particularly if applied to the pragmatic use of language. Using Chomsky's approach to thought and language, we can think of speech as a process that involves translating thought into linguistic form, and then transforming that language into meaningful sound. But Chomsky also raises another important issue, i.e. the 'possible' relationship between perceptual categorisation and language. Does language somehow contain encoded representations of perceptions, and what in what linguistic forms might these perceptions manifest themselves?

Chomsky's questions are critically important in exploring the relationship between language and perception, and this ultimately applies to the way in which degree modifiers are used, particularly given the categorisational aspect of their headers. However, it is essential to bear in mind that language must serve a range of functions (such as those proposed by Austin), and that they are used within a social context. Windisch (1990: 23) illustrates the point that speech is more than just a collection of sounds:

> "Verbal behaviour is actually never purely verbal, it is always verbal, cognitive and social at the same time. Linguistic practice is indissociable from cognitive and social practice. A linguistic practice *is* a social practice".

These views raise interesting questions. How would a philosophy of thought and language differ from a philosophy of thought and speech? Is speech the verbal expression of linguistic thought, or is it a social behaviour that uses language as a common currency? Clearly Chomsky and Wittgenstein differ in their views on these issues; Chomsky favours the idea that thought and language are closely related, whereas Wittgenstein takes a more socio-behavioural view of language.

There are several areas where the relationship between thought, language and speech is critical. One of the most important in the context of the stated goals of this research is the way in which people organise objects, events and people into natural categories, and the relationship between these categorisational representations and their application in language, and ultimately in the representation of categories, prototypes and scalar relationships between degree modifiers and headers. Fraser (1992: 102) illustrates the point well:

> "Perception is closely bound up with language and culture. Our most common way of perceiving is in terms of the categories our language gives us".

Cognitive structures such as categories are important and I will discuss them in more detail at a later stage. However, a core philosophical issue remains: are categories merely internal cognitive structures that can be expressed in speech, or does speech actually shape and activate categories? This was one of the primary interests of Edward Sapir and Benjamin Lee Whorf, two American linguists who together proposed the Sapir-Whorf Hypothesis. In 1929 Edward Sapir, suggested that:

> "Human beings do not live in the objective world alone, nor alone in the world of social activity as ordinarily understood, but are very much at the mercy of the particular language which has become the medium of expression for their society. It is quite an illusion to imagine that one adjusts to reality essentially without the use of language and that language is merely an incidental means of solving specific problems of communication or reflection. The fact of the matter is that the 'real world' is to a large extent unconsciously built upon the language habits of the group. No two languages are ever sufficiently similar to be considered as representing the same social reality. The worlds in which different societies live are distinct worlds, not merely the same world with different labels attached... We see and hear and otherwise

> experience very largely as we do because the language habits of our community predispose certain choices of interpretation" (1958: 69).

The writings of Whorf have created more debate about the extent to which these ideas hold true more than the credibility of the notions themselves, although Whorf was not without his critics. For example, one famous example associated with the Sapir-Whorf hypothesis is the Inuit Indian's use of many different terms of different varieties of snow. One major criticism of their hypothesis is its lack of empirical support. Schlesinger points out that

> "the mere existence of such linguistic diversities is insufficient evidence for the parallelist claims of a correspondence between language on the one hand and cognition and culture, on the other, and for the determinist claim of the latter being determined by the former" (1991:18)

and that

> "Whorf occasionally supplies the translations from a foreign language into English, and leaves it to the good faith of the reader to accept the conclusion that here must have been a corresponding cognitive or cultural phenomenon" (1991:27).

There remains a variety of opinions about the extent to which the systemic structures of a language (what de Saussure referred to as *la langue,* Koerner 1973) constitutes a linguistic influence as opposed to those associated with social and cultural norms and individual use (de Saussure's *la parol: ibid*). Benjamin Whorf reinforced Sapir's thoughts by proposing that:

> "We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impressions which has to be

organized by our minds - and this means largely by the linguistic systems in our minds" (Whorf 1940: 213-14)

The Sapir Whorf hypothesis contains two main proposals (from Kit-Fong Au 1996: 194):

(i) **Linguistic Relativity**: Structural differences between two languages will generally be paralleled by non-linguistic cognitive differences in the native speakers of the two languages.

(ii) **Linguistic Determinism**: The structure of a language strongly influences or fully determines the way its speakers perceive and reason about the world.

The notion of linguistic relativity is less problematic as it avoids the suggestion that there is a direct causal relationship between language and thought, whereas linguistic relativity suggests no more than a parallel between the two. The more extreme notion however that using a particular language somehow traps the speaker in the same cognitive environment as other speakers of the same language does seem difficult to accept; but there must also be some consistency in the cognitive environments of speakers of a given language to the extent that scalar representation operates in a reasonably consistent way across a population. Furthermore, the notion of prototypes depend heavily on culturally specific references and experiences, and the idea that languages can be translated effectively on a word-for-word basis in a way that captured the exact notion and example of prototypes in each language and culture seems very unlikely (see Nida's work on equivalence 1964, 1969 and 1982).

The nature of the relationship between language and thought is an important aspect of the research of this thesis. The role of uncertainty is critical: language itself contains many forms of uncertainty, which raises the issue of how people endeavour to address uncertainty in language. Arguably, the use of degree modifiers achieve this to some extent in that they potentially offer a greater degree of precision or qualification

of what is being expressed, but this remains to be seen. When we add other important elements such as the subjectivity and variability of the beliefs on which many perceptions are based, then uncertainty becomes an issue that cannot be ignored. Fortunately, the expertise vested in cognitive linguistics is particularly well suited to exploring the relationship between cognition and language.

Some of the most recognisable work in cognitive linguistics came from researchers such as Ronald Langacker (1987, 1991), Charles Fillmore (2003) and George Lakoff (1980, 1987), both of whom were instrumental in bringing cognitive linguistics to the fore in the 1970s. Langacker and Fillmore produced copious amounts of research and publications on the topic of cognitive grammar. Lakoff wrote widely on a range of cognitive linguistic topics, most often in areas of semantics and language and conceptualisation. His 1987 publication '*Women, fire and dangerous things*' in one of the better known books on semantic conceptualisation and categorisation, a core element in this thesis. The 1980s in particular saw greater numbers of researchers devoting their time and attention to many areas of cognitive research, and linguistics enjoyed renewed attention and a fresh perspective as a consequence. The scene was now well and truly set for the expansion of cognitive linguistics to the heights it has reached today, and for the manner in which the cognitive aspect of language has become an increasingly established element of many specialist sub-fields within linguistics.

The birth of cognitive linguistics as a formal area of academic research was claimed by the International Cognitive Linguistics Association (ICLA) at the First Cognitive Linguistics Conference, which was held in Duisburg in 1989. Since then, the ICLA has been responsible for producing its journal *Cognitive Linguistics*, and has organised biennial conferences at which leading academics gathered to present and

share developments in cognitive linguistics. Presidents of the ICLA since its inception have included George Lakoff and Ron Langacker, two of the most recognised names in cognitive linguistics.

1.2.3 Current Developments in Cognitive Linguistics

As Croft and Cruse (2004: 328) point out, cognitive linguistics began largely as an approach to the analysis of linguistic meaning and grammatical form in response to truth-conditional semantics and generative grammar. The evolution of cognitive linguistics has seen its application beyond the boundaries of linguistics, and the extent to which one area of academic specialisation influences another is always a good indication of how far it has progressed. Cognitive linguistics in 2005 is a highly developed and extensive field of academic research. Research in cognitive linguistics has been applied to literary analysis (e.g. Turner 1987), to the stylistic analysis of poetry, narrative fiction and lyrics (e.g. Semino & Culpeper 2002), and even philosophy and ethics (e.g. Johnson 1993). Furthermore, the findings of cognitive linguistic research, in particular the assertion that language is not an autonomous cognitive facility, has increasingly held sway with researchers in non-linguistic cognition, who recognise the value that cognitive linguistics has added to our understanding of conceptual structures.

Differing views remain about the critical question of the relationship between language and cognition. Sperber and Wilson argue that the essential function of language is information processing and that this function can be separated completely from language as a communicative device:

> "The activities which necessarily involve the use of a language (i.e. a grammar-governed representational system) are not communicative but

cognitive. Language is an essential tool for the processing and memorising of information" (Sperber and Wilson 1995: 173).

One criticism of cognitive linguistics is that it tends to focus on the internal cognitive processes of the individual, and not enough on the linguistic discourse between people. While I am not convinced that this is a particularly strong argument, I would agree that it is useful to be able to link cognitive linguistic theory to observable linguistic behaviour. In this regard I aim to include both the internal constructs associated with degree modifiers with their usage in everyday language, particularly with regard to their relationship to other linguistic forms and the linguistic choices people make when dealing with uncertain concepts. Another criticism is that cognitive science assumes that the mind has mental representations analogous to computer data structures, and computational procedures similar to computational algorithms. This is the compromise between an approach to cognitive science that is computationally tractable (i.e. it can be computed mathematically) and cognitively plausible (i.e. it accurately reflects how the human mind actually works). Debate continues in other key areas, and answers are likely to be slow in emerging. Topics remain such as the nature versus nurture debate, the role of the social, physical and emotional world, and the ultimate challenge of creating a mathermatical model of human reasoning, given that human thinking cannot be computational in the standard sense, so the brain must operate differently, perhaps as a quantum computer, an issue that Thagard (1996) suggests can be best explored by expanding the computational-representational approach to researching this area of cognitive science.

1.2.4 The Cognitive Context of Language

In order to understand why people reason about language as they do, it is essential to appreciate the processes that act upon and influence their linguistic

behaviour. The amount of information that people have to process even to engage in the most basic linguistic exchange is almost overwhelming. This is especially the case when we consider that all of this information and the utterances produced as a consequence have to be managed in *real time*, i.e. as it actually occurs. This might not be so difficult if what people said was literally true and expressed their intentions directly and explicitly, as this would limit the work required to the simple understanding of words and sentences. However, in order to balance the need to achieve various goals while adhering to social expectations, people need to employ various linguistic strategies. The constant need for interlocutors to 'think on their feet' is not limited to their linguistic behaviour, although the pragmatic use of language is an excellent example of this ability.

The role of context in determining meaning and word sense will ultimately become very apparent over the course of this thesis. I would first like to look at the nature of context itself, and to develop at least an initial understanding of how it can be defined. The notion of context applies across a multitude of disciplines including linguistics, psychology, computer science, and artificial intelligence. Across such disciplines, two broad categories or approaches to context have evolved; a theory of objective context, exemplified by the works of Kaplan (1978, 1989) and Lewis (1969, 1993, 1998), and a theory of subjective context, exemplified by the works of McCarthy (1958) and Giunchiglia (1993). These two categories of context can be summarised as follows:

- Context is an objective or metaphysical (ontological) state that represents a set of features of the world that can be expressed in ways such as time, place, speaker, etc.
- Context is a subjective or cognitive (epistemic) representation of the world that can be expressed as language, rules, axioms, etc.

Perry (1997) also proposes three different levels of context; **pre-semantic**, **semantic** and **post-semantic**. The pre-semantic context is required to initiate a syntactic evaluation of an utterance, which otherwise would contain potential ambiguities. For example, a sentence such as "I saw her duck under the table" contains potential ambiguities. It could refer to a woman's duck (the bird) underneath a table or a scenario where a woman is seeking cover beneath a table, depending on whether 'her' is an indexical or a possessive pronoun, and whether 'duck' is a noun or a verb. Once it has been determined which syntactic structures and meanings are being used, we then need to resolve the semantic context. For example, assuming that the word 'her' in the sentence above is an indexical, we then need contextual information about the person, place, time, etc. to decide which individual the sentence refers to. Interestingly, Penco (1999: 3) defines post-semantic context as what is assumed or taken for granted during a linguistic exchange between people. This notion is an element in various parts of this thesis, such as the discussion of prototypes, schematic beliefs and categorisational processes, many of which are reflective of the culture and society in which the interlocutors live.

Firth once stated that a word is characterized by the company it keeps (Firth 1957:179). His *Contextual Theory of Meaning* emphasizes the importance of context: the context of the social setting (as opposed to the idealized speaker), the context of spoken and textual discourse (as opposed to the isolated sentence), and, important for collocations, the context of surrounding words. Context is also an important element in word sense discrimination (also known as word sense disambiguation, discussed in section 2.2.2 below). The difficulty with word sense discrimination is to choose which word sense to select for that particular context. McRoy (1992: 3-4) suggests a number of sources that can inform word sense:

- the analysis of each word into its root and affixes, that is, its **morphology;**
- the contextually appropriate part or parts of speech of each word, that is, its **syntactic tag or tags;**
- for each sense of the word, whether the sense is preferred or deprecated, either in general, because of its frequency, or in the context, because it is the expected one for a domain;
- whether a word is part of a common expression, or **collocation,** such as a nominal compound (e.g., *soda cracker)* or a predicative relation (e.g., *take action);*
- whether a word sense is supported by the semantic context – for example, by its association with other senses in the context sharing a semantic category, a situation, or a topic;
- whether the input satisfies the expectations created by syntactic cues (e.g., some senses only take arguments of a particular syntactic type);
- whether it satisfies role-related expectations (i.e., expectations regarding the semantic relations that link syntactically attached objects);
- whether the input refers to something already active in the discourse focus.

To take this discussion to a deeper level would require a detailed look at areas such as semantic networks and clusters, and this would distract from what is intended, at least at this stage, to be a higher level exploration of the notion of context. What is relevant to now consider is how the limitations of the human mind contribute to the construction of context.

Aside from the surface social and behavioural constraints imposed on people, another less obvious yet very real constraint exists, i.e. that of *cognitive economy.* Cognitive economy is an accepted notion that the human mind constantly seeks to obtain and process as much information as possible for as little cognitive effort as possible, and consequently needs to shape information into the most efficient

structures possible (Ungerer & Schmid 1996: 68, Sperber & Wilson 1995: vii). This also affects perceptual and attentional biases both in our surrounding world and the language we use. For example, when chatting in a room full of people, we are surrounded by an astonishing amount of information that we could possibly focus on and consider. We could focus on the light bulb that illuminates the room, the physical and dimensional properties of its filament and the mechanical and electrical processes that creates this source of light. If we were to allow ourselves to be wide open to that level of unfiltered detail about every item in the room, then mentally we would implode as the human mind is simply incapable of processing such vast quantities of data.

This is a rather superficial example of a process that has a significant influence on the way we process language and thought, and the extent of this influence will become apparent as the thesis progresses. In order to concentrate on the conversation itself, an interlocutor cannot afford to attend to environmental details other than those that are immediately relevant to current mental or behavioural activities. The human mind, despite its impressive capabilities, is limited in the amount of information it can process at one time. It is generally accepted that approximately seven items (known as units) of information can be held in short term memory (technically known as Short Term Storage, or STS) at any given time (Miller 1956). One cognitive process that seeks to address this difficulty is known as *chunking*, whereby individual units are linked together to form one single more complex unit. Ashcraft (1994: 147) uses the following example to illustrate the point:

BYGROUPINGITEMSTOGETHERINTOUNITSWEREMEMBERBETTER

It would be very difficult, if not impossible, to remember the above sequence of 40 letters and would cause difficulties in processing even if this was possible. STS

therefore 'chunks' chosen letters together into words that can be more easily held in STS, more quickly processed and more readily stored in Long Term Storage (LTS) if necessary. The process of remembering these new 'chunked' units is known as *re-coding*; the individual units such as letters are therefore automatically ignored. Obviously there has to be some basis for how information is re-coded, i.e. units are chunked on the basis of some relationship between them, and not arbitrarily.

I have already borrowed the term ***cognitive economy*** to describe the way in which people need to be 'cognitive misers'; i.e. people use their cognitive resources only to support necessary information-processing tasks. Fiske & Taylor (1991: 14) described people as cognitive misers in that they are burdened with processing demands that far exceed their timeframes and mental capacities. The propensity of the human mind to take cognitive 'short-cuts' such as chunking and re-coding has a number of important implications. It indicates that information can be stored into meaningful collections in an organised and efficient manner, and that the storage of information in the human mind is based upon some associative relationship rather than purely arbitrarily (Srull & Wyer 1989). One of the most fundamental mental processes that is shaped by the requirements of cognitive economy is ***categorisation***, a process which ensures that "the perceived world comes as structured information rather than as arbitrary and unpredictable attributes" (Rosch 1978: 274). Categorisation involves the classification of people, objects and events into groups which have perceivable similarities with each other, and which are distinguishable from other categorical groups.

All of these elements combine to moderate how language is perceived and interpreted. The way in which words are mentally classified and related is not an arbitrary process, but rather occurs in such a way that ***semantic categories*** are formed,

i.e. words are categorised according to associations between their meanings. Individual words or phrases therefore take on added significance in that they can create expectations about what is about to occur in the conversation, and create a 'background' against which subsequent hypotheses can be tested. Beliefs therefore are generated and modified dynamically in real time and the amount and quality of information available to the perceiver is critical in determining the strength or certainty of beliefs. This obviously is an important consideration in examining the use of degree modifiers, which themselves can be used to enhance or weaken the strength of beliefs expressed through linguistic forms such as adjectives or verbs. I have discussed the process of categorisation in detail in chapter 2.

Another basic property of language is **linearity**, i.e. that language has a time-related structure that constrains the exchange of information and meaning between parties to a speech event. This aspect is very obvious when reading a text, where the reader is constrained by linearity but benefits from the opportunity to look back at what has already been read, or to look at what lies ahead in the text; in speech however the constraints of linearity are more evident. There is a difference between the real time and online aspect of speech processing, a difference that is crucially important in understanding the pragmatic use of language. The real time element is straightforward, i.e. speech must be processed and produced as it occurs. This however does not mean that lexical choice and interpretative processes occur strictly as speech is produced and attended to. Unlike a textual transcription of a conversation, an interlocutor cannot easily access everything that has already been said (due to cognitive economy) and is entirely unable to access the actual sentences and linguistic behaviour that lies ahead (although certain predictions may be made).

In order to maintain a fluent stream of meaningful and appropriate speech, an interlocutor utilises a process known as *back-propagation* (Altmann & Shillcock 1993), which involves the constant backward reference to existing beliefs or associations that have been generated already in the conversation. This is essential in order to maintain cognitive economy; uncertain meanings or beliefs cannot be maintained indefinitely and therefore new information needs to be compared against existing information using this back-propagation system.

Online speech processing is not an entirely backward-looking function. As I have already mentioned, language usage also creates expectations about what may be about what might lie ahead (a process known as *priming* (Brooks 1987)), which can influence the interpretation of the speech being processed at a particular point in time. An example of the effect of priming can be seen in the following sentence:

Example: The astronomer married the star.

In this example the term 'astronomer' creates a set of assumptions and beliefs that moderate how subsequent language is perceived. The idea of an astronomer marrying a celestial body is clearly at odds with our factual knowledge of the world we live in, yet the reader is required to do a mental 'double-take' in order to make any sense of the sentence. Another good example of this process (known as *feedforward* (Altmann & Shillcock 1993)) can be seen in what linguists informally refer to as 'down the garden path' sentences. The following examples (which I also use later in the thesis) demonstrate the influence of both back-propagation and feedforward systems in language; an initial belief is generated as the sentence is processed and this creates a strong expectation about the remainder of the sentence. When the new information is inconsistent with the existing belief, the perceiver mentally refers back to this belief and revises the belief with the benefit of the new information.

Example 1: The old man's glasses were filled with sherry.

Example 2: The crane on the building site had laid three eggs.

Clearly the interpretation of the words 'glasses' and 'crane' is critical. The initial strong belief (generated by 'old man' and 'building site' respectively) becomes highly uncertain as new information is added. By the time this new information becomes available, the perceiver has already travelled 'down the garden path', and is forced to re-test the initial belief in order to retrieve the correct meaning of the sentence.

The linear and potentially ambiguous nature of language and the ways in which people use language can create uncertainty about how to interpret and react to different potential meanings. The extent to which this is manifest in the use of degree modifiers is an interesting question and the research study in chapter four will explore this in some detail. In particular, I am interested in exploring how more ambiguous (or less certain) forms of degree modifiers influence the perceived certainty of their header, which might suggest that the perceiver would increasingly have to attend to or search for alternative evidence in the utterance to ascertain the intended meaning of the speaker.

1.3 Understanding Uncertainty and Uncertain Reasoning

Despite uncertainty, people appear to be able to use language fluently and without much conscious effort. Language itself is abstract, i.e. it is a tool of symbolic thought, and the communication of meaning between people depends on their common understanding of what words represent. However, uncertainty is an inherent part of language and people often deliberately harness this in their pragmatic use of language. Uncertainty can also be created in communication due to individual differences in

perception, interpretation and beliefs, which are usually quite subjective. Resulting from these, a third and very fundamental phenomenon occurs, that of *uncertain reasoning*, which is the process of reasoning with uncertain knowledge or beliefs. Uncertain reasoning is significant in that it competes heavily for very limited cognitive resources; ordinarily online processing involves the efficient management of a great deal of information, but when uncertain knowledge is introduced this process become increasingly difficult to sustain, particularly given the demands of real-time speech events.

Uncertain reasoning at any level should not necessarily be thought of as a part of an individual's deep cognitive machinery. While I have already pointed out that speech is often typified by the way it is produced and comprehended without much conscious effort, the conscious awareness and use of uncertainty in language can have a disproportionately large impact on the pragmatic use of language. The essential condition here is *awareness*, that an individual can consciously use uncertainty strategically in their pragmatic use of language, or the idea that an awareness of uncertainty can also adversely influence an individual's ability to process language effectively. The link between cognition, context and the behaviour of social interactants is a widely accepted notion; Potter (1998: 40) stresses:

> "the importance of treating cognition in much the same way as other features of context – as something that is formulated, worked up, constituted and oriented to by participants".

Language and speech-in-use therefore do not simply occur *within* a context – they *are* part of the context, and elements of language and linguistic behaviour, such as uncertainty and the use of uncertainty in social interaction, are essential and inseparable parts of the context.

Uncertainty is an inherent part not only of language itself, but also of the way in which people participate in social communication. This is an important aspect of the context in which the specific use of forms such as degree modifiers should be interpreted, i.e. that uncertainty is not limited merely to *linguistic uncertainty*, but is also part of a much broader continuum of uncertainty which encompasses social communication, ambiguities about the *intended* meaning of the speaker, etc (see additional reference to *pragmatic uncertainty* in section 1.3.2.2 below). All of these factors (and many more) are potential sources of uncertainty, and are all part of the perceptual context in which language is processed and interpreted.

1.3.1 Approaches to Reasoning with Uncertain Knowledge

Uncertainty is such an inherent part of language that it is impossible to ignore. I also believe that this study of uncertainty and uncertain reason reflects how language is actually used in practice:

> "Speakers rarely mean what they say. The direct meaning of their utterances is only a clue to what they mean, and listeners have to combine such clues with other information and infer the intended interpretations" (Clark 1978: 319).

This reiterates two points that I have already made: that language is a form of social human *behaviour* and that combinations of propositions often need to be considered. Language is a perfect tool for those with questionable motives or those who need to be maximally polite or evasive:

> "Natural language is notorious for its vagueness, ambiguity, nonspecificity and indexicality. Those very properties make it relatively easy to lie, dissemble, obscure and confuse so that even those who are fluent in a natural language are easily deceived" (Smithson 1989: 227).

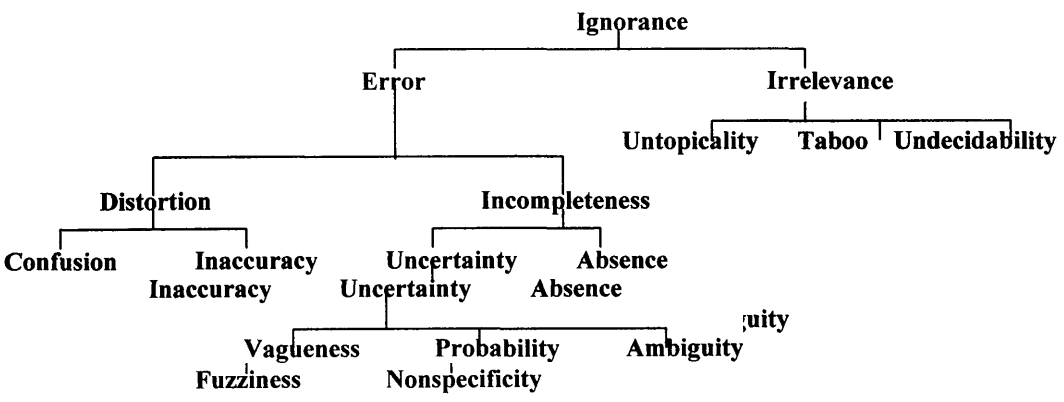
Clear there is more to uncertainty than the term applies; Smithson (1989) develops this by proposing a typology which begins with the central concept of

ignorance, the premise for which is that ignorance, like knowledge, is socially constructed and negotiated. Smithson (1989: 227) suggests a loose definition of ignorance:

> "A is ignorant from B's viewpoint if A fails to agree with or show awareness of ideas which B defines as actually or potentially valid"

Smithson does acknowledge that this definition is somewhat inadequate given the highly generalised nature of the term, from which many other more specific forms of ignorance are derived. From a linguistic point of view it is also lacking, specifically in the way that Smithson's definition emphasises the elements of 'agreement with' and 'showing awareness'. I will qualify this criticism in section 1.5.4 below. He also makes two important points regarding ignorance. The first is that ignorance occurs at a number of levels, i.e. that people vary in the extent to which they are aware of their own ignorance; I have already mentioned the role of second-order logic and uncertainty. The second point is that ignorance can occur at either an informational or epistemological level. *Informational ignorance* occurs when an individual (who Smithson rather unkindly refers to as an 'ignoramus') is in error about factual matters, whereas *epistemological ignorance* occurs when that individual, having the correct facts available, does not process them appropriately. Beyond this Smithson illustrates his taxonomy of ignorance as follows (Smithson 1989: 9):

Figure 1.1: Smithson's Taxonomy of Ignorance



Traditional approaches to the cognitive management of uncertainty have taken a probabilistic view of uncertainty, i.e. uncertainty is seen either as a frequentistic measure of randomness or in terms of a subjective measure of confidence satisfying well circumscribed propositions (Krause and Clark 1993: 3). A classic example of this approach can be found in Bayesian probability, which is a *subjective* view of probability measured by the degree of belief of a person in a given hypothesis. This is often combined with the Bayesian rule of conditioning, which essentially is a subjective system of belief revision based on the observation and consideration of new evidence. The Bayesian approach however has been criticised (Krause and Clark 1993: 16) for being *normative* but not *descriptive*, i.e. it prescribes an ideal method of establishing degrees of belief rather than describes how people actually evaluate beliefs. Give that people are poor estimators of numerical values and do not assign percentage probability values to each proposition, Bayesian probability therefore, while computationally tractable, lacks cognitive plausibility in that it does not reflect how people actually reason with uncertain knowledge. I have borrowed an example from Croft and Cruse (2004: 185) to illustrate this point:

Person A: How was the earthquake?

Person B: Quite good – better than the last one.

The degree-modifying adverb *quite* above could potentially create a great deal of uncertainty. Depending on your point of view or interpretation of the strength of *quite*, this degree modifier might potentially be seen to reduce the strength of *good*, i.e. that *quite good* is somewhat less definite or strong than *good* (without the degree modifier). It is the addition of the second clause that provides the evidence, i.e. it refers to and therefore benchmarks this earthquake against the most recent one. Without this additional clause, it would have been very difficult to get a sense of what

quite good actually meant. However, person A is unlikely to have assigned a percentage belief in their hypothesis of what speaker B meant, or to have mathematically adjusted this figure upwards when the second clause was uttered.

This thorny issue of how to ascribe measures to degrees of belief remains a point of debate in areas such as cognitive science and logic. However, the notion that beliefs can be adjusted (conditional probability) depending on what evidence presents itself is important, and this point will be revisited throughout the thesis. Cheeseman (1985: 29) summed this point up as follows:

> "The conditional probability of a proposition given particular evidence is a real number between zero and one, that is an entity's belief in that proposition, gives the evidence".

This approach uses a non-monotonic logic, i.e. a formal framework devised to capture and represent *defeasible inference*, i.e., that kind of inference of everyday life in which reasoners draw conclusions tentatively, reserving the right to retract them in the light of further information. Such inferences are called "non-monotonic" because the set of conclusions warranted on the basis of a given knowledge base does not increase (in fact, it can shrink) with the size of the knowledge base itself. This is in contrast to classical (first order) logic, whose inferences, being deductively valid, can never be "undone" by new information.

In the context of uncertain reasoning, first order logic most certainly does not reflect how people reason with uncertain beliefs, especially in the case of degree modifiers. Degree modifers themselves represent a potential source of uncertainty, as do the headers on which they act. For example, take the degree modifier *somewhat*. Hat exactly does this word mean? What level of precision can it be assigned, or is this level something that is perceived subjectively and individually depending on that person's own interepretation of the word or the context it which it presents itself? Now

take the header *large*. How large is *large*? Is it a physical or conceptual measurement? Across how many dimensions does it apply? Both the degree modifier and the header are potentially uncertain (and possibly highly so), and the perceiver will be aware of this. This metacognitive awareness of uncertainty is an important aspect of **second order reasoning**, particularly when people are required to evaluate what the degree modifier represents in terms of other people's beliefs.

Taking a first order approach, a measure of uncertainty could be calculated as 1 minus the amount of certainty. However, to 'calculate' uncertainty in this way is to ignore the effect of metacognition, specifically the degree of uncertainty *about* uncertainty. I have already emphasised the role and effect of metacognition on people's behaviour and language usage, and this is equally applicable to uncertainty, and therefore second-order reasoning has to be taken into consideration. Uncertainty cannot easily be assigned fixed values, and this is especially true when people have their own perceptions about degrees of uncertainty, and for this reason uncertainty has to be assigned a subjective value. Therefore a more appropriate proposal is:

> "That the uncertainty of a belief is 1 minus its subjective probability, and that the degree of uncertainty of a conclusion validly inferred from uncertain beliefs should not exceed the value of their uncertainties" (Evans, Over & Manktelow 1993: 182).

Second-order uncertain reasoning (i.e. uncertain reasoning about uncertainty) in an environment where various uncertain propositions remain resolved quickly increased the cognitive load and makes real-time speech processing difficult. The reflexive nature of language adds to this, i.e. an interlocutor who is uncertain about the meaning of an utterance is very likely to experience some problems in quickly choosing an appropriate response. The amount of certain beliefs being processed by an individual is therefore likely to be overshadowed by a relatively small number of

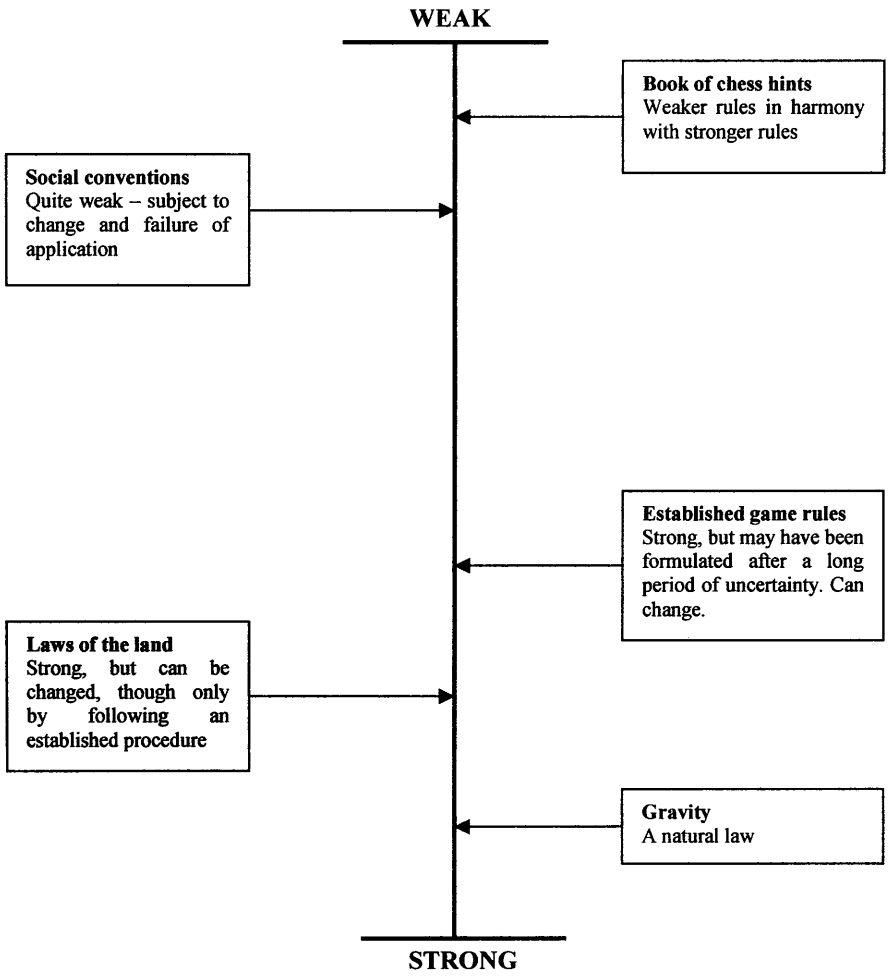
uncertain propositions. Clearly people need an efficient mechanism with which to resolve uncertainty, and it is important therefore that the nature of the uncertainty can be identified and addressed appropriately.

Up to this point I have referred variously to 'knowledge' and 'beliefs', and as yet I have not suggested any distinction between the two. The definition of what constitutes knowledge or belief is the subject of some debate. One apparent distinction between the two is that beliefs are likely to be more subjective then knowledge. Such a well-defined distinction is hard to justify without entering into a lengthy philosophical debate, which is unlikely to be either conclusive or productive. Furthermore, it would not necessarily shed any light on the issue of uncertainty in knowledge or beliefs, which is one of my areas of interest.

A more constructive approach to the subject is to treat knowledge and beliefs as being very similar mental constructs that have different levels of certainty associated with each. The degree of certainty can be represented along a scale, ranging from highly uncertain (weak) to highly certain (strong) beliefs. Much of what is usually thought of as knowledge can actually be more accurately described as beliefs. For example, most people can name the planets within our solar system, and they 'know' that these planets revolve around the sun. However, most people have never seen these planets nor have any direct evidence to suggest that they do in fact revolve around the sun. For many centuries the earth people (even scientists and the established church) held that the earth was at the centre of the universe, and that the sun, stars and planets revolved around the earth. This was most definitely treated as accepted knowledge, to the extent that anyone who openly contradicted this view was considered a heretic. Two entirely different sets of beliefs about the same subject have both been treated as knowledge, despite the apparent lack of evidence to support

either. The essential reason that they qualified as knowledge is that they were very strongly commonly held beliefs, and thus treated as factual knowledge. McEnery (1996: 30) proposes a hypothetical continuum of weak/strong knowledge as below:

Figure 1.2: McEnery's Continuum of weak/strong knowledge



This approach, however, does deal explicitly with uncertain knowledge. Uncertain knowledge could be represented as an inverse of McEnery's continuum of strong/weak knowledge, i.e. the stronger the belief, the lower the uncertainty associated with that belief, and vice versa. This is potentially an interesting hypothesis in relation to the study of degree modifiers, i.e. does the certainty associated with the perception of degree modifiers grow as their perceived strength increases? For example, most people would accept that the degree modifier *really* communicates a

stronger modifying effect than *fairly*. Does this mean then that people's belief of the strength of *really* exceeds that of *fairly*? This interesting question will be examined further during the experiment in chapter 4. For the moment however I want to concentrate on deepening our understanding of uncertain reasoning, particularly in relation to language and linguistic processing.

1.3.2 A Typology of Uncertainty in Language

While I have yet to develop a more complete list of different types of uncertainty, there is one area of uncertainty that requires discussion before the pilot study can be commenced. I have already outlined in broad terms how language relates to thought and the way in which people use categories and other such cognitive mechanisms to minimise the amount of cognitive load. However, the disadvantage of this system is its lack of precision. Furthermore, uncertainty can be found in the way language is *used* in addition to uncertainty in language itself. To simplify matters I have proposed two broad classifications of uncertainty in language, i.e. *linguistic uncertainty* and *pragmatic uncertainty*. Linguistic uncertainty is especially relevant to the way in which degree modifiers are used in that these modifiers can be used to reduce, increase or hedge the amount of uncertainty associated with or expressed by an utterance. However pragmatic uncertainty is also extremely important in that it can be closely related to speaker motivations underlying the choice of language used in a given situation. Uncertainty has a number of significant implications for everyday language. The term 'uncertainty' tends to have negative connotations, and uncertainty in language can certainly adversely affect the efficient processing of speech. In addition to people's knowledge *of* language and thought, people also have knowledge *about* language (metalinguistic knowledge) and *about* thought (metacognitive

knowledge). An interlocutor, being both speaker and hearer, can be affected by uncertainty in many ways. For example, a speaker's awareness of the grammatical or pragmatic 'rules'[1] of language means that they can detect when these 'rules' are being infringed or broken in some way. This is the basis of one of the leading figures in pragmatic theory, H.P. Grice, whose Co-operative Principles were based on people's knowledge about language usage (Grice 1975). Metaknowledge is also one of the basic components of any Artificial Intelligence (AI) system, as the ability of a computer to reason about the way it thinks is the essence of its own intelligence.

There is unquestionably a direct relationship between metacognition and language, particularly cognition involving subjective beliefs. In order to express a belief, e.g. "he's a nice guy", it is first necessary to hold a *metabelief* about this belief, i.e. 'I believe that he's a nice guy'. Moreover, according to Langford (1994: 20), this relationship is not compromised where the speaker is mistaken or insincere about what is said. This is extremely important for the pragmatic use of language. Language can be used to disguise intentions and to mislead in the same way that it can be used to convey clear and unambiguous meanings. If a speaker mistakenly but sincerely expresses a belief, then the fact that the belief is mistaken does not alter the fact that the speaker still genuinely holds that belief. Conversely, a speaker who insincerely expresses a belief does so knowing that he/she does not *actually* hold this belief. The same principles can be applied to people's beliefs about other people, and about the way that the pragmatic use of language can alter other people's perception of them. While many beliefs are not expressed through language (as they often need to be disguised), beliefs or perceptions about other people's beliefs are significant in

[1] I use the term 'rules' here simply to refer to people's general awareness of how language works. I am not suggesting that language usage is rule-based.

shaping the motivation and linguistic choices of interlocutors. As Maslow, A. (in Lowry (Ed.) 1979) points out:

> "Behaviour in the human being is sometimes a defence, a way of concealing motives and thoughts, as language can be a way of hiding your thoughts and preventing communication".

Metacognitive and metalinguistic beliefs therefore are by no means purely internalised functions, as they both relate to the perception of other people, and in particular to people's conceptions of communicative strategies. A classic example of the overlap of metacognitive and metalinguistic knowledge can be seen in the way people utilise their beliefs about the recursive nature of language. One of the fundamental principles in pragmatic theory is that the communication and interpretation of meanings depends on interlocutors' recognition of each other's intentions, i.e.:

> "The speaker's intention in the making of an utterance to produce an effect in the hearer by means of the hearer's recognition of the intention to produce that effect" (Verschueren 1999:47).

This metacognitive belief about language and its effect on people's perceptions and behaviour is used regularly to achieve people's communicative goals. Similar metacognitive knowledge applies to the social context within which speech events occur, such as schemata, scripts, and frames. These strongly held beliefs about the way people behave in certain types of situations have an important influence both on people's linguistic choices and on the expectations that they have about given contexts or situations. These principles are fundamental to what have become known as Relevance Theory (Sperber and Wilson 1986), a cognitive-oriented theory that emphasises the strong relationship between the language and thoughts of interlocutors:

> "Oral communication, for instance, is a modification by the speaker of the hearer's acoustic environment, as a result of which the hearer entertains thoughts similar to the speaker's own" (Sperber and Wilson 1986: 1).

Relevance theory depends on metacognitive and metalinguistic awareness, particularly in the interpretation of utterances. Interlocutors' knowledge about both knowledge and language means that they can understand what is being said in its given context, and therefore they can resolve and utilise the linguistic and contextual elements that are relevant to the speech event.

An interlocutor's knowledge about the uncertain nature of language can also play a significant role in the pragmatic use of language. Ordinarily people may elect to make linguistic choices that minimise the amount of uncertainty in their utterances; alternatively they may choose to deliberately employ linguistic strategies to increase uncertainty. However, in order to appreciate how uncertainty functions in language usage it is useful to firstly gain an understanding of what uncertainty actually is, and the forms in which it may present itself.

Relevance theory has attracted strong interest among researchers and academics because of the way it captures important aspects of cognition and communication within its two main principles. The first principle (known as the Cognitive Principle of Relevance) proposes that people constantly understand their environment by:

> "paying attention to the newly accessible information that seems most relevant to them, and.... having thoughts inferentially derived by combining this information with the most relevant contextual information available" (Sperber & Wilson 1997: 3).

This concept of the cognitive environment within which social interaction occurs forms the basis for Sperber and Wilson's second principle (Communicative Principle of Relevance), which suggests that:

> "Every act of ostensive communication communicates the presumption of its own optimal relevance" (Sperber and Wilson 1986: 158).

However, there are elements in social communication that rely heavily on non-ostensive communicative methods. Furthermore, relevance as a notion is somewhat intangible, as it combines general notions of what is relevant in given situations (such as schematic beliefs) as well as more specific situational-dependant perceptions of relevance. It would be very unreasonable to suggest that people work on the basis of identical beliefs or perceptions, or that their knowledge about situations or other people is complete. Relevance theory provides a convenient explanation of how certain communicative goals are achieved but places less (and arguably too little) emphasis on communicative failure or the management of difficulties (such as uncertainty) in communication. I have explored Relevance Theory in more detail in section 2.2.3 below.

1.3.2.1 Linguistic Uncertainty

Several areas of language are uncertain irrespective of their pragmatic application in speech or the context in which they occur. Certain syntactic categories, such as adjectives, are notorious for the way in which they lack precision (e.g. nice), are fuzzy (e.g. long), can be used to convey more that one meaning (e.g. kind). Some adjectives have uncertain relationships between them, such as 'pretty' and 'beautiful'; these adjectives are arguably part of a continuum of adjectives that describe *degrees* of attractiveness, although they might also be adjectives that are used to classify certain types of nouns. For example, 'pretty', as an adjective, is more likely to be used to describe some person or object that is *visually* appealing, whereas 'beautiful' could be used to describe something that appeals to other senses such as hearing (music), smell

(aroma of cooking) or taste (good food). In this sense 'pretty' can be thought of as being part of the possible range of meanings of 'beautiful', but not vice versa.

Uncertainty is also an inherent part of nouns. Some nouns are used to label categories that are very broad, and the noun therefore can be very imprecise. For example, the nouns 'vehicle' and 'precipitation' can be used to encompass many different sub-types of vehicles (cars, buses, motorbikes) and precipitation (rain, sleet, drizzle, hail, snow). As with adjectives, some nouns have different potential meanings. Although it was many years ago, I distinctly remember my mother telling me to put some clothes into the 'bin'. I was very young at the time and I proceeded to empty the clothes into the dustbin instead of the clothes bin. My inability to distinguish between the different potential meanings of this noun was not at all appreciated by my mother.

Verbs can also contain uncertainties. For example, what is the exact difference between the verbs 'to agree' and 'to concur'? Furthermore, the verb 'to concur' can also mean to occur simultaneously, to combine, to co-operate or to coincide. Even some of these alternative meanings are uncertain in that while they have different syntactic forms, they have extremely similar meanings (e.g. to occur simultaneously and to coincide). Verbs such as 'to like' suffer the same uncertainty as adjectives such as 'nice' in that they are very vague and imprecise; to like something expresses approval but fails to quantify it effectively, hence the potential value of degree modifiers such as *really*.

Other types of words can be used to try to describe or quantify verbs, adjectives and nouns in a way that might reduce their inherent uncertainty. Linguistic devices such as quantifiers (very, few, several, somewhat) help to address issues such as imprecision, but even quantifiers are uncertain in that they are fuzzy (i.e. they do not have finite boundaries) are therefore also imprecise. It is rather ironic that a

linguistic device that can be used to reduce uncertainty is itself uncertain, although this adds to the intrigue in exploring the relationship between uncertainty and the use of degree modifiers such as quantifiers and intensifiers. In this regard it is important to have an appreciation of the various classifications of degree modifiers and the way they can be used to influence other linguistic forms. This is particularly true as there are also issues such as grammatical constraints and collocations that need to be borne in mind when evaluating the role of degree modifiers. I have explored these issues in greater detail in section 3.2 below.

Other syntactic categories such as pronouns can create uncertainties because they rely on clarity of reference to function effectively. Take the following example:

"John likes Paul because he shares his interests".

The confusion in this case over who exactly is being referred to in the first pronoun (he) and the possessive pronoun (his) is not critical because the meaning of the sentence is the same whatever pronoun reference is used. However, the frequent use of large numbers of uncertain references such as pronouns and deictics are often more problematic that the simple example above. The uncertainty of these and other syntactic categories is also moderated by the ways in which they are used in everyday language. The way in which language is used can itself create another class of uncertainty, i.e. *pragmatic uncertainty.*

1.3.2.2 Pragmatic Uncertainty

Pragmatic uncertainty occurs as a result of the way in which people use language. While people often use their knowledge of linguistic uncertainty to achieve this, pragmatic uncertainty is not necessarily the result of linguistic uncertainty. Consider the following examples:

Example 1: This coffee is wonderful.

Example 2: Is the window open?

Example 1 contains linguistic uncertainty because the adjective 'wonderful' is vague (it lacks clarity of definition and differentiation between other adjectives such as 'brilliant'), and it is also fuzzy (it lacks clear boundaries that define its upper and lower limits). It is however reasonably precise because its polarity is clear (i.e. it is a positive description) and it is towards the upper end of a possible scale of positive adjectives (good, great, brilliant, wonderful). Despite these areas of linguistic uncertainty, example 1 lacks pragmatic uncertainty in that the language is used in a straightforward, unambiguous way and it is obviously a positive comment about the coffee (excluding a possible scenario where intonation might indicate sarcasm).

Example 2 does not contain similar linguistic uncertainty. The only possible linguistic uncertainty is in the definite article 'the' (we assume that there is only one window, or that there is more than one but that the interlocutors understand which window is being referred to). The adjective 'open' has a direct binary opposite, i.e. 'closed' and while there are other possible options (e.g. ajar, half-open), any possible uncertainty is minimal. Despite this lack of linguistic uncertainty, example 2 is clearly uncertain in that the intended meaning of the speaker is unclear. A hearer might infer a number of different intended meanings, such as:

1. Is the window open? (i.e. the question was intended to be literally true).
2. Don't you think it's too hot/cold/draughty/noisy in here? (requesting an opinion).
3. Can you open/close the window? (requesting or ordering an action).
4. You always leave the bloody window open/closed! (criticism).

From a communicative point of view, the use of degree modifiers should provide greater specificity in that they qualify or moderate the strength of a concept, e.g. *a*

really nice car is a more strongly expressed opinion than *a nice car*, and this belief is apparent to anyone who hears any such utterance. From a more comparative point of view, the difference between *a fairly nice car* and *a quite nice car* is less clear. For someone to describe a car (particularly the other person's car while in their presence) as *fairly nice* would be unusual in that it flouts the Gricean maxim of manner, which suggests that people should avoid obscurity of expression and avoid ambiguity. The intention of the speaker in this case is certainty ambiguous and it's hard to immediately tell whether it is in fact intended as a compliment or as damning the vehicle with faint praise. Incidentally, if the latter were the case then it would also be in line with Dascal's (1983) suggestion that indirectness is both costly (takes longer for the speaker to produce and the hearer to process), and risky (the hearer may not understand what the speaker is trying to communicate).

The important point to note at this stage is that language can contain many different sources of pragmatic uncertainty such as the use of implicature, indirectness, politeness, hesitations, speech dysfluencies, and variations in paralinguistic and extralinguistic features. Sources of pragmatic uncertainty often reveal or are related to the motivations of the speaker, or alternatively can be used to disguise a speaker's motivations (such as the use of uninformative intonation or ambiguous polarity to make the sincerity of a statement unclear). This example arose after a presentation by an enthusiastic interviewee, who was under the impression that he had performed particularly well:

> Interviewer: "Thank you for your presentation, I hope it won't be necessary to ask you to do that again."

It was only afterwards when the interviewee received extremely negative feedback that he realised that he had been mistaken about the valency of the statement (i.e. it

was a negative rather than a positive comment) but that it had been phrased in such a way that the insult was not immediately apparent. The realisation that the interviewer was actually saying "I hope we won't need to sit through that rubbish again" added to the pain of the rejection, particularly as he had initially believed that he had done well. This example illustrates how effective pragmatic uncertainty can be, even when linguistic uncertainty is at a minimum. The use of sarcasm is a wonderful example of the pragmatic use of degree modifiers to compound the reversal of semantic meaning. For example:

Person A: Mary just reversed into your new car.

Person B: That's brilliant. Absolutely brilliant.

Clearly the word *brilliant* here is the main vehicle for sarcasm, but the addition of *absolutely* combined with the repetition of *brilliant* makes the sarcasm utterly unqualified and emphatic. It is interesting to see how differing relative strengths of degree modifiers and headers combine, e.g.:

"That meal was perfectly adequate"

"That was rather tasty"

In the first sentence, the degree modifier *perfectly* by itself is very strong and potentially very complimentary, yet it is combined with an adjective (*adequate*) that is less than flattering. This combination is likely to make the listener infer that the intended meaning of the statement was negative. The second sentence however involves a less emphatic degree modifier (*rather*), but it is combined with a positive and approving adjective (*tasty*). This gives the sense that this is a slightly understated but nonetheless enthusiastic compliment about the food. To examine this further would require the exploration of the collocational effects of word combinations, and this is the subject of chapter 3 in this thesis.

1.4 Summary

It is clear that language has many types and sources of uncertainty, and that people need strategies to help them resolve these potentially problematic issues. The ability to reason effectively with uncertain knowledge and beliefs requires an insight into the uncertain nature of language, and uncertain concepts therefore need to be represented in the perceiver's mind in a way that permits them to be used effectively during speech in real time. So despite their linguistic uncertainty and pragmatic uncertainty associated with their usage, it seems that people are able to use verbs, adjectives and nouns without substantial communicative failures. If not, speech would fail as an effective form of communication.

I now want to bring this introductory chapter towards a more finite focus on specific issues relating to degree modifiers are headers. These are important parts of language and the way they are used depends on many complex cognitive, linguistic and epistemic elements. In chapter 2 I have introduced these key elements with the intention of developing the reader's understanding ahead of the experimental study in chapter 4.

Chapter 2

Cognitive Linguistic Representation of Degree Modifiers & Headers

2.1 Introduction

Up to this point I have used terms such as 'information', 'knowledge', 'beliefs' and 'facts' with relative synonymy whereas such definitions, at least past this point in the thesis, become more critical. This is particularly true as this research includes the study of uncertainty in language, and the representation of uncertain knowledge therefore requires clarity of definition. In the next section I will harness this phrase, i.e. 'uncertain knowledge' as the ongoing issue in this research and will attempt to define these and other terms in a meaningful and applicable way within the context of this research.

In order to grasp the elements underlying the representation and pragmatic use of degree modifiers, it is first essential to understand how people categorise objects, events and concepts, and how they are represented in people's minds; these are after all the basic 'building blocks' of context. Furthermore, the fact that social interaction and speech events take place in *real time* needs to be acknowledged, and that decisions regarding utterance content, degree of indirectness, etc. need to be made within the constraints of real-time and in line with the communicative goals of the people concerned. This may sound straightforward but it actually represents an extremely complex combination of cognitive and linguistic processes working in co-ordination with people's existing beliefs (often based on social or cultural norms) about the world around the. In this chapter I have endeavoured to choose what I believe are the most relevant points from this complex scenario, and to relate them to

both 'real life' communication and to the complex mental processes underlying that use of language.

As with many words, the word itself is a symbol that represents a particular concept. The word 'apple' is not itself an apple; it is a linguistic token that people in a culture understand represents that particular type of fruit. I have touched on this subject in the first chapter when discussing the work of Sapir and Whorf. The name notion applies to degree modifiers and adjectives, as well as many other types of lexical units. The notion that something is *nice* is a way of representing qualities about that object, person or experience that are pleasant or agreeable, but the word in itself is not more specific than that. Often it required additional information to determine a more precise meaning. For example, saying that '*the meal was nice*' communicates the idea that *nice* means *tasty*, and that the two concepts are interchangeable in this context. Equally, the word *very* represents the idea that something is somehow stronger than some given norm, hence the need to use this word to boost the scalar strength of that particular element, whatever it may be. It is all rather conceptual and intangible, yet it is such a common, everyday aspect of the way we use language. The ability to use language to communicate via concepts such as these is a rich area of research, and the fact that communication can be achieved in real time so successfully through such an abstract tool as language is genuinely intriguing. I firstly want to focus on how this communication is achieved and how uncertainty in its many forms can be effectively managed.

2.2 Cognitive Efficiency and Management of Uncertainty

Throughout this thesis a number of basic ideas relating to human cognition and perception surface constantly. These are the fundamental mental structures and

processes that allow human to manage the vast amount of information that bombard them daily, not to mention the lifetime of memories and experiences already stored in memory. These processes allow people to attend to specific types of stimuli and information as required, and to avoid the unmanageable task of dealing with unnecessary or peripheral stimuli. They also permit the organisation of an otherwise chaotic world into structured units, and the consequent generation of working assumptions that form the basis of mutual or common knowledge, such as what constitutes 'normal' social behaviour.

There is also the question of what people actually do with information having acquired it; in order to infer people need some means of reasoning with the information available to them. Pragmatic theory, which has a natural focus on language issues, tends to avoid this level of cognition, as it appears to be somewhat removed from linguistic expression. Furthermore, it largely avoids the more involved social aspects of human interaction, which form an important part of the context in which speech events occur. This is not a criticism; it is an observation that needs to be made to help understand the orientation of this thesis. As my research interest is grounded in cognitive aspects of language, I have consequently also spent some time exploring social issues, as this is often the environment where dialogue is most commonplace. Thomas (1995: 208) points out the need for the balanced consideration of these elements:

> "it is a mistake to adopt an approach to pragmatics that focuses on social factors to the exclusion of cognitive factors, or on cognitive factors to the exclusion of social factors".

The way in which degree modifiers are used and the beliefs they represent depend on the comparison of observed behaviour against established beliefs or assumptions. In this chapter I will deal with both cognitive and pragmatic aspects of

language and beliefs, with the aim of illuminating the subject of how degree modifiers help to represent beliefs about other people.

2.2.1 Semantic Categorisation and Prototype Theory

The role of categorisation, i.e. the classification of objects into groups that are considered equal (Rosch 1978: 30), plays a crucial role in this research, particularly in the context of social cognition. For this reason it is important to understand how prototypes are created and how they influence our perception of the world around us. My intention is also to demonstrate that categorisation is more than just a cognitive device; it directly affects our interpretation of people and events, and even our own self-perception. To label someone as being '*extremely* likeable' as opposed to '*somewhat* likeable' requires some fundamental basis on which such an appraisal can be made, i.e. there must exist some notion or common understanding of what constitutes a scale of 'likeability'. Using such labels and adjusting them through degree modifiers relies on a system of categorisation of people, events and behaviour such that their interrelationship can be understood by all. I will begin by outlining the theoretical basis of semantic categories and prototypes before continuing in subsequent sections to apply this theory to the categorisation of people and events.

Categorisation as a cognitive process has been widely explored, particularly in the 1960's and 1970's when, as discussed in section one, cognitive psychology and cognitive science gained immense popularity. Categorisation in general has been the subject of renewed interest of late in the light of new connectionist models of cognition, which I will discuss separately. The process serves a number of functions in the execution of cognitive processes. It helps to preserve cognitive economy in that categories "provide maximum information with the least cognitive effort" (Rosch

1978: 28) and ensure that "the perceived world comes as structured information rather than as arbitrary and unpredictable attributes" (ibid.).

Individual categories may be related to each other by means of class inclusion where there is a directly proportionate relationship between the degree of inclusion and the level of abstraction of the category, i.e. the proportion of distinctive to common features within the level. For example, the category 'animal' and 'dog' is related in that a dog is an animal, but the category 'animal' is more inclusive (it includes all animals) and is more abstract (it is not a particular instance of an animal). Continuing this example, we can see that the category 'dog' is a subset of 'animal', and that 'Labrador' in turn is a subset of 'dog'. This exemplifies the top-down hierarchical nature of categorisation, which I shall discuss shortly. The proportionate relationship between level of abstraction and degree of inclusion can be measured in terms of **cue validity** (Rosch *et al.* 1976). Cue validity has been described as a probabilistic concept (Rosch 1978: 30): the validity of a given cue *x* as a predictor of a given category *y* (the conditional probability of *y/x*) increases as the frequency with which cue *x* is associated with category *y* increases, and decreases as the frequency with which cue *x* is associated with categories other than *y* increases. This, in addition to allowing a harder measure of the level of abstraction of a category, also demonstrates that objects can be members of different categories at varying levels of cue validity and abstraction. This measure is useful when characterising different levels within the hierarchical structure of categories mentioned earlier. Ungerer & Schmid (1995: 71-103) provide a detailed account of how categories can be conceptualised at three main levels of abstraction:

- **Superordinate Level**: This is the 'highest' level and is characterised by having a high ratio of distinctive to common features, therefore being more abstract than lower categories. Consider the superordinate level category

'animal', a category whose members include birds, reptiles and mammals. These three example members are related to each other by means of class inclusion, i.e. they are types of animals, but comparatively they are quite distinct and have few features in common, with lower cue validity.

- **Basic (or Generic) Level**: This is the level at which most everyday objects are classified. Category members at this level typically share more common features with fewer distinctions between members than at other levels of abstraction. Consider the category member 'bird' within the superordinate category 'animal', which is a commonly cited example of this category (see Aitchison, J. 1987). At the basic level the category 'bird' may include hundreds of different classes of bird, but they will share many more common features (such as having wings, ability to fly, size, etc.) and fewer distinctions than the category members of the superordinate level 'animal', i.e. birds, reptiles and mammals. Cue validity is maximised as there is a high degree of class inclusion and a high degree of common features between members.

- **Subordinate Level**: Category members at this level are usually highly specialised forms of the higher categories. If the superordinate category is 'vehicles', the basic level might then be 'cars', and the superordinate level would list particular examples of cars, perhaps by make (Ford, BMW, Volvo) or by function (sports car, estate car, etc.). It is similar to the superordinate level in that it has lower cue validity than the basic level, but for different reasons; there are more category members at subordinate than superordinate level, and subordinate category members share most attributes with contrasting subordinate categories while maintaining a relatively low ratio of distinctive to common features. The subordinate level is therefore more abstract than the basic level because category members do not contrast well with each other.

The above description of levels of categorisation is somewhat technical and is perhaps better expressed in terms of the types of objects one might encounter in everyday life, which is in itself an important consideration. Formal classification

systems such as scientific categories of plant or animal forms are of course valid but do not necessarily conform to what Rosch (1978: 29) refers to as **perceived world structure**. A whale for example is a mammal but people are likely to classify it as a fish in that it shares a great many physical features with different species of fish, e.g. lives in the water, has fins, etc. Categories are also likely to be formed on relatively unscientific or formal bases, e.g. books might be classified into 'books I like to read', or 'boring books', or 'books with an interesting cover'; I often do this with types of food, e.g. 'food to have with a cup of tea' or 'food which really tastes horrible without salt'. This emphasises the *subjective* nature of classification; however, despite subjectivity and individual differences, categorisation still generally represents shared or mutual knowledge within a given culture, i.e. categories create a shared set of assumptions about the world which can form the basis for communication and meaning.

At the beginning of this section I mentioned Rosch's definition of categories as the classification of objects that are considered equal. What this means is that category members share a sufficient number of common features and sufficiently few distinctive features to be classified together in a category; it does not necessarily mean that within a category all members are equal. We need to consider this point in conjunction with issues of subjectivity and perceived world structure. Categories are not perceived as finite entities with exact definition and boundaries. For example, when thinking of an example of the category 'bird' I am more likely to think or a robin or a crow than an emu, in fact I would only classify an emu as a bird in that it has feathers and lays eggs, but I would not attribute crows and emus equal status as emus cannot fly, which is a characteristic I would strongly attribute to members of the 'bird' category (see Aitchison, J. 1987). Other people for this reason might exclude

emus from the 'bird' category or see an emu as being a marginal member of both the 'bird' and 'two legged-animal' categories. Where then does one category begin and another end? There is no real answer to this because categories, general speaking, have fuzzy boundaries that do not have finite cut-off points. Often this is due to vagueness of definition, e.g. mountain and hill, or mist and fog, or fuzziness or polysemy as to ranges of meaning, e.g. the adjectival label 'kind' can mean generous, or possibly well-intentioned, but these labels do not convey *degrees* of kindness or of good intention. Their combination therefore with degree modifiers is important in expressing beliefs or perceptions more accurately. In addition, the notion mentioned earlier that objects can be members of different categories at varying levels of cue validity and abstraction emphasises the fluid nature of classification into categories.

At this point we can see that categories are based on real world classifications, have fuzzy boundaries and a range of good to bad members. We must also remember that while categorisation serves to preserve cognitive economy, this cannot be achieved where categories merge into each other at fuzzy boundaries to the extent that there is no distinction between them. The need to attain separateness between categories, particularly in the case of continuous categories, is achieved through the conception of each category in terms of its clear as opposed to marginal cases of membership, the clearest cases being those which are defined operationally by people's judgement of 'goodness of membership' in that category (Rosch 1978: 36). This best example of a category member is known as the **prototype**, which according to Rosch and Mervis (1975) can be measured in terms of *attribute-based typicality ratings*, i.e. a weighted and rank-ordered matrix of attributes. In essence, a prototype is the central and most typical member of a given category. A prototype however is simply a notion that describes the idea of centrality and as such must arise from

somewhere, but is not a cognitive process such as cognitive economy (although prototypes can help to achieve cognitive economy). Prototypes are formed experientially in three main ways:

- **Frequency of Occurrence**: the attributes and examples of category members encountered most frequently in the experiential environment play an important role in prototype formation.
- **Typicality**: In a given environment or culture, some objects are more typical than others of a given category are and there is generally a high degree of consensus about prototypes. This in part is due to frequency of occurrence but also to the fact that some attributes of category members are more important than others.
- **Psychological Salience**: The prototype of a category normally occurs where there is a maximal convergence of humanly relevant properties, i.e. where those attributes are easily perceivable. It is easier for example to visualise 'car' than 'vehicle' because one can conceptualise 'car' in terms of particular attributes. This relates strongly to the notion of levels of categorisation described above.

Prototypes then have their foundation in the real world classification of everyday objects. In this sense we can consider the prototype as 'strong' knowledge in that people

> "overwhelmingly agree in their judgements of how good an example or clear a case members are of a category, even for categories whose boundaries they disagree" (Rosch 1978: 36).

This point although important is also quite limited insofar as we have only really considered the role of categorisation and prototypicality as it relates to *objects*. A primary aim of this section is to provide a theoretical basis for the analysis of relevant *instances* of categories and prototypes, e.g. relative to scalar representation of concepts such as adjectives and degree modifiers.

2.2.2 Prototypes in Lexical Semantics

One risk of focusing on prototypes and cognitive categories is that we potentially give insufficient attention to the lexical and semantic aspects of language. For example, the semantics of many nouns are quite straightforward in that they correspond to a set of objects in the real world, e.g. car, chair, dog. Equally, adjectives represent some specific property, e.g. green, sharp, hot. But most verbs (and also many adverbs and adjectives) represent events and relationships that have an internal structure, e.g. "Michael left the envelope with Catherine before he left for his meeting". Describing people, events and actions (among many other concepts) must be accomplished within sentential and grammatical structures (and related constraints), and this can impose selectional restrictions. Croft and Cruse (2004: 3) point out that grammatical inflections and constructions play a major role in construing the experience to be communicated.

Equally, we need to recognise that people's choice of words or phrases, grammatical constraints aside, is generally intended to reflect the thoughts and concepts they are trying to communicate. This can include attempts to be specific about the degree of particular lexical items such as adjectives, nouns and verbs, which is where degree modifiers serve their purpose. The sentential structure around these elements can often serve to specify or disambiguate the intended meaning of specific words. However, there also may be a level of ambiguity or potential variety of meaning in words that the sentence does not address, and it is important to highlight these aspects of lexical semantics. Examples of such instances might include:

Homonyms: Words with the same spelling and pronunciation, but with different meaning. For example:

Snowdrops are usually the first sign of *spring*.

The suspension problem was caused by a defective *spring*.

Homographs: Words with the same spelling, but with different meaning and possibly different pronunciation. For example:

She had a pretty *bow* in her hair.

She decided to *bow* deeply as the Queen passed by.

The *bow* of the ship was badly damaged.

Homophones: Words that have the same pronunciation but have different spellings and meanings. For example:

The *knight* rode his trusty steed.

The fox only came out to forage at *night*.

Polysemy: These are often a particular type of homonym, but essentially polysemy presents potential multiple meanings from the same word. For example:

Michael returned the chair because the *leg* was broken.

Michael limped badly because his *leg* was broken.

Synonyms: Generally interpreted as 'another name for', synonyms are usually different words that have the same or similar meanings. For example:

He enjoyed his *food*.

He enjoyed his *grub*.

He enjoyed his *nosh*.

Antonyms: These are generally seen as the opposite of a given concept. For example:

Big → Small

Wide → Narrow

Dead → Alive

There are a range of other categories such as hyponyms, meronyms and troponyms, but these are less relevant to the core area of research of this thesis.

The notion of ***antonyms*** is especially interesting when discussing degree modifiers, and is an important aspect of scalar representation. This was the subject of Paradis and Willner's (forthcoming) paper on antonymy and negation, which looks specifically at both relative to what she calls the ***boundedness hypothesis***. How scalar representation is approached does in part depend on how many dimension of the topic you want to explore. To illustrate this I have drawn two scales below; the first deals with a single adjectival concept, and how degree modifiers might act on it, and the second is of a broader multi-adjectival scale, within which degree modifiers can also act.

Single adjectival scale for DIFFICULT

[] [] [] [] [] [] [] [] [] [] []

Least difficult **Difficult** **Most difficult**

The concept of DIFFICULT on this scale can be though of as a prototype, i.e. one of its key features is its centrality along the scale. I have discussed prototypes as part of categorisational processes at various points in this thesis. It is quite easy to imagine where different degree modifiers might fit on this scale; for example, the degree modifier VERY would probably be very near the ***most difficult*** end of the scale, whereas SOMEWHAT might be somewhere in the mid-range between ***difficult*** and ***least difficult***.

This is certainly one way to approach the exploration of degree modifiers, and this is how I have approached this topic as it maintains a strong focus on scalar modification via degree modifiers rather than extending and widening the debate to a

more complex continuum of adjectives. Take for example a more complicated scale as below:

Scalar representation from EASY to DIFFICULT

[] [] [] [] [] [] [] [] [] [] []

Most Easy **Most Difficult**

I have presented a similar scale in section 2.3.2 below on person schemata, in which I present a scale of intelligence between ***moron*** and ***genius*** (see next paragraph). It is easy to see how this differs from the single adjectival scale; firstly there is a continuum of adjectives along the scale that communicate strength of the concept along that scale, and then there are degree modifiers that can further refine the precision of these concepts.

Another interesting aspect of more complex scales is that it may be more difficult to immediately identify the prototypical or central features within the scale. Take the example from section 2.3.2 of the **moron → genius** scale:

Moron **Stupid** **Average** **Bright** **Genius**

This is potentially confusing. At either end of the scale there is a noun that described a particular type of person, whereas within the scale there are adjectives that describe aspects of people's intelligence. I am not necessarily holding this up as a correct example of this scale, but I do want to use it to illustrate how the *linguistic* representation of these concepts can become very complicated. The central element of this scale is ***average***, which in fact is not especially informative of a level of intelligence, and depends heavily on what you define as an average level of intelligence. While this is a very realistic approach to the subject and would certainly be interesting to explore, it is however beyond the scope and reach of this particular

thesis, and thus I will maintain my focus on the effects of degree modifiers along single adjectival scales. Another reason for this is that it allows me to keep the exploration of uncertain reasoning reasonably simple, and this aspect of the research will become more apparent in chapter 4.

Lexical semantic aspects of language can produce interesting varieties of meanings for words. For example, Turewicz's (2000) study of cognitive grammar demonstrated how ten common prepositions realised more than two hundred different meanings using the Collins COBUILD series. Research by Peter Turney (2005) of the Institute for Information Technology in Ottawa used a process known as Latent Relational Analysis (LRA) to measure semantic similarity between two analogous pairs of words (e.g. cat: meow and dog: bark), which included some interesting work on noun-modifier relations. Relatively little research however has been directed specifically towards the lexical semantic study of degree modifiers, hence the inclusion in this thesis. There can in fact be many types of semantic similarities between words, but Turney's work focused mainly on relational similarity (correspondence between relations) and attributional similarity (correspondence between attributes). Words with a high degree of attributional similarity are usually classified as synonyms. LRA analysis however does not lend itself especially well to measuring either attributional or relational relations between degree modifiers themselves.

One issue with degree modifiers is linked to their nature; one role of degree modifiers is to moderate or influence the perceived strength of the word or phrase they act on; a classic example is a degree modifying adverb acting on an adjective. For example, the degree modifying adverb VERY is likely to strengthen the perception of any adjective it acts on, e.g. VERY BIG, VERY BAD. Degree modifiers often rely on

the concept of the mental representation of scale (see above paragraphs and examples of scalar representation) where, particularly in the case of this thesis, the relations between degree modifier, header and other linguistic elements are left undetermined. For example, the study in this thesis looks at the relations between degree modifiers such as VERY, REALLY, etc, combined with various headers such as BIG, NICE, etc. But these combinations lack any real reference point, e.g. the combination of VERY + BIG + CAR or FAIRLY + NICE + WEATHER offers at least some additional information whereby prototypical or categorical notions of CAR or WEATHER can be activated. As Sloman, Steven A. and Love, Bradley C. and Woo-kyoung, Ahn (1997: iv) point out, a robin that does not eat is harder to imagine than a robin that does not chirp – i.e. the ability access specific or central features are therefore important in generating highly accurate conceptual notions, and this applies equally to scalar representation. Without these nouns, the simple degree modifier/header combination lacks an item or category that represents information in a way that maximizes the cognitive effects that can be derived from it, and minimizes the effort needed to derive these effects (Van der Henst, Jean-Baptiste and Politzer, Guy and Sperber, Dan (2002: 7). Paradis (2000: 5) suggests that "Adjectives are intrinsically prone to ambiguity and vagueness in that they are semantically underspecified. They require the presence of a noun for a fully-fledged interpretation".

The individuals who participated in the thesis study therefore had to rely to an extent on their 'pure' conceptual notion of what the degree modifier and header within the sentential context, and this in fact was part of the rationale in structuring the study in this format. Using a measured scale to indicate perceptions of strength (see chapter four below) takes this process one step further by asking subjects to decide and measure their perception of the strength of each degree modifier.

The fact that lexical semantics identifies opportunities for words to have multiple similar meanings can create an issue as regards disambiguating both degree modifiers and headers. Take for example the degree modifiers RATHER and SOMEWHAT. Their precision is likely to vary according to the opinion of the perceiver, and some people might argue that they could be interchanged. One of the reasons for this is that these degree modifies by themselves lack any reference or context (such as a header), and therefore lack inferential potency, i.e. features that are diagnostic of a category to the extent that they allow us to infer other features of the category (Franks 1995). Equally, what exactly is the difference between VERY and REALLY? Intuitively one might suggest that REALLY is stronger than VERY (although not necessarily), but how much is difficult to measure. This issue also applies to the headers chosen of the study in Chapter 4 below. For example, the header BIG could have a multitude of meanings depending on the context in which it is used. The following thirteen different senses were generated for the adjective BIG using WordNet 2.1, an online lexical reference system whose design is inspired by current psycholinguistic theories of human lexical memory. English nouns, verbs, adjectives and adverbs are organized into synonym sets, each representing one underlying lexical concept:

> **1.** (1114) large, big -- (above average in size or number or quantity or magnitude or extent; "a large city"; "set out for the big city"; "a large sum"; "a big (or large) barn"; "a large family"; "big businesses"; "a big expenditure"; "a large number of newspapers"; "a big group of scientists"; "large areas of the world")
>
> **2.** (242) big -- (significant; "graduation was a big day in his life")
>
> **3.** (77) big, large, prominent -- (conspicuous in position or importance; "a big figure in the movement"; "big man on campus"; "he's very large in financial circles"; "a prominent citizen")

4. (24) bad, big -- (very intense; "a bad headache"; "in a big rage"; "had a big (or bad) shock"; "a bad earthquake"; "a bad storm")

5. (22) big -- (loud and firm; "a big voice"; "big bold piano sounds")

6. (21) big, heavy -- (prodigious; "big spender"; "big eater"; "heavy investor")

7. (13) adult, big, full-grown, fully grown, grown, grownup -- ((of animals) fully developed; "an adult animal"; "a grown woman")

8. (8) big -- (marked by intense physical force; "a big wind")

9. (6) big, swelled, vainglorious -- (feeling self-importance; "too big for his britches"; "had a swelled head"; "he was swelled with pride")

10. (4) boastful, braggart, bragging, braggy, big, cock-a-hoop, crowing, self-aggrandizing, self-aggrandising -- (exhibiting self-importance; "big talk")

11. (3) big, large, magnanimous -- (generous and understanding and tolerant; "a heart big enough to hold no grudges"; "that's very big of you to be so forgiving"; "a large and generous spirit"; "a large heart"; "magnanimous toward his enemies")

12. big, bighearted, bounteous, bountiful, freehanded, handsome, giving, liberal, openhanded -- (given or giving freely; "was a big tipper"; "the bounteous goodness of God"; "bountiful compliments"; "a freehanded host"; "a handsome allowance"; "Saturday's child is loving and giving"; "a liberal backer of the arts"; "a munificent gift"; "her fond and openhanded grandfather")

13. big, enceinte, expectant, gravid, great, large, heavy, with child -- (in an advanced stage of pregnancy; "was big with child"; "was great with child")

It would be impossible to decide which of these senses were applicable without some basis for doing so, such as the occurrence of this adjective within a sentence. The first issue then from a lexical semantic point of view is that of **word sense disambiguation**. Arguably, the first interpretation above is likely to be the most commonly accepted prototype of this particular adjective, particularly given the frequency of occurrence (and therefore salience) of this definition. However, this

would entail synonymous meanings between BIG and LARGE, in which case one could ask the question as to why two words need to exist if they in fact represent the same concept. WordNet 2.1 defined LARGE as follows:

> **1.** (152) large, big -- (above average in size or number or quantity or magnitude or extent; "a large city"; "set out for the big city"; "a large sum"; "a big (or large) barn"; "a large family"; "big businesses"; "a big expenditure"; "a large number of newspapers"; "a big group of scientists"; "large areas of the world")
>
> **2.** (2) large -- (fairly large or important in effect; influential; "played a large role in the negotiations")
>
> **3.** bombastic, declamatory, large, orotund, tumid, turgid -- (ostentatiously lofty in style; "a man given to large talk"; "tumid political prose")
>
> **4.** big, large, magnanimous -- (generous and understanding and tolerant; "a heart big enough to hold no grudges"; "that's very big of you to be so forgiving"; "a large and generous spirit"; "a large heart"; "magnanimous toward his enemies")
>
> **5.** big, large, prominent -- (conspicuous in position or importance; "a big figure in the movement"; "big man on campus"; "he's very large in financial circles"; "a prominent citizen")
>
> **6.** large -- (having broad power and range and scope; "taking the large view"; "a large effect"; "a large sympathy")
>
> **7.** big, enceinte, expectant, gravid, great, large, heavy, with child -- (in an advanced stage of pregnancy; "was big with child"; "was great with child")

This indicates some degree of synonymy between BIG and LARGE, but they do differ in the number of word senses generated, and in the prevalence of each word sense. However, if we apply the adjective BIG to a particular noun such as MAN, then the potential meanings of BIG are potentially extended due to the specificity of the features that are now accessible. BIG could now mean TALL, FAT, HEAVY-SET, etc. and therefore we are moving from synonymy to polysemy. This is demonstrated

by the fact that TALL and FAT are entirely different characteristics, yet both may potentially be represented by the adjective BIG. These are important points when considering the issue of what constitutes a prototypical notion of either a degree modifier or adjective, which as we can see are largely conceptual in nature unless specified by proximity or reference to a particular noun or other similar reference. To explore this further we need to understand how prototypes are mentally represented, and in particular whether these representations are conceptually driven or data driven, as explained in section 2.3.1 below.

The study of collocations have also been used to explore word sense disambiguation, usually by searching for words that co-occur with senses of the target word more often than could be expected by chance (Wiebe, McKeever, & Bruce 1998). Natural language applications often use knowledge about groups of related words. A variety of distributional methods exist for measuring word similarity in order to obtain groups of similar words (e.g. (e.g., Bensch & Savitch, 1992; Brill, 1991; Brown et al., 1992; Grefenstette, 1992, 1994; McKeown & Hatzivassiloglou, 1993; Pereira, Tishby, & Lee, 1993; Schutze, 1993). However, it is critically important to distinguish between word senses within groupings. For example, Brown et al. (1992) illustrate the notion of a distributionally derived, "semantically sticky" cluster using an automatically derived word group containing *attorney, counsel, trial, court, and judge*. Although human cognition can use epistemic knowledge to comprehend the relationships between these words as a cluster, a computational system query expansion might generate words like *advice* (derived from *counsel*) or royalty (derived from *court*). A solution to this is to use taxonomically-defined semantic similarities to distinguish grouping between word senses as opposed to word meanings. However, there must be some basis for determining or informing what

taxonomy is appropriate in the context. One view of the role of context in meaning and inference was proposed by Dan Sperber and Deirdre Wilson, who developed what ultimately became known as Relevance Theory.

2.2.3 Cognitive Economy and Relevance Theory

The above section indicates the need for degree modifiers and headers to refer to a specific noun or to occur within a given context (such as sentential) in order to communicate a specific meaning. This is in fact important for two reasons. The first has to do with the issue of **cognitive economy**, i.e. the propensity of the human mind "to provide maximum information for least cognitive effort" (Rosch 1978: 28). This is one simple definition of what is a considerable ability, particularly given the degree to which language can contain ambiguities and other classes of uncertainty (see Smithson's Taxonomy of Ignorance in section 1.3.1 and the discussion of word sense disambiguation in section 2.2.2 above).

Different definitions of cognitive economy have also been proposed. Collins and Quillian (1969) used the term cognitive economy to describe a principal for eliminating the redundant storage of information by presenting a semantic network of human memory in which facts about different knowledge are stored in a hierarchical network. This approach naturally organises the world into meaningful associations between complex items and simplifies the world by using cognitive devices such as categorical perception (see section 2.2.1 above) and prototypical representations such as stereotypes (people) and schemata (actions and events). The notion of perception is interesting in that it suggests that the human cognitive system filters incoming information in order to reduce the cognitive load; as Rosch (1978: 29) points out "it is to the organism's advantage not to differentiate one stimulus from another when that

differentiation is irrelevant to the purposes at hand". Perceived relevance therefore is an important aspect of cognitive economy, and I will discuss this in a few moments. One significant point needs to be made first, particularly in the context of the structure of the thesis study; the linkage between lexical semantic aspects of language and the determination of relevance in itself. What I refer specifically to is the process of **feature extraction**, i.e. the process by which an individual modifies their representations to detect features that are relevant to the task. This is further determined by the nature of the task itself; cognitive processes can for example include *goal-oriented categorisation* or can be concerned with *failure avoidance*. These motivations make it easier for the individual to make finer discriminations as to the information attended to or deemed to be most relevant (Finton 2002: 21). However, as indicated in section 2.2.2 above on lexical semantics, the lack of specific features associated with the degree modifier/header combination as a result of the lack of related noun or sentential context reinforces the notion that participants in the study were forces to rely purely on their conceptual scalar representation of both degree modifiers and headers. Furthermore, the lack of a specific goal or task (other than participating in the study) mitigates again this element being activated and therefore contributing to finer discriminations being made by participants as to the information most relevant.

I now want to focus on the notion of relevance as an element in cognitive economy. A good definition of this relationship can be found in Van der Henst, Jean-Baptiste and Politzer, Guy and Sperber, Dan (2002: 5), which suggests that:

> "In relevance theory, relevance is seen as a property of inputs to cognitive processes (e.g. stimuli, utterances, mental representations). An input is relevant to an individual at a certain time if processing this input yields *cognitive effects*. Examples of cognitive effects are the

> revision of previous beliefs, or the derivation of *contextual conclusions*, that is, conclusions that follow from the input taken together with previously available information. Everything else being equal, the greater the cognitive effects achieved by processing an input, the greater its relevance. On the other hand, the greater the effort involved in processing an input, the lower its relevance. Everything else being equal, it is clearly conducive to greater cognitive efficiency to aim at greater relevance in the inputs one processes".

This known as the Cognitive Principle of Relevance, i.e. that human cognition is geared towards maximising relevance (defined further below). The idea that relevance increases in line with cognitive effects achieved is interesting in how it relates to the degree of uncertainty that a given concept entails. It also raises a possible contradictory element in this aspect of Relevance Theory, which is described below.

We have seen from the arguments in this section that context can contribute considerably to the specificity and perceived accuracy of concepts such as those represented by degree modifying adverbs. The study of contextual factors (specifically in verbal communication) was a core research area of two researchers, Deirdre Wilson and Dan Sperber, who were interested in two specific aspects of human communication: firstly, *what* is communicated, and secondly *how* communication is achieved. They examined how coding and inference co-occur in communication, and the critical differences between sentences and utterances. They brought their different approaches to this subject together in what ultimately became known as Relevance Theory; I have captured some of the fundamental elements of it below but it is difficult to describe all aspects of Relevance Theory in detail without a very lengthy description, hence I have limited my discussion to identifying some of the more pertinent aspects.

Sperber and Wilson pointed out that the semantic representation of a sentence takes no account of non-linguistic properties such as the time and location of the utterance, the identity of the speaker and their intentions, etc. Sentences therefore are confined to semantic representation and are bound by rules of grammar. Utterances, however, convey a number of elements, such as the thoughts of the speaker and their attitude to those thoughts, and their comprehension requires at least an element of **inference** on behalf of the perceiver. Comprehension in its most inclusive sense typically requires the integration of the semantic aspects of the sentence plus the relevant aspects of the context in which the utterance occurs. The relevance of a stimulus is determined by two factors: the need to process it optimally, and the cognitive effects this optimal processing achieves (Sperber and Wilson 1995: 156 – 157). Other important issues are also in play such as the assumption that the communicator intends the meaning of their utterance and their communicative or pragmatic intention to be apparent to the hearer, and that this further assumes that the utterance is relevant to the hearer in some way. This is an important part of what Sperber and Wilson refer to as **ostensive-inferential communication**. As Sperber and Wilson point out, ostensive-inferential communication requires the construction of conceptual representations and the mobilisation of central thought processes (*ibid* 1995: 153).

This has interesting implications for the representation of degree modifiers. It has already been established that the greater the effort involved in processing an input, the lower its relevance (see Cognitive Principle of Relevance above). Furthermore, the greater the reliance on existing presuppositions (such as prototypical notions or schematic beliefs), the lower the processing effort required, and therefore relevance is increased. However, this assumes that these conceptual representations themselves can

be described as reasonably strongly held beliefs, as otherwise the belief is unlikely to hold any predictive value or to activate clear expectations of what is about to occur (such as in the remainder of a sentence). This aspect of language and cognition has already been described in section 1.2.4 above, particularly in relation to the process of *feedforward*. Some beliefs can be described as being weak in two ways:

- Beliefs that are vague or non-specific (or engender other forms of uncertainty, see Smithson's Taxonomy of Ignorance in section 1.3.1)
- Beliefs that are more specific but which are not strongly held, i.e. they engender high levels of uncertainty

This does raise a question as to whether vague beliefs are more likely to entail higher levels of uncertainty. This issue is one reason why the study in this thesis was structured to take account of both of these elements. It also raises the question as to whether vague beliefs are more or less commonly held between individuals than strongly held beliefs, and whether they require more evidence (such as in the content of a sentence or contextual clues) to validate or specify their meaning. There is therefore a ratio between the initial strength of a belief and the amount of information (sentential or contextual) required to confirm or to revise that initial belief. This confirms Sperber and Wilson's assertions about the need to combine coding/decoding (sentential) and inference (contextual), but it is on this very point that Relevance Theory comes in for some criticism. While the original 1986 version of Relevance Theory was subsequently updated in 1995, it has still attracted criticism (such as Frederking 1996) for its dependence on a relatively unspecified cognitive theory; it would be difficult to actually test the validity of Relevance Theory without combining it experimentally with an appropriate computational cognitive model. Equally, while their notion of relevance is interesting, I am not fully convinced that it sufficiently takes into account the highly complex area of human reasoning, and of uncertain

reasoning in particular. Given this, I can accept the principle that relevance can be used (at least in part) to explain how people attend to aspects of communication that they perceive to be relevant to the goals or intentions of the speaker, but I think it is important to examine further the underlying cognitive structures and reasoning processes that both inform the inferential process and contribute to the ongoing goal of ensuring cognitive economy. In particular, the idea that the greater the cognitive effects (such as the revision of existing beliefs) achieved by processing an input, the greater its relevance, requires a fundamental understanding of and a more critical approach to the whole area of human reasoning.

2.3 Degree Modifiers and Headers as part of the Mental Lexicon

As with prototypes of objects and people, events and social behaviours share many of the characteristics of prototypes, particularly in that they form sets of assumptions about the social world that are sufficiently consistent between individuals as constitute social and behavioural norms. The origin of schema theory is generally attributed to Frederick Bartlett, although the growth in popularity of cognitive psychology in the 1970's and the subsequent emergence of cognitive science has refocused attention on this important subject. Schema theory features strongly in research on social cognition; in fact it was originally research on person perception, non-social memory and categorisation that gave rise to schema theory as we know it today (Fiske & Taylor 1982: 139). In addition to a plethora of research, there also emerged an array of different terminologies, most of which convey essentially the same idea. For the sake of simplicity I will continue with the term 'schemata' (Rumelhart 1976, Rumelhart & Ortony 1977) although one could also use terms such as 'frames' (Minsky 1975) or 'scripts' (Schank & Abelson 1977). Rumelhart defined a schema as "a data structure

for representing the generic concepts stored in memory.....those underlying objects, social situations, events, sequences of events, actions and sequences of actions" (Rumelhart 1984: 163), whereas Schank (Schank & Abelson 1977: 41) defines a script as "a structure that describes appropriate sequences of events in a particular context..... a predetermined, stereotyped sequence of actions that defines a well-known situation". We can see here that these definitions while worded differently are nonetheless representing the same idea.

Schemata are similar to prototypes in that they create approximations about events and actions that minimise cognitive processing requirements and allow these limited cognitive resources to be focused elsewhere. Furthermore, schemata contain causal structures that can link individual events into chains of events, further decreasing processing load. This is relevant when considering the relationship between degree modifiers and uncertainty, particularly as degree modifiers can serve to either express an element of uncertainty (*FAIRLY* NICE) or to reduce uncertainty (*VERY* NICE). The effect of this can also be seen in combination with verbs which normally are associated with uncertainty such as *seem*. Consider the difference between 'she seems *fairly* nice' and 'she seems *very* nice' – the degree modifiers in these examples significantly alter the degree of uncertainty associated with the verb *seem*. In each case the schematic associations with each belief expressed might well be significantly different. Anything that reduces uncertainty also reduces the cognitive load and allows limited processing resources to be directed to other tasks when communicating in real time. Rumelhart and Ortony (1977) described the main characteristics of schemata:

- Schemata have variables.
- Schemata can embed, one within another.
- Schemata represent knowledge at all levels of abstraction.

- Schemata represent *knowledge* rather than definitions.

Rumelhart (1984: 169 – 170) suggests two additional characteristics:

- Schemata are active processes.
- Schemata are recognition devices whose processing is aimed at the evaluation of their goodness of fit to the data being processed.

A classic example of a schema that is widely used is Schank's restaurant schema. Entering a restaurant activates a whole sequence of beliefs about what to do, where to go, how to behave, i.e. you enter the restaurant, are shown to your table, are provided with a menu and given some time to choose your dishes, the waiter then takes you order, and so on. People in such scenarios do not need to expend much cognitive effort on deciding what to do because they can rely instead on their knowledge and experience of the world. Schank and Abelson (1977) even developed a computer programme called SAM to measure the consistencies and variances between people's self-reported behaviour in restaurants.

Schemata can tell us a lot about the way humans integrate existing and new information. The activation of schemata is particularly informative in this context. Because of the variety of levels of abstraction within schemata, and the existence of sub-schemata within schemata, there must be some form of control process to determine how and when different schemata are activated and processed. I have already noted that people typically require some evidence to guide which degree modifiers they use (if any) and the strength of beliefs they express, and it is important to understand the potential sources of this evidence. Bobrow and Norman (1975) suggest that schemata can be *conceptually driven* or *data driven.*

2.3.1 Conceptually Driven and Data Driven Schemata

As I have already mentioned, schemata often contain a range of sub-schemata. The activation of a higher schema may also activate one of these sub-schemata, which is a *conceptually driven* process in that the broader concept activates subsets of itself. For this reason conceptual processing is often referred to as *top-down* activation. This conceptually driven processing is also significant in that the activation of specific sub-schemata is generally derived by the expectations created by the initial schemata. This is consistent with the notion that people tend to generate schema-based hypotheses about the world and that there are causal relations between schemata and probabilistic expectations generated by these schemata. For example, schematic notions relating to clothing and dress generate strong schema-based expectations. Observation of how someone is dressed can generate other sub-schemata and also activate other related schemata. For example, the idea of a man wearing a smart suit generates schemata relating to how individual items of clothing constitute this general appearance; individual aspects such as items of clothing (jacket, trousers, tie, shirt, etc.) are activated as are style (formal or conservative) and colour (usually dark). This is also consistent with the notion of feedforward described in section 1.3.3 above which illustrates how language can drive expectations or beliefs.

Observing items such as clothing and dress however may in turn activate *data-driven* processing, which is a *bottom-up* form of processing. The activation of lower level schemata (known as *feature detectors* for their attention to finer detail) can in turn activate higher level schemata associated therewith. From the above example, the observation of formal dress might result in the activation of a 'businessman' schema, which involves schematic knowledge relating to profession, salary and social status and lifestyle. Each of these processes involves the evaluation of 'goodness of fit'

against schematic beliefs. Given the constraints of cognitive economy, Rumelhart (1984: 171) suggests that:

> "when sufficient evidence is accumulated against a schema, processing of that schema is suspended and processing resources are allocated to other currently more promising schemata. Whenever enough evidence is gained in favour of a schema that schema is taken as an adequate account for the relevant aspect of the input and the interpretation offered by that schema is taken as the 'correct' interpretation of the relevant event".

Schemata are highly integrated conceptual structures in that they can encompass a vast range of relations. For example, a person telephoning to offer double-glazing at an amazing discount immediately activates a 'seller' schema, but also activates a 'buyer' *self-schema.* The self-schema is a form of self-categorisation and is significant in that it generates beliefs about what other people expect of us, which can potentially influence our behaviour. I often balk at mentioning that I am a student because I dislike the idea of being categorised as such, given some of the negative stereotypical features associated with the label. It is often also more difficult to 'compete' with people within the domain of other schemata such as the example of businessman mentioned above.

Given that the activation of schemata can be conceptually driven or data-driven, there remains the issue of why one might occur and not the other. I am not suggesting that they are mutually exclusive or cannot co-occur, in fact their co-occurrence can be a useful 'check' as to the validity of the perceiver's beliefs, and can result in back-propagation or belief revision described in section 1.3.3 above. Assuming that information is available that might initiate either, what factors determine which is activated? This relates strongly to the particular instance and context of occurrence and the attentional and motivational biases that apply in that case.

Schemata are also significant in that they create strong expectations about future events. In this sense schemata can be thought of having predictive properties which, based on previous repeated experience (one of the main components in schema formation), is thought by the individual to be the most likely outcome. Probabilistic expectations arising from schemata are in part defined by the *degree* of belief associated therewith; schemata can be highly prototypical or more marginal and can be thought of therefore as ranging in their 'strength' of knowledge. Strong or definite expressions (e.g. she's *really* nice), such as those expressed through the use of intensifiers, are more likely to be associated with strong beliefs than with marginal or weak beliefs. Highly prototypical schemata such as Schank's much-cited restaurant schema creates strong beliefs concerning the probability of likely sequence of events and actions of individuals in that case, whereas a less typical schema is likely to generate weaker beliefs concerning such probabilities. Schema theory has however attracted a certain amount of criticism relating to the supposed predictive powers (Culpeper 1994: 48) because of the all-encompassing nature of schemata; schemata can relate to almost any class of event or action at any level of abstraction and therefore hardly constitutes a scientifically testable hypothesis about predictive powers. Whatever the strength of these expectations, the 'hypothesis' created by schema-based beliefs can be tested against available evidence that presents itself during the duration of the event. This evidence may serve to confirm or disconfirm this hypothesis, or may range in its degree of informativeness regarding the validity of the hypothesis. The need or desire to test the hypothesis is itself moderated by a number of factors. Given that perception is a goal-directed activity (Rumelhart 1984: 179), the motivation of the individual is likely to play an important role in defining

attentional biases, which could influence the way in which perceptions are represented and the strength of beliefs associated with them.

2.3.2 Schematic Beliefs and the Cognitive Context

Beliefs can be classified in a number of ways, in this case I have chosen to present them as schema subtypes which I think is the most concise and practical method of summarising schemata as they relate to the representation of degree modifying adverbs. The role of individual features in the generation of highly defined and specific beliefs can be of particular importance in that some features are more psychologically salient than other in a given context; as Culpeper (1994: 50) usefully points out when discussing Asch's (1946) experiments: "a cold, intelligent person was seen as calculating, whereas a warm, intelligent person was seen as wise". It is not necessarily easy then to predict impression from individual traits, nor can we consider impressions as being an average of the traits involved; the above example illustrates this clearly. Culpeper continues his exploration of social schemata to suggest the three following subtypes.

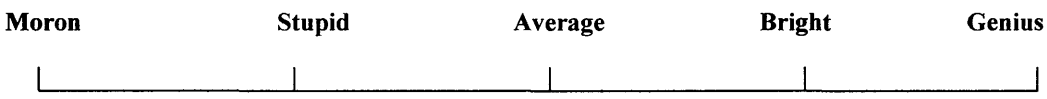
1. Person Schemata

This form of schema relates to knowledge concerning either a particular person or people in general. A person schema generally consists of trait schemata and/or goal schemata. While we mentioned earlier that schemata in themselves lack predictive powers, this criticism does not hold true for goal schemata; goal schemata have strong predictive powers regarding an individual's likely behaviour in a given situation (Fiske & Taylor 1984: 150). This in part is due to fact that goals tend to be highly contextually or circumstantially dependent and depend largely on the

individual concerned. Trait schemata are typically conceptualised as adjectival labels (kind, generous, friendly, unsociable) which approximate the strength of that label; what this means is that often adjectival trait labels can be thought of as existing on a scale relating to that general class of labels, although this does not apply to all classes of adjectives (see section 3.2.2 below). Degree modifiers can be used to 'shift' the adjective along a scale and can possibly extend the strength of the expression or belief beyond the natural parameters of the scale itself. For example, consider the following instance:

Figure 2.1: Scalar Properties of Adjectival Trait Labels

Example: Scalar representation of adjectives associated with intelligence:



This very simple example might include a range of further adjectival labels such as smart, clever, dim, brain-dead, dunce, etc. This is useful when considering one adjective at a time but, as I have already mentioned information earlier in this section, adjectives need to be considered in relation to each other in terms of the schematic beliefs and associations they might generate. Furthermore, some domains of adjectives do not have defined cut-off points or adjectival trait labels associated with them; 'generous' for example might be extended by adding 'extremely' to it but I cannot think of a label which extends the meaning to its ultimate extremity. This scale also fails to communicate the notion that individual traits tend to generate associations with other classes or instances of traits, such as 'introvert' invoking an association with 'unsociable' or 'shy'. Schema theory does however generate associations in that a trait schema for a confident person will include how confident people behave, what they

say, examples of confident people, and other characteristics typically associated with confident people such as extroversion and social skills.

2. Social Role Schemata

One's social role can be described in a number of ways. Taylor & Fiske suggested that these could be expressed as either *achieved roles*, which have to be acquired through effort (e.g. professional roles such as accountants or solicitors), or as ascribed roles, which are automatically acquired by individuals (such as kinship roles, e.g. father, son, uncle). Individuals can move quickly from one role to another as required. As schema theory suggests, these role labels each generate further schematic associations. An ascribed role such as 'mother' might generate schematic expectations of a caring, devoted and protective person who has specific responsibilities related to the upbringing of her offspring (incidentally, this is also an example of *entailment*, i.e. mothers are necessarily female). Such associations, particularly those relating to achieved roles, are likely to generate the final category of social schemata, i.e. stereotype schemata.

3. Stereotype Schemata

Stereotypes are notoriously inaccurate in that they emphasise particular attributes depending on the individual's point of view; a stereotypical member of the one's social group (the *in-group*) is likely to be conceptualised in terms of its more favourable characteristics whereas a stereotypical member of a different social group (the *out-group*) is conversely more likely to be conceptualised in terms of its negative characteristics. Furthermore, stereotypical notions tend to exaggerate highly distinguishing characteristics, such as a stereotype schema of an English person including the wearing of a bowler hat, which very few people in fact wear (example

from Culpeper 1994: 52). Stereotypes are strongly held beliefs that are highly resistant to change, and the activation of schematic beliefs and expectations can influence attention to and interpretation of new information, and the encoding and retrieval of information in memory (Rothbart, Evans & Fulero 1979). The stereotype is a good example of a conceptually driven process whereby *category-based* beliefs are typified by the prototype of that social category. This is distinct from a more *person-based* data-driven approach. As mentioned in section 2.3.1, both conceptually-driven and data-driven processing can combine, which in the context of social cognition means that impressions are created through the combination of category-based *and* person-based processes.

There is one form of schema (below) that I would add to Culpeper's. While this type is somehow implicit in the notion of schemata anyway, I think it is worth identifying separately when discussing the cognitive context.

4. Event Schemata

Event schemata consist of information relating to how typical events occur and the sequence in which particular sub-events usually happen. Fiske and Taylor (1984: 149) suggest that

> "People's prior knowledge of the typical sequence of events on standard social occasions helps them to understand ambiguous information, to remember relevant information and to infer consistent information where it is missing".

This definition actually contains a number of important points. The role of schemata and other such conceptual structures in the interpretation of ambiguous and other forms of uncertain knowledge is important and for this reason I have dedicated a specific subsection to the exploration of this subject. The notion of standard social

occasions is actually quite robust in that general conceptually-driven or data-driven schemata in this regard can contain sufficient information to guide processing even when highly specialised social situations occur. In this context I think Fiske & Taylor might have reconsidered the use of the term 'standard' as this suggests a bias in favour of conceptually driven processes.

Fiske & Taylor (1984: 149) also suggest two further types of schemata in social cognition. Firstly, they propose *self-schemata*, which aid information processing concerning oneself. I find this suggestion lacking in a number of respects. It fails to deliver a robust account of how self-categorisational processes influence other aspects of social perception in the way that Self-Categorisation Theory (SCT) does. Furthermore, Fiske & Taylor's definition of self-schema relates to "information about one's own psychology" (1984: 149), which they suggest guides information processing about oneself. The term 'psychology' here is somewhat vague, or rather it is to broad a term to be usefully applied in such a definition. They also propose *content-free* or *procedural social schemata* differs from other forms of schemata in that they govern *how* schematic information is applied; they in fact consist entirely of rules for managing information within schemata. An important example of such a non-domain specific schema is the *causal schema*, which contains information regarding how causal relationships are inferred and processed. This type of schema then can be thought of as a form of *meta-knowledge* in that it contains information *about* information. This form of knowledge is significant in that it in part constitutes how human reasoning operates, which I will be applying later in relation to uncertainty resolution in particular.

Schema theory as we can see is useful in terms of describing how knowledge in represented in the mind and how it combines in a structured and efficient manner.

What schema theory lacks is the ability to explain how people process and manipulate information beyond the scope of conceptual structures. More specifically, the role of schemata and categorisation in linguistic behaviour such as the use of degree modifiers needs to be considered, particularly with reference to the extent to which people share an understanding of their meaning and strength.

2.3.3 Mutual and Proprietary Knowledge

In the above subsections I have introduced conceptual structures that allow people to view the world in a consistent and organised way. Consistency is an important aspect of these structures; if each person had highly individualised conceptual structures then communication would be extremely difficult, as people would base their linguistic decisions on different sets of assumptions. In this regard schemata and stereotypes work well as they are largely consistent within a given culture, for the reasons explained in the above sections. In cognitive terms this idea is known as the *co-presence heuristic* (Clark & Marshall 1981), which can be segregated into three different levels of awareness: physical co-presence, linguistic co-presence and community membership. Essentially this is the same concept as mutual knowledge (and not dissimilar in nature to Sperber and Wilson's *mutual manifestness* in relation to spoken communication); people share similar assumptions about their physical environment and linguistic meanings, both of which are moderated by the culture or community in which they exist. A simple example that is cited increasingly often is the use of the 'cc' function when sending an email to a number of recipients; the fact that other recipients are visible to all readers (as opposed to 'bcc') makes the content of the email common knowledge. None of these things are said because they are what Lewis (1969) call *common knowledge*, i.e.:

The members of a group G commonly believe that p = def.

1. The members of G believe that p.
2. The members of G believe that the members of G believe that p.
3. The members of G believe that the members of G believe that the members of G believe that p.

And so on, although the constraints of cognitive economy intervene to limit an otherwise infinite reflexivity. This idea has been proposed under different labels, but they all convey the same basic definition. One question that these different definitions cover to varying extents is the degree to which mutual knowledge represents a set of common assumptions about the world as opposed to knowledge available to both interlocutors that is not strictly mutual. Consider the following definitions, in this case (using the example of perceptions about a person):

> **Proprietary Knowledge**: Factual knowledge that is not usually available to all upon first meeting, e.g. religious persuasion, dietary preferences, temperament, personality traits, etc.
>
> **Non-Proprietary Knowledge**: Factual knowledge that is available to all upon first meeting, e.g. skin colour, general appearance, dress, facial expression, etc.

Unless these individuals had met each other before, then both categories could be considered as new information, beginning with non-proprietary knowledge (available immediately) and moving towards non-proprietary knowledge as more information becomes available. Yet neither could be accurately classified as mutual knowledge, even though non-proprietary knowledge is available to all. This is because prior to their meeting this information was not mutually available and therefore was not common to both interlocutors. Furthermore, mutual knowledge is best presented as a set of working assumptions about the world (and a given culture in particular) as

this is more consistent with the maintenance of cognitive economy. New information is therefore compared with and assimilated into existing knowledge as it becomes available.

While mutual knowledge, which is comprised of conceptual structures such as prototypes and schemata (and therefore experientially driven), is common to both interlocutors, the same cannot be said of specific events and memories in their own lives. Mutual knowledge therefore is an 'approximation' about the world and how it functions, and not a limitless resource of information about every event, situation or person. This initial generalised set of assumptions about the world is supplemented by individual experiences (stored in and retrieved from memory), and then by non-proprietary and proprietary knowledge acquired in specific situations. In considering how this process works in real time, one needs to look more closely at how these elements combine and how they relate to inferences, particularly from a cognitive linguistic perspective. Memory can be thought of as the 'middle ground' between mutual knowledge and non-proprietary/proprietary knowledge, as well as offering some answers about how inferences are processed in real time. What is important is that people operate at both levels, and that the combination of assumptions about our environment (mutual knowledge) and information that is particular to that individual, such as from personal experience. These are some of the specific influences that will contribute to informing cognitive structures such as categories, prototypes and schemata, all of which play an important part in both minimising uncertainty and defining notions such as those communicated through degree modifiers and adjectives.

2.4 Summary

In this chapter I have introduced some of the key elements in the scalar representation, and particularly those relating to the combination of degree modifiers and headers (such as adjectives) within the sentential context. I have also discussed some of the cognitive and informational processes that either function generally or those that are activated specifically by particular types of stimulus. One of the reasons for keeping the discussion reasonably broad at this stage is that I want to emphasise the social and experiential context within which everyday speech occurs, and to remind the reader of how the diversity of the social environment influences the use and interpretation of what I have defined in section 1.2.4 as the cognitive context. Beliefs and stimuli relating to *people* can activate a social mental lexicon and features such as central stereotypical notions that can be quite different to those activated by an event (such as entering a restaurant), where the logistical aspects of the experience may play a more central role than stereotypical notions about the people themselves.

To proceed straight to a technical discussion of degree modifiers without at least attending to such important issues would be to treat the use of degree modifiers in language as existing in a vacuum, in some way removed from or separate from the context in which they are used. Having completed this task, I can now move on towards a more detailed discussion of degree modifiers themselves, how they interact with other lexical units and how the tendency of words to co-occur in collocational form can contribute to our understanding of degree modifiers/header combination in general, but also relative to the specific combination of both chosen for the experimental study in chapter 4 below.

Chapter 3

Understanding Degree Modifiers and Headers

3.1 Introduction

In developing an appropriate study for this research, several critical factors needed to be considered. Linguistic uncertainty markers such as quantifiers and intensifiers are typically part of a grammatical structure comprising many linguistic forms such as nouns, verbs, adjectives, etc. I have already emphasised the need to consider uncertainty markers not only in isolation, but also in the way in which they relate to different classes of linguistic forms. There are few methodologies that encompass all of these elements while allowing an adaptation appropriate to this particular research topic. For example, Semin and Fielder's (1988) Linguistic Category Model (LCM) would offer a number of features, although in this thesis I will use Paradis' (1997) Scaling Test (described in section 4.1.2 below).

The original LCM proposed a framework that examines how language and specific linguistic forms mediate between social cognition and social reality. Their 1988 model focused on the use of adjectives and three classes of verb forms in representing social beliefs, and even this initial work demonstrated the flexibility and adaptability of the LCM. Another benefit of the LCM is that it established the relationship between social beliefs and the degree of abstraction of the linguistic forms used to represent them. This is especially relevant to the subject degrees of uncertainty, which can also be represented along a concrete→abstract scale. Finally, the LCM can be used in a wide variety of experiments, and in this regard it is relatively straightforward to use it to explore hypotheses or research questions from different perspectives.

The LCM however does not deal with degree modifiers per se and for this reason I have not used it as the basis of an experiment or study. Instead, I have employed the methodology used by Paradis (1997) in her Scaling Test, which deals specifically with combinations of degree modifiers and adjectives. It is easy to speculate or use common sense to understand everyday linguistic choices, but this is not adequate when critically examining the role of degree modifiers in representing beliefs. Any model used would need to address the role of language at differing levels of abstraction, and be inclusive of linguistic categories other than degree modifiers. It is also important to understand the broader social context in which language is used, and the ways in which pragmatic language use moderates the beliefs we hold about people. For this reason it is important consider the role of various linguistic classifications such as nouns, verbs and adjectives. This can be used as a foundation for the more specific study of degree modifiers and their relationship to other linguistic categories, and to the wider social and pragmatic context in which language and communication occurs.

3.2 What are Degree Modifiers?

So far I have given a considerable amount of attention to the cognitive processes and social factors that feed into the way we perceive situations and people. Language offers people a rich and varied means of expressing their beliefs, and it is important to at least briefly look at the main lexical units that are part of everyday language. Rather than attempt to cover every aspect of this lexicon, I have used the main linguistic components in line with the Semin and Fielder Linguistic Category Model, i.e. verbs and adjectives. I have also added nouns as they are an important category in terms of the cognitive representation of beliefs.

Nouns have an obvious significance in describing objects, people and events in that they can activate schematic and category-based beliefs, and can create a set of expectations. For example, the noun 'accountant' can generate quite a detailed yet stereotypical image of that individual that extends well beyond the scope of professional occupation. It is also more likely to create an impression of a male person compared to the noun 'nurse' which stereotypically is more likely to be represented by a female. This too can have implications for the selection of adjectives; using the above examples, it is far more likely that the adjective 'pretty' would be associated with the noun 'nurse' rather than 'accountant', although interestingly neither noun in itself conveys gender identity. Conversely, the inability to find a noun that neatly and conveniently categorises an individual, object or event is likely to make it more difficult to establish strong beliefs about and expectations of that target.

Verbs seem to attract a great deal of attention from Semin and Fielder, to the extent that they propose that verbs be classified into four main categories. I have examined these classifications in detail below and therefore will not attempt to describe them at this stage. In some ways verbs are actually less directly descriptive than nouns or adjectives, and Semin and Fielder's typology of verbs has more to do with the identification of verb categories at cognitive and functional levels. The real significance of verbs in scalar modification is more indirect than nouns or adjectives, i.e. verbs describe what people do, think and feel, and describe how they behave. Furthermore, the use of verbs to can be quite significant to the expression not only of a belief, but also to the tacit expression of uncertainty in a belief; consider the difference between these two sentences:

'He's a nice guy'
'He seems like a nice guy'

Comparing the two, we can see that the first conveys a greater degree of certainty about the belief that the target is a nice guy. Injecting a degree modifier such as 'very' (i.e. he seems like a *very* nice guy) does substantially increase the intensity of the adjective 'nice' and the certainty of the belief expressed through the sentence by hedging the uncertainty implicit in 'seems', and I will explore this aspect later in this chapter. Sentences such as the above examples also reflect something of the character of the perceiver as well as their beliefs about the target. Take the following examples:

'He knows what he's talking about'

'He seems to know what he's talking about'

The first sentence communicates a sense of authority and level of knowledge on the part of the perceiver, and as such tells us something more about the relative knowledge of the perceiver than a more abstract and subjective observation such as 'he's a nice guy'.

The final category is adjectives, which can be used very effectively to accurately describe beliefs or to specify the strength of a belief. As with verbs and nouns, the choice of adjective reflects something of the position of the perceiver relative to their target. Adjectives can be versatile at describing people in any number of ways, e.g. physical (tall, fat), personality (kind, generous), abilities (intelligent, incisive), attitudes (easy-going, liberal), etc. In the context of this thesis they are also important in that they are readily influenced by the use of degree modifiers subject to grammatical limitations and collocations discussed in section 3.3.2 below.

Individually, nouns, verbs and adjectives can be used to describe beliefs or to represent a concept. However, their collective use has a compound effect that can be quite informative about the degree of belief held by the perceiver about their target. This is one of the strengths of Semin and Fielder's model, albeit with some criticism for their lack of inclusion of nouns and their possible over-emphasis of verbs. The

LCM does however provide a framework within which the use of degree modifiers might be evaluated, and in this regard it is a very useful and proven tool. However, it is important to move towards a methodology that focuses specifically on degree modifiers, hence the move away from the LCM and the move towards Paradis' Scaling Test in Chapter 4. Before this I want to examine degree modifiers in more detail, and to specifically focus on collocational aspects of degree modifier/adjective combinations.

3.2.1 Exploring Degree Modifiers

There is no single definition of what constitutes a degree modifier. Very simply, a degree modifier is a linguistic form that alters in some way an adjacent or related form. The influence can be positive or negative, i.e. it can intensify or weaken the original effect, or can possibly change the character of the effect in a way that cannot be best described as an intensifying or weakening effect. Degree modifiers can take a wide number of forms - nouns, verbs, adjectives, adverbs, prosodic features, repetition, etc. can all have a modifying effect. Previous research on degree words in English (such as Bolinger 1972) has demonstrated the syntactic, semantic and pragmatic constraints on degree modifiers. It is important to note such constraints as they have a material effect on the way the study in this thesis is constructed and analysed, in the same way that any legitimate study in linguistics must take linguistic principles and rules into account. For this reason topics such as lexical semantics and collocations have been included.

I have made various references so far to the forms that degree modifiers influence. For the sake of convenience I will refer to the base form (upon which the degree modifier acts) as the 'head'. Jacobson (1964:14) points out the syntactic

dependency between modifiers and a head, to the extent that the head can select and determine the modifiers in the first place. For example, the adjective 'cold' (the head) selects degree modifiers such as *very*, *fairly*, *bitterly*, etc, but cannot select *much*. The nature of the head therefore is important in determining what degree modifiers are available for use. Using the above example, the head 'cold' can be placed along a scale, such as hot → cold, with varying degrees of heat and coldness along that scale. However this scalability is not necessarily true of all potential heads: (Vermeire 1979: 26) describes three main types of head, which he characterises as follows:

Inherently non-gradable:	Absolute, implies no scale E.g., male/female
Non-inherently Gradable:	Absolute/relative E.g., full/empty
Inherently Gradable:	Relative, implies a scale E.g., good/bad

These classifications are useful in that they express the extent to which each are restricted by the degree modifiers that can be applied to them. Inherently non-gradable heads are relatively restricted compared to non-inherently gradable heads, with inherently gradable heads being the least restricted.

The accuracy of these classifications is open to debate. The integrity of absolute classifications such as male/female is questionable given that there are a variety of stages of transexuality between the two, albeit that as a mainstream classification it is acceptable if not entirely inclusive. Similarly, heads such as dead/alive can also be modified (e.g. half-dead, barely alive), although these cannot be literally true – one is either alive or dead. Non-inherently gradable heads, while relative, can also be expressed in less than absolute terms, although again their literal validity is questionable. A vessel can be full, empty, or somewhere in between, but

cannot be extended beyond the full or empty absolute limits. Yet it is possible to say for example that a bus or a cup is very full, but this refers more to the normal or recommended rather than the absolute physical capacity. Inherently gradable heads are least restricted in that their abstraction and the fuzziness of the upper and lower parameters make them easily modifiable.

To progress this exploration further requires a shift in focus towards the degree modifiers themselves, and to break them down into their own set of classifications. As I mentioned previously on as number of occasions, degree modifiers can take many forms. Prosodic or paralinguistic features of language can easily be used as a form of degree modifier by moderating the effect of an utterance, such as the use of loudness, emphasis/stress, repetition, and even silence. Vermeire (1979:42) points out that a unit in a clause that is given extra prominence by means of loudness or pitch variation is also in a sense intensified. Speakers can use both conventional and conversational implicatures to alter the tone, style or meaning of an utterance (Grice 1975). For example:

***Conventional implicature**:*

He was old yet very agile.

The implication of the content of this sentence is that old people are generally not very agile, and it is the use of the word 'yet' which conventionally implies this. Such use of language can be employed to create or increase effects such as emphasis or contrast.

***Conversational implicature**:*

John: I think she's really pretty.

Alice: Of course, my dear husband, she's a real stunner.

Assuming that Alice does not normally refer to John as 'my dear husband', it becomes clear that what she is saying is not literally true, and that she patently disbelieves John's assertions. By using the phrase 'my dear husband' she is obviously being

sarcastic (by flouting the Gricean maxim of quality) because she does not believe what she is saying. This not only modifiers the adjective 'stunner', it undermines the integrity of the description in itself. Even devices such as tag questions can be used as degree modifiers:

Jane: He's a liar, isn't he?

Harris (1984) argues that people's use of tag questions does not express uncertainty or a request for confirmation, but that it actually reflects a very powerful act in that questions demand answers.

These examples demonstrate how the pragmatic use of language can be used to moderate how language is used and inferred, and such types of linguistic behaviour are prevalent and important in linguistic research, although they might qualify as 'language modifiers' rather than strictly degree modifiers. However for the purposes of this thesis I will focus on a narrow category of linguistic phenomena (i.e. degree modifying adverbs) and my discussion will define what I ultimately mean by the terms 'degree modifiers' for the purposes of the subsequent experiment. This is the form most familiar to people as degree modifiers, e.g. *very* tall, *rather* strange, *bitterly* cold, *clearly* successful. These fall into different sub-classifications of adverbs.

3.2.2 A Typology of Adverbs and Degree Modifiers

In this section I will focus on describing, with examples (in italics), the most common adverb groups by semantic domain. By doing this I aim to illustrate what degree modifying adverbs are, as opposed to what they do (see the next section on the effects of degree modifying adverbs). Not all adverbs act as degree modifiers, but for the sake of inclusiveness I have discussed as many adverb categories as possible as most classifications include some examples of adverbs that have a modifying effect.

Although this list in not exhaustive, degree modifying adverbs can be broadly classified as follows:

Place Adverbs: *Here, there, away, far, toward*

Place adverbs show position (*here*), direction (*forward*) or distance (*far*).

Time Adverbs: *Always, never, now, then, usually, often*

Time adverbs describe time position (*now*), frequency (*often*), duration (*always, continuously*) and relationship (*recently, already*).

Manner Adverbs: *Quietly, well, quickly, together, well, significantly*

Manner adverbs describe how actions are performed. These adverbs are often (although not always) typified by *–ly* suffixes, derived morphologically and semantically from the adjective from which they originate.

Degree Adverbs: *Really, very, quite, fairly, more, too*

Degree adverbs are the most obviously significant category in the context of this research's focus on degree modifiers. They describe the extent to which a characteristic (typically characterised in the head) is either less or greater than usual or than another element in the neighbouring discourse.

Additive Adverbs: *Also, too*

Additive adverbs, as their name suggests, demonstrate that one item is being added to another either at a clausal or phrasal level.

Restrictive Adverbs: *Just, particularly, only, else*

Restrictive adverbs are similar in nature to additive adverbs insofar as they create a focus on a certain element of a clause, often having an emphasising or narrowing effect, e.g. *All the boys, <u>especially</u> Gavin, hated the new teacher.*

Stance Adverbs: *Probably, actually, like, maybe, indeed, perhaps*

Stance adverbs are interesting in that they have a range of applications and can on occasions illustrate a level of uncertainty or doubt.

Linking Adverbs: *Then, so, therefore, anyway*

Linking adverbs are used to create or moderate relationships between clauses for purposes such as continuity, contrast, relativity, etc.

Other Adverbs: While avoiding extending the list to every conceivable class of adverb, there are other adverbs that can be important and therefore merit a mention. Arguably some could possibly be included under some of the above categories, although there is not a universally accepted standard list of adverb classes.

Adverbs that might be considered are **manner of speaking adverbs** (*bluntly, frankly*), **factive adverbs** (*fortunately, naturally*), **instrumental adverbs** (*manually*), and **viewpoint adverbs** (*statistically, economically*).

These categories are useful in that they break adverbs into identifiable groups based on definitions of what constitutes each group. However it is also important to appreciate the effect that degree modifiers have, i.e. what they do versus what they are. This is the focus on the next section.

3.2.3 Degree Modifiers and their Effects

There are many ways of approaching the task of classifying and describing degree modifiers. The previous section provided a structured approach to their classification based on definitions of what they are. Another approach, which I have adopted in this section, is to look at how degree modifiers are used and the effect they have. The value of taking a different approach to degree modifiers can be seen when

examining the various ways in which the same adverb can be used, which technically would mean that the same adverb would have to be simultaneously classified in several of the categories in the above section. For example, consider the adverb *just*:

1) I had *just* finished my coffee (denoting closeness in time).
2) We're *just* two goals down on the other team (downplays the size and significance of the two goals).
3) That skirt is *just* awful (intensifying effect of the adjective *awful*).
4) It's *just* too difficult for me (denotes an absolute statement, i.e. *just* could be easily be replaced by another adverb such as *simply*).
5) He's *just* here beside me (denotes physical closeness).

In this case we can see that the same adverb is used in many different ways to create varying effects. Equally, it is important to note the semantic, syntactic and grammatical constraints that adverbs operate under, and analysing how adverbs are used contributes to this. Essentially there are three primary effects that degree modifiers have on their related head, and the following classifications are based on these effects (from Quirk et al 1985 and Paradis 1997):

Amplifiers (+): Amplifiers have the effect of increasing the intensity of the form they act on, hence the plus sign attached to the title. They can be broken down into two sub-categories:

Maximisers – *completely, totally, absolutely*
Boosters – *very, really*

Downtoners (-): These have the effect of reducing the intensity of the form they act on:

Approximators – *almost*
Compromisers – *more or less*
Moderators – *quite, rather, pretty, fairly*
Diminishers – *partly*
Minimisers – *hardly, barely*

Emphasizers: Emphasizers, although similar in nature to amplifiers and downtoners, do not necessarily have either a positive or negative effect.

While this approach is useful, there are elements that are not particularly satisfactory. Not least of these is the final category, i.e. emphasizers, which could potentially include most of the other two categories. Allerton (1987) proposed a different type of classification based on their gradable features, as described below (from Paradis 1997):

1. **Scalar Modifiers** indicate different parts of a mental scale of degree, which ranges from immeasurably high to zero, e.g. *extremely, very, pretty, rather, fairly, somewhat, slightly, not at all.*
2. **Telic Modifiers** relate the actual degree of the modified item to the degree required for some purpose and place it above or below that mark, e.g. *easily, barely, only, just, hardly, virtually, nearly.*
3. **Absolutive Modifiers** indicate that the degree of the modified item is 'superlative', e.g. *absolutely, utterly, totally, entirely*, and these combine with 'superlative' types of adjectives.
4. **Differential Modifiers** indicate the difference of degree between the item being described and some reference point. They include *far, much, a lot, marginally, slightly, a bit* in combination with comparatives.

Whichever model one chooses to identify with, they all use broadly the same sub-classifications such as maximisers, diminishers, etc., which are useful in characterising the effects of various degree modifiers. However, there are constraints that apply to any classification system. Specifically, one must consider the effect of collocations, i.e. the way that lexical items combine according to semantic and grammatical rules or principles. An exploration of this area of linguistics would take a considerable effort and I do not propose completing such a study within the confines of this thesis, although I will refer when appropriate to specific instances or rules regarding:

- Collocational preferences between degree modifiers and adjectives, i.e. the propensity for specific degree modifiers and adjectives to co-occur;
- Selectional and attitudinal restrictions that apply to the combination of degree modifiers and adjectives.

The effects of degree modifiers can be influenced by collocations. For example, the combination of 'rather' and 'nice' can be used to express a level of appreciation that exceeds the strict literal meaning of the phrase, e.g. "My, that car is rather nice". The phrase 'rather nice' here is an understated way of expressing strong admiration for the car in question, particularly with supporting use of stress and intonation. Collocations, in addition to indicating words that tend to be used together, also can create restrictions on which particular words can be combined. The co-occurrence of words can also activate the priming and down the garden path processes described in section 1.3.3 above. For example, the use of the degree modifier *bitterly* creates a strong expectation that the adjective *cold* or *disappointed* will follow, due to their collocational associational with each other. The same would not apply to a degree modifier such as *very*.

Gnutzmann (1975) also points out that the nature of the utterance itself can create or moderate collocational associations. For example, exclamatory utterances can only use intensifying degree modifiers to reinforce the related head. For example:

1) How beautiful!
2) How very beautiful!
3) How fairly beautiful!

The use of the intensifier *very* in example 2 above works well with the adjective *beautiful* in the context of the exclamatory utterance. The use of *fairly* in example 3 however makes no sense as it undermines the use of the adjective in the exclamatory utterance. Collocational associations are also subject to the intended

meaning of the degree modifier, as many have a number of potential meanings (such as *quite*) or have a different potential meaning from the adjective from which they are derived. Classic examples of this are *awfully* and *terribly*, which can be used interchangeably with *very* or *extremely*. The relevance of collocations depends on the actual degree modifiers and heads chosen for the experiment in this thesis, and for this reason I have not expanded the discussion of collocations any further at this stage.

One point that emerges from the above discussion is that the effect (and possibly even the meaning) of the degree modifier can depend on the head that it relates to, or on the broader sentence or utterance in which it occurs. The latter will be the subject of my analysis of the results of the experiment later in this chapter, which I believe is an important and valuable aspect of this research, particularly in looking at degree modifiers as markers of certainty or uncertainty. With regards to the relationship between the degree modifier and the head, one might argue that the effect of one depends on the intensity of the other. For example, descriptions such as *fairly nice* or *fairly disgusting* beg the question as to whether the term *fairly* has the same 'strength' in each case, or whether it is influenced by the extremity of *disgusting* versus the more neutral adjective *nice*. This does not necessarily undermine the notion of gradability of degree modifiers or adjectives such as suggested in this chapter and in section 2.3.2.1 above, but it does mean that some consideration needs to be given to the combinations used to represent beliefs about people. This is part of the rationale behind my choice of experimental methodology and the design of the actual experiment.

3.3 Collocational Aspects of Degree Modifiers

A collocation is an expression consisting of two or more words that correspond to some conventional way of saying things. Firth (1957: 181) describes collocations of a given word as "statements of the habitual or customary places of that word." Collocation is the relationship among any group of words that tend to co-occur in a predictable configuration. Khellmer (1991) suggests that our mental lexicon is made up not only of single words, but also of larger phraseological units, both fixed and more variable. Although collocations seem to have a semantic basis, many collocations are best recognized by their syntactic form. (McRoy 1992). Collocations are characterized by limited *compositionality*. We call a natural language expression compositional if the meaning of the expression can be predicted from the meaning of the parts. Collocations are not fully compositional in that there is usually an element of meaning added to the combination. A commonly cited example of this is the phrase *strong tea*. In this case the word *strong* is likely to be defined as rich in some active agent as opposed to having physical strength. Nouns such as *cats and dogs* are more likely to be associated with each other than *cats and giraffes*. Equally, word sense can be influenced by collocations. For example, the sense of the word *mouse* is likely to vary when collocated with these two groups of words:

(a) Computer, keyboard, click

(b) Cheese, trap, rodent

I have already mentioned the association between collocations and word sense disambiguation in section 1.3 above, in particular the famous quote from Firth about how words are characterised by the company they keep. Various suggestions have been made about how collocations can be defined and classified, which is the subject of the next section.

3.3.1 Defining and Classifying Collocations

I have already provided a preliminary definition of collocations (above) that are generally accepted as describing the broad nature of collocations. However, different definitions of collocations have been suggested:

5. We may use the term **node** to refer to an item whose collocations we are studying, and we may define a **span** as the number of lexical items on each side of a node that we consider relevant to that node. Items in the environment set by the span we will call **collocates** (Sinclair 1966:415)
6. the study of lexical patterns (Brown 1974:1)
7. a sequence of words that occurs more than once in identical form and which is grammatically well structured (Kjellmer 1987:133)
8. the meaning of a word has a great deal to do with the words with which it commonly associates (Nattinger (1988:68)
9. a recurrent co-occurrence of words (Clear 1993:277)
10. the way individual words co-occur with others (Lewis 1993:93)
11. the way in which words occur together in predictable ways (Hill & Lewis 1997:1)

Definitions aside, several approaches to the subject of collocations have also been proposed. Gitsaki (1996) identifies three different schools of thought:

The lexical composition approach: Methodologically, this approach 'is based on the assumption that words receive their meaning from the words they co-occur with' (Gitsaki 1996:10). It thus sees lexis as independent of grammar and the *Neo-Firthians*, as they were called (represented by Halliday and Sinclair), also kept grammar and lexis separate, though they did not try to devalue grammar in any way. Firth provided a more detailed explanation:

> Meaning by collocation is an abstraction at the syntagmatic level and is not directly concerned with the conceptual or idea approach to the meaning of words. One of the meanings of *night* is its collocability with *dark*, and of dark, of course, collocation with *night* (Firth 1951/1957:196)

Thus part of the meaning of a word is the fact that it collocates with another word. The other words with which it collocates, however, are often strictly limited.

The semantic approach: This is an approach where 'linguists attempted to investigate collocations on the basis of a semantic framework, also separate from grammar' (Gitsaki 1996:13). The crux of this approach was to try and find out not just that certain words collocate with each other, but *why* they collocate: why we can say *blonde hair* but not *blonde car*. The semantic approach attempted to address what was perceived as a failing of the lexical compositional approach, which was its perceived inability to explain *why* words collocate.

The structural approach: The third approach to collocation says that "collocation is influenced by structure, and collocations occur in patterns; therefore the study of collocations should include grammar" (Gitsaki 1996:17). Thus, in contrast to the two previous approaches, grammar is seen as a central factor that cannot be separated from lexis. Lexical and grammatical collocations thus represent two different but *related* aspects of the same phenomenon, and Bahns (1993: 57) defines the difference between them as follows:

> Examples of grammatical collocations include: *account for*, *advantage over*, *adjacent to*, *by accident*, *to be afraid that*... They consist of a noun, an adjective, or a verb, plus a preposition or grammatical structure such as an infinitive or clause. Lexical collocations on the other hand, do not contain prepositions, infinitives or clauses, but consist of various combinations of nouns, adjectives, verbs and adverbs.

A more consolidated approach involves ***lexical and grammatical integration***, such as that advocated by Sinclair (1987, 1991). Hudson et al (1997:209) suggest that "there are two main points about patterns to be made: firstly, that all words can be described in terms of patterns; secondly, that words which share patterns also share meanings". Collocations can be found in **idioms** (such as *level playing field*, *new kid on the block*, *raining cats and dogs*) and in **phrasal verbs** (*see through*, *write down*, *throw up*). Interestingly, Hill (1999) suggests a class of collocations that he refers to as ***unique collocations***, such as *foot the bill* or *shrug your shoulders*, and it does seem that this is simply another way of classifying idiomatic phrases as collocations. Collocation does occur in these cases, as phrasal verbs and idiomatic phrases entail the collocation of given words to create a specific meaning, although in idiomatic phrases this meaning often differs from the literal meaning of the constituent words. This is different however from a more random collocation of words, or the propensity for some words to collocate more than other outside of lexical units such as idioms. Collocations are usually placed somewhere in the grey area between fixed idioms and free combinations, often in a phraseological framework (e.g. Burger *et al.* 1982). In a narrower sense, they are understood as semi-compositional word pairs, with one "free" element (the *base*) and the other element lexically determined (the *collocate*). From this point of view it is useful to classify types (or scale) of collocations, such as those suggested by Lewis (1998):

Strong collocations: These are collocations that tend to co-occur only in specific combinations and are strongly associated with each other. Examples would include *bitterly cold* and *avid reader*.

Medium strength collocations: These are words that co-occur more frequently than weak collocations. Examples include *hold a meeting* and *carry out a study*.

Weak collocations: These are defined as words that co-occur with greater than random frequency. For example, colour labels can be used liberally with most objects, but with a noun such as *wine*, the collocates are likely to be *red*, *white* or *rosé*.

Hill (2000) proposes seven different categories of collocations based on their grammatical structure:

1. adjective + noun, e.g. *a huge profit*
2. noun + noun, e.g. *a pocket calculator*
3. verb + adjective + noun, e.g. *learn a foreign language*
4. verb + adverb, e.g. *live dangerously*
5. adverb + verb, e.g. *half understand*
6. adverb + adjective, e.g. *completely soaked*
7. verb + preposition + noun, e.g. *speak through an interpreter*

This research focus in this thesis in obviously most interested in the sixth category above, i.e. adverb + adjective. Also, this largely eliminates the need for any substantial exploration of the topic of **collocational span**, i.e. the idea that words can collocate even if they occur two, four or even more words away from each other in a sentence. However, I will explore the subject of **reciprocity** in collocations, i.e. that the strength of the collocation is not equal between the words concerned. For example, the word *blonde* collocates only with a relatively small number of words (normally associated with *hair*), but the word *hair* can co-occur far more widely. Given that the degree modifier and adjective combination group in the study of this thesis is so finite, it is relatively easy to examine reciprocity within that group. This is part of an examination

of the wider characteristic of the adverb + adjective collocation, particularly in relation to scale and boundedness (explained in detail in section 3.2.3 above). I will now focus on the specific characteristics of collocations associated with degree modifiers before exploring evidence in various corpora.

3.3.2 Collocations and Degree Modifiers

My specific interest at this stage is to look at the combination of six degree modifiers and the various headers used in the study in this thesis, and to examine whether there are any observable patterns in terms of how they collocate. I should mention first that the exact meaning of a degree modifier/adjective combination depends on the context, a point made several times during the course of this thesis. For example, saying "that's *absolutely wonderful*" in a sarcastic tone when you discover that the dog has relieved itself in your slippers is unlikely to be literally true. Equally, describing an expensive sports car as "*rather nice*" is a particularly understated style of expression that communicates the notion that the person considers that car to be very much more than "*rather nice*". The study of collocations here is not directly related to the context in which they occur and is limited to their co-occurrence in given corpora irrespective of how they can be used pragmatically or in various contexts.

Firstly, a reminder of the degree modifiers and headers used in the study:

Degree modifiers (6)	**Adjectives (9)**
Quite	Nice
Very	Big
Rather	Happy
Really	Bad
Fairly	Likely
Somewhat	Difficult
	Weak
	Warm
	Kind

When using corpora to explore the above items, it is important to bear a few things in mind. The collocations I am interested in here are instances where the above combinations of degree modifiers and adjectives co-occur. Calculating the significance of the scores for the results is quite straightforward. In this case I am using the ***t score*** to measure the statistical significance of the results. It would be easy to calculate the frequency that a given combination (e.g. QUITE + NICE), but this ignores the underlying frequency of the query word QUITE. In general, a t score is a statistic which assumes that the values being analyzed are distributed in the standard bell-shaped curve (what is called the normal distribution). The t score allows measurements which conform to some normal distribution to be reduced to the standard unit normal distribution which has a mean of zero and a known average squared deviation. Once this is done, then the significance of a measurement can be assessed.

The advantage of using t scores as a measure of significance is that it assesses whether the association between collocates is true and not due to the vagaries of chance; raw frequency in itself does not achieve this. The t score test looks at the mean and variance of a sample of measurements, where the null hypothesis is that the sample is drawn from a distribution with mean μ. The test looks at the difference between the observed and expected means, scaled by the variance of the data, and tells us how likely one is to get a sample of that mean and variance (or a more extreme mean and variance) assuming that the sample is drawn from a normal distribution with mean μ.

The calculation of the t score first requires the determination of the ***z score***. The z score reports the relative position of a score in the test distribution, and is the number of standard deviations a score is from the test mean. The mean will have a z-

score of zero. Scores above the mean have a positive z score and scores below the mean have a negative z score. Z scores and t scores are called standard scores. These scores are usually interpreted in conjunction with the normal curve where 68% of the scores fall within one standard deviation of the mean; 96% of the scores fall within two standard deviations of the mean; and 99% of the scores fall within three standard deviations of the mean. T scores are obtained by multiplying the z score by 10 and adding 50. This gives t scores a mean of 50 and a standard deviation of 10. A t score of 65 is 1.5 standard deviations above the mean. Z score is a statistic for hypothesis testing, i.e. for assessing whether a certain event is due to chance or not. When used for collocation selection, z score tests whether the co-occurrence of two words is due to other factors than chance. It is very similar to a t score, the difference lying in the fact that z is used with the data distributed normally. Both z score and t score are **one-sided** measures. Large positive values indicate significant evidence for positive association, while large negative values indicate evidence for negative association.

Other methods of measuring the significance of word collocations *are mutual information, likelihood ratios* and *Pearson's Chi square test. Relative frequency ratios* can also be used to assess the significance between collocations in different corpora. Pearson's chi-squared test is the standard test for statistical independence in a *2 x 2* contingency table, and is much more appropriate as a measure of the *significance of association* than t.score. Despite its central role in mathematical statistics, it has not been very widely used on co-occurrence data. In particular, t score was found to be much more useful for the extraction of collocations from text corpora (cf. Evert & Krenn, 2001). The SARA software used to make enquiries about collocations in the British National Corpus (or BNC, a 100 million word collection of samples of written and spoken language from a wide range of sources, designed to represent a wide

cross-section of current British English, both spoken and written) allows both *mutual information* and *z scores* to be selected as scoring algorithms, although it does not provide a facility for calculating t scores. The Collins Wordbanks Online English collocation sampler does allow the user to select either t scores or mutual information, but offers limited flexibility in defining tagsets or word combinations.

Extracting collocations relating to degree modifier/adjective collocations requires a careful approach to setting up the query. It is important where possible to limit the collocational span to the word to the immediate right of the degree modifier (also referred to as the *focal word* or *base*), and to specify that the collocate should be an adjective. This is especially important with adjectival headers such as *kind*, whose polysemous characteristics mean that it could be either an adjective (e.g. a *kind* person) or a noun (e.g. a *kind* of dog). Also, only the adverbial form of the degree modifier itself was selected in each query. These were considerations that were factors into the query process when using the largest corpus in the world, the British National Corpus.

3.3.3 Degree Modifier Collocations in the British National Corpus

The British National Corpus (BNC) is a very large body of written and spoken data, consisting of more than 100 million words. The BNC is primarily a corpus of written text (90%), with the remaining 10% being spoken language. It is an excellent resource for exploring instances and patterns of collocations and is used widely by researchers for this and for many other research purposes.

The query for the study of our combination of degree modifiers and adjectives firstly involved a singly word query to determine the frequency of occurrence of each of the six degree modifiers, which is indicated in the table below:

Figure 3.1: Frequency of Degree Modifiers in the British National Corpus

Degree Modifier	Frequency
VERY	113,282
REALLY	46,467
FAIRLY	6,584
RATHER	20,531
QUITE	39,895
SOMEWHAT	4,495

Straight away we can see that the degree modifier VERY is by far the most prevalent within the group with 113,282 instances found in the adverbial form. REALLY and QUITE are roughly similar in their frequency, and thereafter the other remaining degree modifiers occur increasingly infrequently. Without trying to jump to conclusions too quickly, the prevalence of each degree modifier is potentially interesting in that frequency of occurrence is one of the elements that indices psychological salience in the mental categorisational processes (Rosch and Mervis 1975). However, raw frequencies of the degree modifying adverbs alone are not an especially valid method of analysing the data or deriving conclusions. For this I am going to use two measures:

- The frequency of collocations of each degree modifier and adjective (with the adjective specified as falling immediately to the right of the degree modifying adverb
- The z scores generated by the SARA software based on the frequency of the collocation relative to the frequencies of both the degree modifier and adjective

The data collected from the BNC enquiry is displayed in the table below. Two figures are included in each cell; the frequency of the collocation of that specific combination of degree modifier and adjective, and the z score generated (in brackets). For example,

the collocation of VERY + BIG is 472 (89.2), which means that the collocation of VERY + BIG occurred 472 times, and generated a z score of 89.2. The table below is structured to easily illustrate the variances between the scores for each combination.

Figure 3.2: Degree modifies/adjective combination matrix

DM	BIG	DIFFICULT	KIND	BAD	WEAK	HAPPY	WARM	LIKELY	NICE
VERY	472 (89.2)	2052 (434.4)	365 (69.9)	465 (115.8)	147 (76.5)	730 (212.3)	128 (46.4)	317 (61)	1419 (391.8)
REALLY	149 (43.2)	58 (16.4)	11 (0.4)	207 (80.7)	4 (2.1)	69 (29.7)	34 (18.7)	14 (1.4)	384 (164.7)
FAIRLY	20 (15.4)	8 (6)	0 (0)	5 (4.4)	13 (28.3)	13 (15.1)	4 (5.7)	1 (-0.3)	1 (0.3)
RATHER	9 (2.1)	112 (54.3)	0 (0)	15 (17.4)	33 (40.6)	3 (0.6)	5 (3.4)	1 (-1.6)	91 (58)
QUITE	93 (28.3)	209 (72.6)	8 (-0.1)	32 (11.6)	9 (7)	563 (277.8)	33 (19.8)	190 (63.6)	328 (151.9)
SOMEWHAT	0 (0)	14 (14.1)	0 (0)	0 (0)	2 (5)	0 (0)	1 (1.4)	0 (0)	0 (0)

The results here are extremely interesting. There are clear asymmetries between the combinations and there are obvious propensities for some combinations to either occur very frequently or to occur very rarely. A more detailed discussion of the results is presented in section 3.3.4 below.

Before this, I want to briefly look at another intriguing aspect of collocations within the degree modifier group. The inclusion of the degree modifier REALLY in this group adds a dimension in that it can be used in combination with other degree modifiers to form a more emphatic form of compound degree modifier (e.g. that woman is *really very* nice). This quality does not work with the other five degree modifiers, i.e. combinations such as *very really* or *somewhat quite* do not work. I could have extended this query to consider how the degree modifier combinations below also collocate with the nine adjectives in this study, but this would have taken the analysis to a depth that would not have directly addressed the research questions of this thesis, although it would be an interesting area for further exploration.

The word REALLY has a number of interesting qualities and is quite versatile in terms of how it can be used. Stenström (1986: 151) suggests that the position and syntactic function of *really* give rise to its varying meaning:

- this question is ***really*** surprising
- this is a ***really*** surprising question
- this is ***really*** a surprising question
- this ***really*** is a surprising question
- ***really*** this is a surprising question

The first two examples above involve REALLY acting as a degree modifier to the adjective SURPRISING. It also has the ability to combine with other degree modifiers as indicated below, although this could also be VERY VERY (e.g. *I'm very very busy at the moment*) and possibly QUITE QUITE (e.g. *it's quite quite impossible, I'm afraid*), although the latter would be seen as very idiosyncratic use of language. The combination of VERY VERY yields a collocational frequency of 913 and a z score of 72.1, and the combination of QUITE QUITE yields a collocational frequency of 30 and a z score of 4.2. Paradis (2003) explores the nature and the semantic/pragmatic characteristics of REALLY in more detail, and she asserts that "*really* differs from *very* in that it is not a fully-fledged degree modifier, since it takes propositional truth attesting scope in questions" (ibid: 8); truth attesting *really* takes scope over a proposition whose function is to assert something that may be true or false, e.g. 'she loves me *really*'.

With the exceptions of FAIRLY and SOMEWHAT, the degree modifiers seem to combine quite frequently with REALLY. The clear exceptions of FAIRLY and SOMEWHAT plus the z scores of the remaining degree modifier combinations indicate the strong likelihood that these collocations (REALLY + VERY, RATHER, QUITE, REALLY) occur more than might be expected on a random basis. The scores

for REALLY + QUITE is interesting, as intuitively I would have expected REALLY + VERY to return a higher frequency and collocational effect.

Figure 3.3: Frequency of REALLY + degree modifier collocations

Degree Modifier	Frequency	Z Score
REALLY VERY	204	22
REALLY RATHER	111	22.5
REALLY FAIRLY	2	-0.4
REALLY SOMEWHAT	0	0
REALLY QUITE	235	53.7
REALLY REALLY	117	22.3

It might be worthwhile exploring these aspects of collocations further, particularly with regard to how their combined use might affect judgements of strength and uncertainty. Logically a combination of REALLY + VERY + ADJECTIVE should have the effect of further reinforcing the scalar component of the property denoted in the adjective. Inevitably the compound degree modifier will always serve to strengthen or emphasise the adjective's scalar property, but also should (at least logically) reduce uncertainty associated with that belief. The effect of the additional degree modifier could be measured, but in order to maintain a focus on the specific research goals of this thesis, I will now look at the results of the corpus data from the original degree modifier/adjective combinations and consider what it tells us about collocational effects.

3.3.4 Analysing and Interpreting the Corpus Data

The table of both collocational frequency and z scores for each of the 54 degree modifier/adjective combination actually represents a lot of information to analyse. For convenience I have presented the table in figure 3.2 once again below:

DM	BIG	DIFFICULT	KIND	BAD	WEAK	HAPPY	WARM	LIKELY	NICE
VERY	472 (89.2)	2052 (434.4)	365 (69.9)	465 (115.8)	147 (76.5)	730 (212.3)	128 (46.4)	317 (61)	1419 (391.8)
REALLY	149 (43.2)	58 (16.4)	11 (0.4)	207 (80.7)	4 (2.1)	69 (29.7)	34 (18.7)	14 (1.4)	384 (164.7)
FAIRLY	20 (15.4)	8 (6)	0 (0)	5 (4.4)	13 (28.3)	13 (15.1)	4 (5.7)	1 (-0.3)	1 (0.3)
RATHER	9 (2.1)	112 (54.3)	0 (0)	15 (17.4)	33 (40.6)	3 (0.6)	5 (3.4)	1 (-1.6)	91 (58)
QUITE	93 (28.3)	209 (72.6)	8 (-0.1)	32 (11.6)	9 (7)	563 (277.8)	33 (19.8)	190 (63.6)	328 (151.9)
SOMEWHAT	0 (0)	14 (14.1)	0 (0)	0 (0)	2 (5)	0 (0)	1 (1.4)	0 (0)	0 (0)

I will first make some general observations before looking more at some of the specific instances. The first comment to make is that the degree modifier VERY obviously generates the highest number of collocations across the nine adjectives, and that the degree modifier SOMEWHAT generates the least. Looking at the pattern of collocations across the tables, the degree modifiers can be ranked as follows from most to least collocations generated:

(1) VERY
(2) REALLY
(3) QUITE
(4) RATHER
(5) FAIRLY
(6) SOMEWHAT

The disparity of the results does illustrate how dependant the scores are on the particular combinations involved. The example of QUITE demonstrates this clearly, especially given the variance of results across the nine adjectives. I have flagged the combinations below that I feel are most interesting:

Figure 3.4: Key adjective/degree modifier combinations

DM	BIG	DIFFICULT	KIND	BAD	WEAK	HAPPY	WARM	LIKELY	NICE
VERY	472 (89.2)	2052 (434.4)	365 (69.9)	465 (115.8)	147 (76.5)	730 (212.3)	128 (46.4)	317 (61)	1419 (391.8)
REALLY	149 (43.2)	58 (16.4)	11 (0.4)	207 (80.7)	4 (2.1)	69 (29.7)	34 (18.7)	14 (1.4)	384 (164.7)
FAIRLY	20 (15.4)	8 (6)	0 (0)	5 (4.4)	13 (28.3)	13 (15.1)	4 (5.7)	1 (-0.3)	1 (0.3)
RATHER	9 (2.1)	112 (54.3)	0 (0)	15 (17.4)	33 (40.6)	3 (0.6)	5 (3.4)	1 (-1.6)	91 (58)
QUITE	93 (28.3)	209 (72.6)	8 (-0.1)	32 (11.6)	9 (7)	563 (277.8)	33 (19.8)	190 (63.6)	328 (151.9)
SOMEWHAT	0 (0)	14 (14.1)	0 (0)	0 (0)	2 (5)	0 (0)	1 (1.4)	0 (0)	0 (0)

I firstly want to use this table to analyse each ***column*** of adjectives; for each adjective above I have indicated (via colour code) the degree modifiers that appear to be most significant, at least relative to the scores within that group. For those combinations that co-occur frequently, it will be interesting to compare these results against perceived measures of strength and uncertainty in the study of this thesis in Chapter 4.

BIG: The adjective BIG seems to combine strongly with VERY, and to a lesser extent with REALLY and QUITE. The combination of RATHER + BIG seems to co-occur quite rarely, and the BNC query returned no collocations for SOMEWHAT + BIG.

DIFFICULT: This adjective co-occurs most frequently with VERY, then with QUITE and RATHER to a decreasing extent. As with BIG, the remaining degree modifiers co-occur with DIFFICULT much less frequently.

KIND: This is an especially interesting adjective. With the obvious exception of VERY, there are very few collocations with other degree modifiers. It is not immediately obvious why KIND would co-occur with VERY so often but not with REALLY, which is not a particularly dissimilar degree modifier. As mentioned above, Paradis (2003) does make an important distinction between REALLY and VERY, and this may be a factor. I will return to this point in Chapter 4 when analysing the results of the study and comparing them with those of the BNC query.

BAD: This adjective only combines strongly with REALLY and VERY, and less so with the less extreme degree modifiers, although this is a hypothesis based purely on the observation of the results. It is also possible that the negative nature of BAD may be a factor, and again this is an idea that I will return to in Chapter 4.

WEAK: The co-occurrence with VERY is considerably higher than for all the other degree modifiers. With the possible exception of RATHER, there are no other

instances where degree modifiers co-occur with this adjective to the same extent as with VERY.

HAPPY: There are two pronounced cases of collocation, i.e. with VERY and QUITE. My first thought was that this may be related to the word senses involved; for example, HAPPY can communicate different senses such as *jovial*, *pleased*, *content* and *satisfied*. This does require further exploration to understand why these particular combinations co-occur more than others.

WARM: This is similar to BIG in that the degree modifier VERY co-occurs most often, followed by REALLY and QUITE. I am a little surprised that RATHER + WARM does not co-occur more often, as I had imagined that this phrase might have been used reasonably frequently in spoken language. Then again, given the weather of the British Isles, perhaps there are reasons why this is not the case.

LIKELY: This adjective co-occurs most frequently with VERY and QUITE. The adjective LIKELY communicates a sense of probability about a given outcome, and this word sense may influence the degree modifier it co-occurs with most frequently. The relative absence of the degree modifier REALLY is also interesting.

NICE: Once again the degree modifier VERY far outweighs the others. REALLY and QUITE are roughly similar, although I suspect that the combination of QUITE + NICE normally communicates a somewhat understated expression of admiration (similar to RATHER + NICE, which interestingly co-occurs much less). The adjective NICE is notoriously vague in that it communicates a sense of *niceness*, but does not specify what quality of the target is appealing.

Looking across the table by row, it is clear that FAIRLY and SOMEWHAT represent the least number of co-occurrences within the wider degree modifier/adjective group. Part of the explanation for this is likely to be found in the

frequency of occurrence of these degree modifiers themselves in the BNC, illustrated in the figure 3.1 table below (also shown in section 3.3.3):

Degree Modifier	Frequency
VERY	113,282
REALLY	46,467
FAIRLY	6,584
RATHER	20,531
QUITE	39,895
SOMEWHAT	4,495

And now let us re-introduce the ranking table of degree modifiers from a few paragraphs above, with the frequencies now included:

(1) VERY (113,282)
(2) REALLY (46,467)
(3) QUITE (39,895)
(4) RATHER (20,531)
(5) FAIRLY (6,584)
(6) SOMEWHAT (4,495)

The ranking of the degree modifiers based on the frequency of collocations across the nine adjectives matches exactly with the ranking of raw frequency of the occurrences of the degree modifiers themselves, e.g. VERY occurs most times in the BNC and it also generates the most collocations across the nine adjectives. The frequency of occurrence of FAIRLY and SOMEWHAT is the lowest within the group, and inevitably as the occurrences of degree modifiers diminish, the number of co-occurrences with adjectives is also likely to fall, particularly relative to other more prevalent degree modifiers. I have qualified this aspect of the analysis in a few paragraphs below. However, this needs to be looked at in combination with the frequencies of occurrence of the adjectives themselves. In the case of the adjectives I have also examined the part of speech (POS) tags associated with each adjective. For the purposes of the original BNC query above the AJO (adjective, general or positive) POS code only was used for the adjectives, and the AVO (adverb) code only used for the degree modifiers. These figures are included in the table below:

Figure 3.5: Breakdown of adjectives by POS codes

POS Code	BIG	DIFFICULT	KIND	BAD	WEAK	HAPPY	WARM	LIKELY	NICE
AJO	24,433	21,621	1,041	14,493	3,477	11,340	6,060	21,177	11,703
NN1	0	0	21,181	77	0	0	35	0	0
NPO	0	0	1	18	0	0	0	0	113
VVB	0	0	0	0	0	0	251	0	0
VVI	0	0	0	0	0	0	375	0	0
UNC	4	0	3	1	2	0	0	0	0
AVO	0	0	544	16	0	0	0	251	18
AJO-AVO	391	0	0	262	0	0	0	1,280	808
AVO-AJO	25	0	0	46	0	0	0	288	114
AJO-NN1	0	0	241	21	0	0	22	0	0
NN1-AJO	0	0	591	1	0	0	1	0	0
Frequency	24,853	21,621	23,602	14,935	3,479	11,340	6,744	22,996	12,756

Key:

AJO adjective (general or positive) e.g. *good, old*
NN1 singular common noun, e.g. *pencil, goose, time, revelation*
NPO proper noun, e.g. *London, Michael, Mars, IBM*
VVB the finite base form of lexical verbs, e.g. *forget, send, live, return*
VVI the infinitive form of lexical verbs , e.g. *forget, send, live, return*
UNC unclassified items which are not appropriately classified as items of the English lexicon
AVO adverb, e.g. *often, well, longer, furthest*
AJO-AVO adjective or adverb
AVO-AJO adverb or adjective
AJO-NN1 adjective or singular common noun
NN1-AJO singular common noun or adjective

The above definitions and examples were extracted from the BNC user manual.

The frequencies of both degree modifiers (AVO) and adjectives (AJO) therefore are:

Figure 3.6: Degree modifier and adjective frequency tables

Degree Modifier	Frequency
VERY	113,282
REALLY	46,467
FAIRLY	6,584
RATHER	20,531
QUITE	39,895
SOMEWHAT	4,495

Adjective	Frequency
BIG	24,433
DIFFICULT	21,621
KIND	1,041
BAD	14,493
WEAK	3,477
HAPPY	11,340
WARM	6,060
LIKELY	21,177
NICE	11,703

And one again, the matrix of degree modifiers and adjectives (figure 3.4):

DM	BIG	DIFFICULT	KIND	BAD	WEAK	HAPPY	WARM	LIKELY	NICE
VERY	472 (89.2)	2052 (434.4)	365 (69.9)	465 (115.8)	147 (76.5)	730 (212.3)	128 (46.4)	317 (61)	1419 (391.8)
REALLY	149 (43.2)	58 (16.4)	11 (0.4)	207 (80.7)	4 (2.1)	69 (29.7)	34 (18.7)	14 (1.4)	384 (164.7)
FAIRLY	20 (15.4)	8 (6)	0 (0)	5 (4.4)	13 (28.3)	13 (15.1)	4 (5.7)	1 (-0.3)	1 (0.3)
RATHER	9 (2.1)	112 (54.3)	0 (0)	15 (17.4)	33 (40.6)	3 (0.6)	5 (3.4)	1 (-1.6)	91 (58)
QUITE	93 (28.3)	209 (72.6)	8 (-0.1)	32 (11.6)	9 (7)	563 (277.8)	33 (19.8)	190 (63.6)	328 (151.9)
SOMEWHAT	0 (0)	14 (14.1)	0 (0)	0 (0)	2 (5)	0 (0)	1 (1.4)	0 (0)	0 (0)

Although it takes a few minutes to mentally take in all of this data, a few points can be made immediately. The frequencies for each individual combination of degree modifier and adjective seem not to be the most influential factor. For example, the degree modifier SOMEWHAT returns almost identical results across all adjectives despite their varying frequencies. The degree modifier VERY returned much higher collocations with NICE than with LIKELY, despite the frequency of the latter being almost twice as high.

The example of KIND is very interesting indeed. Although a raw frequency of 23,602 occurrences were reported by the BNC query, 21,181 of these were NN1 single common nouns (e.g. a kind of dog) with only 1,041 being AJO adjectives. This is a clear indication of the need to disambiguate word sense, and also flags the danger of word sense ambiguity in the experiment if an appropriate sentence is not provided. In this case the fact that we were presenting adjectives was obvious because of the

way in which they were combined with degree modifiers, but even then the exact concept that the adjective KIND represents is still value. This lexical semantic aspect of adjectives was discussed in some detail in section 2.2.2 above. For example, WordNet 2.1 reports the following potential meanings for KIND:

> **1.** having or showing a tender and considerate and helpful nature; used especially of persons and their behaviour; "kind to sick patients"; "a kind master"; "kind words showing understanding and sympathy"; "thanked her for her kind letter"
>
> **2.** kind, genial, agreeable, conducive to comfort; "a dry climate kind to asthmatics"; "the genial sunshine";" hot summer pavements are anything but kind to the feet"
>
> **3.** kind, tolerant and forgiving under provocation; "our neighbour was very kind about the window our son broke"

While the sentence and context in which this adjective occurs is obviously going to be important, it would be interesting to explore which word sense is most central to the concept of KIND, and the extent to which the others are marginal. This would help us to understand the nature of the prototypical notion of KIND and other adjectives, and consequently of the scalar representation of such concepts.

Without going through each combination in detail, it is clear that some of these combinations have a predisposition to co-occur (for different reasons) beyond what one might expect to occur at random, and certainly more than the combined frequencies themselves would suggest. Equally, some combinations are highly unlikely to co-occur (such as SOMEWHAT + HAPPY), simply because the degree modifier is incongruous with the adjective involved. While the exploration of collocational effects is interesting, there remain unanswered questions that the next chapter should contribute to, which I have specified in section 3.3.5 below.

3.3.5 Integrating Corpus Data with the Thesis Study

A few important points have emerged from the analysis of collocational frequencies above:

- Some collocations occur frequently and are used often in spoken and written language (such as VERY + BIG, REALLY + NICE)
- Other collocations are very incongruous and simply do not either occur frequently or feel 'right' to a speaker, even if they are not necessarily grammatically incorrect (e.g. SOMEWHAT + BAD).
- The fact that individual degree modifiers and adjective might have high frequencies of individual occurrence does not mean that they will have a high frequency of co-occurrence

The effects of frequency of occurrence are open to debate. For example, collocations that are used often and conventionally in language can be said to be *socially salient*, i.e. they represent instances of central and typical patterns of language use (Tomaszczyk & Lewandowska-Tomaszczyk in Hanks 1990). However, collocations that are somehow unusual or more noticeable should in theory generate *psychological salience*. Psychologically, people tend to register the unfamiliar rather than the familiar, the unusual rather than the usual (Tomaszczyk & Lewandowska-Tomaszczyk in Hanks 1990). A lot of research in this area has been conducted by lexicographers such as Hanks (1990: 9), who also strongly concurred with this view when he wrote:

> "Everyday familiarities of language use - common words, ordinary meanings - tend not be registered by the conscious mind. For that reason the everyday, familiar words of our language are often not well described in dictionaries; without a great mass of evidence of unremarkable, everyday usage, it is almost impossible to achieve appropriate levels of generalization. Rare words and unusual uses, on the other hand, seem to be consciously registered and stored in the mind in such a way that they can be readily recalled for mention (discussion of their meaning and use), as well as being used in making new utterances".

This is an interesting point because it has direct implications for how frequency of occurrence can be interpreted, and gives rise to some intriguing possibilities for how either social or psychological salience influences our perception of the strength of belief associated with a degree modifier/adjective combination, and the strength of certainty with which that belief is held.

This is exactly what the experimental study in chapter 4 looks at, so combining the analysis of how the chosen degree modifiers and adjectives collocate is a sensible approach. This suggested analysis however was not part of the original thesis when submitted for examination; instead it was a recommendation to strengthen the existing thesis. For this reason a joint methodology was developed from the outset, which makes it difficult to develop a model that truly integrates both analyses to any substantial degree. For this reason I have focused on examining both the collocational analysis and the experimental study 'side by side', and drawing whatever conclusions can reasonably be deduced. As I have noted in section 4.3 below, this is one potential area in which the study of degree modifying adverbs can be developed.

I can however begin the process of articulating the issues and questions that arise when the subject of integrating both analyses is approached:

- What forms of salience pertain to degree modifier/adjective collocations, and what evidence from either lexicographers (social salience) or cognitive linguists (psychological salience) can be gathered to address this debate?
- Does frequency of collocation in a given degree modifier/adjective combination have any direct correlation with the perceived modifying strength of that degree modifier relative to that adjective?
- Does collocational frequency also have any influence on the degree of certainty with which the above perceptions are held?

As with most analyses of this nature, one would not expect a yes/no answer to any of the above, and particularly the last two. This is partly because any experiment of methodology is unlikely to be entirely conclusive and uncontended, but also because this is an area of immense complexity and there are dimensions of linguistics, social and cognitive psychology and statistics that should always be reviewed and refined. In essence, it would represent a challenging but intriguing work in progress, as do many areas of academic research.

It is difficult to begin to discuss the proposed more straightforward comparison of the results of collocational analysis with the results of the experimental study in chapter 4, and for this reason I will revisit this topic in section 4.2.2 below once the main experiment has been completed.

3.4 Summary

This chapter contains some critical elements in the overall findings of this thesis. Apart from defining and exploring degree modifiers in more detail ahead of chapter 4, it has addressed the issue of how degree modifiers and adjectives tend to co-occur in various ways, some of which co-occur at a level higher than would be expected at random. This has been an especially interesting aspect of this research and will ultimately play a role in defining the findings of the research in chapter 5.

The fact that this research has demonstrated how the specific combinations of degree modifiers and adjectives collocate has a number of implications. It does confirm that collocational effects do apply to these specific lexical units, and therefore the study of collocations should be an intrinsic part of further research into scalar representation. Secondly, it does suggest that collocations might have an influence on prototypical notions of scale or centrality along a scalar continuum, and I would be

especially interested in seeing how this works on a more multi-adjectival scale (see discussion in section 2.2.2 above). Finally, the study of collocations does demonstrate how idiomatic (or at least idiosyncratic) phrases might play a role in accounting for why some specific combinations co-occur.

It is now time to bring this research to an experimental level by studying the perceptions of strength and uncertainty of an identified group of six degree modifying adverbs and nine adjectives. The study of degree modifiers uses an adaptation of an existing methodology (Paradis' 1997 Scaling Test), although my study does not include intonational and prosodic aspects of language included in the original study. I have also included a study of uncertainty in this experiment, which was one of the stated aims of this research thesis. The rationale, methodology and findings are now presented in chapter 4 below.

Chapter 4

An Experimental Study of the Scalar Representation of Degree Modifiers under Uncertain Reasoning

Research into degree modifiers is by no means a new area of exploration. People such as Bolinger (1972, 1981), Sapir (1956), Halliday (1973, 1985) and many others have investigated degree modifiers from varying perspectives. Indeed, the research in this thesis has drawn on much of this previous work, particularly Vermeire (1979) and Paradis (1997). The work of Paradis is especially interesting in that she has devoted much of her academic career to the exploration of the lexical semantics of adjectives in general and to degree modifiers in particular. I have already referred to her work on antonyms and negation, which would be important directionally in terms of taking this research further. Her paper on epistemic modality and degree (specifically to the use of REALLY) has been useful (see section 3.3.3 above) in accounting for the use and collocations of 'compound' degree modifiers (such as REALLY VERY). It is this focus of research and related methodologies that determined my decision to use and adapt the research and experimental methodologies of Paradis to support my own research study in this thesis.

4.1 The Research Experiment: Measuring the Influence of Degree Modifiers

Several factors needed to be taken into consideration when designing an experimental study for this area of research. The core requirement was the use of an established methodology for evaluating the perceived strength of degree modifiers, as without this the integrity of the study would have been questionable. However, it ultimately became necessary to adapt an experimental methodology to suit my particular needs,

and in this regard any changes needed to be thought through properly. In section 4.1.2 below I have outlined Paradis 1997 Scaling Test, upon which my adaptation is based.

A key theme in this research is the scalar representation of concepts such as degree modifiers and adjectives, hence the cognitive linguistic orientation of the thesis. Any person's perception of the strength of a degree modifier is unlikely to be something that they actively think about at a very conscious level in real time, particularly given the constraints of cognitive economy (section 1.2.4) and other issues such as people's tendency to attend to contextually relevant elements (section 2.2.3). Consequently, when asked to consciously score their perception of the strength of a degree modifier, and then to further judge the certainty with which they hold that belief, a question inevitably arises about the risk of subjectivity of the measurements concerned. The fact that in many cases we are dealing with concepts that contain many forms of uncertainty (see Smithson's Taxonomy of Ignorance in section 1.3.1 above) also needs to be borne in mind. I do not propose to construct a formalism for dealing with subjective decision making under uncertainty, but I would like to at least discuss some of the relevant aspect of this area of cognitive science before moving on to the experiment itself.

4.1.1 Representing Subjective Beliefs under Uncertainty

At various stages during this thesis I have described how people acquire, process and measure their existing beliefs against new information. There are distinct cognitive structures and processes (such as prototypes and schemata) that contribute to the efficient acquisition and assimilation of information, and other elements such as context and goal-driven behaviour that informs how information is perceived and interpreted. Some forms of information in the environment are more psychologically

salient than others, i.e. where attributes of the information are easily perceivable. This is an essential factor in the generation of categorisational prototypes.

One of the most important elements to consider is context; context can have a considerable impact on what is communicated and how it is interpreted, both semantically (e.g. word sense) and pragmatically (e.g. speaker intention). Context can also be important in determining the nature and level of uncertainty of an utterance in a given situation (either linguistic or pragmatic uncertainty) as discussed in section 1.3.2.1 and 1.3.2.2 above, but also of what mental processes are activated or utilised in order to manage that uncertainty. To process everything at a conscious level would cause a mental meltdown very quickly, hence the need for underlying reasoning processes, particularly those relating to uncertainty. A great deal of information therefore will be processed at a subconscious level, such as information processed at a metacognitive or second order level (see section 1.2.1 above). The reason I mention this now is that in the experimental study below I am asking people to make an overt judgement of something (i.e. level of uncertainty) that would normally be processed at second order level. In this regard it is important to explain why I have taken this approach and how it fits with current thinking on uncertain reasoning.

To begin the discussion, I have copied below the combination of questions used to test each degree modifier/adjective combination:

The wall is ***very big***

[] [] [] [] [] [] [] [] [] [] []

Least big **Big** **Most big**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

The instructions for the first scale above are contained in the text accompanying the test, and instruct the participant to score their perception of the ***strength*** of that degree modifier/adjective combination. I am not concerned about this first stage question as it is a straightforward elicitation of a reasonably tangible belief. However, the second question above (i.e. how certain or uncertain are you about the judgement you have just made?) is an elicitation of a ***belief about a belief***, and therefore is likely to be more subjective. Furthermore, this second stage was not a part of Paradis' original 1997 Scaling Test, and I cannot therefore rely on this as a precedent. As a consequence, it is important that the reason for using this format is explained, and that its integrity is established.

The first aspect of this test that is important to understand is that this test is not based on a belief revision model, i.e. one where an existing belief is established and measured (i.e. the ***prior belief***), and any changes to that belief measured after new information has been introduced (i.e. the ***posterior belief***). The use therefore of *this particular aspect* of Bayes' Theory is of limited use in that the Bayesian conception of probabilistic reasoning, which provides a normative rule for updating the belief in a hypothesis, will not be relevant to this particular study, although the subjective probabilistic approach of Bayes Theory is certainly relevant.

When considering a given belief in a proposition, we need to remember that this belief represents the perception of ***likelihood*** or ***probability*** that that proposition is true. Toulmin (1958: 14) suggests that "when I say 'S is probably P', I commit myself guardedly, tentatively or with reservations to the view that S is P, and (likewise guardedly) lend my authority to that view". Of all the methods for handling uncertainty, probability theory has by far the longest tradition and is the best understood (Krause and Clarke 1993: 16). They also point out that "modern Bayesian

approaches also provide a way of formalising the notions of relevance and independence which people *do* use in their everyday reasoning" (*ibid*: 17), and that it provides a framework for answering the query 'given that I know E, what is my belief in H?' (*ibid*: 21). While I have not used Bayes' Theorem computationally in the experiment, I have adopted a subjective probabilistic approach to judgements about a given belief, in this case the strength of a degree modifier/adjective combination. If I was looking for a more concrete formalism based on belief revision, then I would also have considered other more objective probabilistic approaches such as those suggested by Tversky and Kahneman, who proposed that people employ certain heuristic rules to process information rather than Bayes' rule, in particular by using a representativeness heuristic (underweighting prior beliefs) or a conservative heuristic (overweighting prior beliefs). Further doctoral research might explore this further, in particular when using an experiment to establish an initial strength value of the adjective itself, and then measuring how this value changes when a degree modifier is added. Apart from being very interesting, this area of research would bring an additional level of knowledge and integrity to the exploration of the effects of degree modifiers.

In this case, the participants in the study are asked to make a subjective judgement of how certain or uncertain they are about the given score for the strength of the degree modifier/adjective combination (i.e. 'given that I know E, what is my belief in H' from the above paragraph). Moreover, the elicitation of subjective judgements does have the advantage of providing a realistic view of the genuine beliefs of each participant rather than trying to infer these beliefs from more objective data (Manski 2004). Furthermore, a very recent study (September 2005) used a very similar process to elicit the strength of belief of the effectiveness of various birth

control methods before then continuing to measure how these beliefs were updated by new information (Delavande 2005). So while I am satisfied that the second question relating to the belief about certainty/uncertainty is the right approach for this particular thesis, I am equally confident that a more sophisticated study involving updating of beliefs would benefit from a more detailed (and inevitably complex) formalism for measuring these changes in beliefs.

I have already mentioned that it is essential that the study in this thesis is based on a methodology that is applicable to the exploration of the scalar representation of degree modifiers. I will now continue by briefly describing the approach I have used for this, which is an adaptation of Paradis' 1997 Scaling Test.

4.1.2 Paradis' Original Scaling Test (1997)

In section 3.2.4 above I mentioned the significance of the combination of degree modifiers and their related head. Judging the strength of a degree modifier based on a single combination therefore is likely to create a biased or less rounded view of the strength of that degree modifier, and any experimental methodology needs to address this from the outset. It would be unrealistic of course to suggest that every possible combination could be taken into account, and therefore a sensible cross-check using the same degree modifiers with a variety of heads would be sufficient. This issue was addressed effectively by Carida Paradis in her Scaling Test (Paradis 1997). Her research work was undertaken at both the University of Lund in Sweden and the University of Manchester, UK, and focused on the role of degree modifiers in spoken English. The orientation of her research had an emphasis on spoken as opposed to written English, and she used the London Lund Corpus as a primary source of common adverbs and adjectives for her work.

The Scaling Test consisted of 40 test sentences, each containing a degree modifier and a related adjective. The issue of the strength of the degree modifier relative to the adjective was addressed by varying the adjective used with a particular degree modifier in a number of test sentences. The degree modifiers used for the scaling test were *quite*, *fairly*, *somewhat*, *pretty*, and *rather*. These were combined with the following ten adjectives: *long*, *good*, *beautiful*, *drunk*, *happy*, *sober*, *different*, *disgusting*, *hot*, *bad*. Participants were presented with 40 test sentences using the above combinations and asked to score the strength of the degree modifier on a nine-point scale ranging as in the example below:

The book was ***somewhat dull***

[] [] [] [] [] [] [] [] []

Least dull Dull Most dull

Participants were also asked to indicate their gender and age group, although this information was not used in the analysis of the results. Paradis used a recording of each sentence being spoken, and repeated once, after which the participants had around ten seconds to indicate their score. The test was conducted twice using different participants, and using different prosodic features for each test. In the first test the nucleus went on the adjective (falling tone), and in the second test the nucleus was on the modifier (fall-rise). In each case the mid-point of the scale was treated as an average score, i.e. in the above example the mid-point on the scale represents an imaginary point of average dullness. Both tests were given to 25 native English-speaking participants at the Universities of Manchester, Nottingham and Lund.

For each test, the mean score and standard deviation for each degree modifier were calculated. Paradis used the results to comment on the differences generated through the use of different intonational features, although this is the point of

departure as regards relevance to my research. The methodology employed however remains valid and useful for my purposes, albeit with some adaptation to suit my specific research goals.

4.1.3 Proposed Experimental Methodology and Theoretical Justification

For this research I propose adopting Paradis' experimental framework and methodology. There is no immediate relevance in using recorded sentences with various intonational features, as the focus of this thesis lies more in how degree modifiers are used at a cognitive level and how their perceived strength relate to judgements of uncertainty, as opposed to how they are produced in speech. I have made several changes to the original questionnaire used by Paradis. I have enlarged the scale from 9 to 11 points to allow a greater degree of sensitivity to be built into the test, and have used 60 native English speakers compared to 25 in Paradis' experiment.

The starting point in terms of the rationale behind these choices is the emphasis of this research on the subject of uncertainty and uncertain reasoning. There is little value is asking participants to score the strength of maximisers (e.g. absolutely, completely) as these scores are inevitably going to be at the upper end of the scale, and their emphatic nature is likely to reveal little about degree modifiers as uncertainty markers. There is however an implicit assumption here that such maximisers communicate a strong element of certainty about the belief they express, and in that regard they are ultimately relevant. The same argument could apply to the heads themselves. In section 3.2.2 above I described how heads could be broken down into three main categories:

Inherently non-gradable:	Absolute, implies no scale E.g., male/female
Non-inherently Gradable:	Absolute/relative E.g., full/empty
Inherently Gradable:	Relative, implies a scale E.g., good/bad

Arguably, the first two categories are less useful in terms of test material in that their nature makes uncertainty or fuzziness less likely. It is necessary to choose combinations of degree modifiers and heads that are likely to be most informative in terms of my research goals. For these reasons I have limited the heads used in the study to those that can be categorised as inherently gradable, and have also excluded both maximisers and minimisers when choosing degree modifiers for the study. There are also grammatical, semantic and collocational considerations, such as those described in chapter 3 above, which need to be borne in mind. The study aims to measure the influence of degree modifiers on a range of heads using Paradis' methodology, albeit on a larger scale.

4.1.4 Research Study: Methodology

For the study in this thesis, a group of 60 native English-speaking undergraduate and postgraduate students were selected from Trinity College Dublin, University College Dublin and Dublin City University in Ireland. All were aged between 18 and 29 years. Twenty four of the participants were female, and the remaining thirty six were male. For this experiment, six degree modifiers and nine adjectives (heads) were chosen as follows:

Degree modifiers (6)	Adjectives (9)
Quite	Nice
Very	Big
Rather	Happy
Really	Bad
Fairly	Likely
Somewhat	Difficult
	Weak
	Warm
	Kind

Participants were presented with the Scaling Test paper, which consisted of a cover sheet that contained instructions and two example sentences and scoring scales. The instructions were as follows:

Here are the instructions for the Scaling Test. The test contains 2 example sentences and 54 test sentences. In this scaling test you are asked to give your judgements on the degree expressed in each of the 54 sentences. Degree of a quality can be expressed by different words and by different strengths. For example, ***somewhat*** *dull,* ***rather*** *dull,* ***very*** *dull,* ***terribly*** *dull.*

Please look at example 1 on page 1. It contains an eleven-point scale, which extends from an imaginary point of ***least dull*** *to another imaginary point,* ***most dull.*** ***Least dull*** *is the left-most box, and* ***most dull*** *is the right-most box. The point in the middle, where it just says* ***dull****, represents an imaginary point of average dullness. If you feel that* ***very*** *indicates a degree somewhere between* ***dull*** *and* ***most dull****, put a tick in what you think is the box that indicates most accurately your judgement of the degree expressed.*

Immediately below this you will see another eleven-point scale, which extends from an imaginary point of ***most uncertain*** *to another imaginary point,* ***most certain.*** ***Most uncertain*** *is the left-most box, and* ***most certain*** *is the right-most box. You should tick the box that indicates most accurately how certain or uncertain you feel your judgement of the degree expressed for that test sentence.*

Please complete the example questions 1 and 2 on the cover sheet. The researcher will examine these to ensure that you understand and have carried out the instructions correctly. You may then open the test booklet and proceed to the Scaling Test itself. There are 54 test sentences, each with an accompanying scale on which you are requested to put your tick. Please try to make your judgement as spontaneous as

possible based on your natural intuition without thinking about each sentence at length. If you have any questions about these instructions you may ask them now or at any stage during the test.

You may now open the booklet and begin the Scaling Test.

In addition to the above instructional text, the cover sheet also contained the two example questions and gender/age fields as follows:

Please complete the fields below for gender and age

Gender: *Male []* *Female []*

Age: _____

Example sentences

1. The book was ***very dull***

[] [] [] [] [] [] [] [] [] [] []

Least dull **Dull** **Most dull**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

2. The book was ***somewhat dull***

[] [] [] [] [] [] [] [] [] [] []

Least dull **Dull** **Most dull**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

Test participants were given five minutes to read the instructions and to complete the example sentences. Before examining the completed example sentences, participants were asked if they fully understood the instructions, and were given the opportunity to ask any questions they wished. The example sentences were then

examined to ensure that they had been properly completed in line with the instructions. Following this, the participants were instructed to open the test booklet and to commence the test. No time limit was imposed on participants, and the test was normally completed within 15-20 minutes.

When the 60 participants had completed the task, the resulting data was collected and analysed as described below.

4.1.5 Research Study: Test Results and Data Format

The obvious question is how the raw data should be analysed and what statistical processes should be applied such that the data could yield meaningful and relevant results in line with the objectives of this thesis. In selecting the most appropriate approach to analysing the data, a number of elements needed to be considered. The study and the questionnaire is structured to yield as much possible information about each individual degree/modifier combination, but also allows for the comparison of the strength of scores for each combination against each other, which means that the relativity between them can be easily analysed.

In addition to the relative scores for the strength of each combination, there is also the added element of the scores against the uncertainty scale for each combination. The nature of the relationship between the strength score and uncertainty score for each combination differs somewhat from the comparisons indicated above in that the strength and uncertainty scores for each combination (i.e. within-combination) are dependant variables, whereas the between-combination scores are independent variables. Accordingly, the correct statistical methods need to be chosen to take into consideration the nature of these relationships. Equally, the methodology chosen has to be robust enough to identify specific instances of interest within the data while

simultaneously revealing wider patterns across the entire data set. The exact methodology and the reasons for choosing this statistical model is discussed further in section 4.2 below.

The study generated a large body of data – 60 participants were involved in the study, each of whom provided scores for their perceptions of both strength and uncertainty for a matrix of 6 degree modifiers and 9 adjectives. In total, this generated a data set of 6,480 individual scores (60 x 6 x 9 x 2). The data is presented below in a series of nine tables, each reflecting the scores for the six adjectives versus the range of degree modifiers. Each of the 60 participants was allocated an alphanumeric code (V01, V02, etc.) such that the results across the different tables reflect the scores given by the same individual in each case. This is of particular importance when using a statistical process known as a repeated measures procedure, which was employed to help analyse the data. The data is arranged within each table under each of the six degree modifiers (*very, really, quite, rather, somewhat, fairly*), with the strength score appearing first followed by the uncertainty score (the 'U' column) immediately to its right. For the sake of clarity, I have colour coded the columns for strength and uncertainty scores for each degree modifier so that they cannot be confused with each other. These tables can be found in Appendix 3 at the back of this thesis; below is a sample of the layout for illustrative purposes.

Figure 4.1: Modified example of degree modifier/adjective data table

BIG	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	9	10	9	9	7	5	7	7	5	7	3	4
V02	8	9	9	8	6	4	8	5	6	6	4	5
V03	8	9	8	9	8	6	8	5	5	8	3	5

This table shows the scores of the first three participants (V01, V02, V03) for the adjective BIG (the adjective involved is indicated in the top left-hand cell). For

participant V01, the combination VERY + BIG yielded a strength score of 9 on the 11-point scale, indicating that participant's belief that the degree modifier VERY adds considerably to the strength of the adjective, i.e. that VERY BIG is considerably stronger than BIG. This interpretation is based on the assumption that the midpoint on the 11-point strength scale is the point at which the relevant adjective is neutral such that the effect of the degree modifier can then be measured. The column immediately to the right (using the same colour coding) shows the uncertainty score (indicated by the column header U) derived from the strength score, i.e. the participant's view of how certain or uncertain they felt about the strength score they had just recorded. This is an important qualifying element in that it gives a more accurate representation of how that degree modifier/adjective combination is perceived; otherwise the study would be limited to the comparatively one-dimensional 11 point scale, which offers no real insight of the role of metacognitive awareness and second order reasoning discussed in section 1.3.1 above.

Given the size and complexity of the data set with regard to the research questions that gave rise to the study, it was extremely important to choose a method of analysing the data that could effectively reveal relationships between the linguistic variables that could be identified as being statistically significant, and which would support a clear interpretation of the results. The details of this methodology and the outcome of the study are presented in section 4.2 below.

4.2 Statistical Analysis Methodology and Findings of the Study

Selecting the best statistical methodology and tools to analyse this complex data set was difficult. In considering this question, a conflict between the methodologies available and the structure of the data became apparent very quickly. At one level, the

data demanded analysis at a very micro level, such as the significance of the scores in what I will call a '***within combination***' set of data, i.e. the scores for all 60 participants for any one combination of degree modifier and adjective. For example, it is important to understand the variances in scores between all 60 participants for the single combination of VERY + BIG. Equally we need to understand these variances *within* all other combinations of degree modifiers and adjectives.

It is then important to understand the relationships in the test results for what I will call '***between combinations***' scores, i.e. the analysis of the test scores for different combinations of degree modifiers + adjective. For example, it is important to understand the variances in test scores between VERY + BIG, REALLY + BIG, QUITE + BIG, etc. This type of analysis should give us an understanding of the extent to which each degree modifier alters the perception of the strength of the adjoining header.

The third dimension of this is not dissimilar, and is no less important in presenting an inclusive view of the test results. It can also be described as a '***between combinations***' form of analysis, but in this case it focuses on the variances in scores caused by using different adjectives with the same degree modifier, e.g. VERY + BIG, VERY + DIFFICULT, VERY + NICE, etc. This goes towards our understanding of whether, or to what extent, the effect of a degree modifier is moderated by the header it is acting upon.

Finally, the overall data set needs to be analysed at a more global level to identify wider patterns and to understand what the totality of the data set means relative to the research questions. Finding a single statistical methodology, plus the right software and analysis tools to support the various needs above, proved very difficult. A quick and convenient way of summarising the data to combine these macro

and micro approaches would have been to calculate the averages of the test scores for each of the 60 participants, and present them in a simple summary table. However, this approach alone sacrifices the higher resolution that the extensive data set offers, and would have gone against the rationale for undertaking such a detailed and comprehensive study in the first place. The 'within combination' level of analysis would have been almost entirely removed from the analysis, and this in my view would have taken away from the overall integrity of the study.

The challenge then was to identify a statistical analysis methodology that was sufficiently robust to achieve all the above goals, and which could be processed such that the outputs could be easily presented and readily interpreted. Before delving into the technical detail of the statistical analysis methodology, I think it is important to refresh our minds about the research questions that this analysis seeks to address. The results can then be more clearly measured against these questions and the interpretation of the results can revolve around these specific questions:

1. What are the key cognitive linguistic elements that contribute to the communication of the meaning of degree modifiers, and what role does uncertain reasoning play in the conceptualisation and processing of these meanings?
2. What effect do different degree modifiers have on the perceptions of the strength of the header on which they act, and on the certainty of the belief that the degree modifier/header combination represent?
3. Can different headers actually influence the way degree modifiers themselves are perceived and if so how does this manifest itself?
4. What role do collocational or other lexical semantic aspects of language play in moderating the way in which the analysis of degree modifier/adjective combinations should be approached or interpreted?

Realistically, the results of the study alone cannot answer all of these questions, nor were they intended to. The overall answer will be derived from the totality of the content of this thesis, in which I have discussed how people represent beliefs about concepts such as measures of degree, and how these are embodies in degree modifiers. What the study *can* provide is measurable and statistically tested evidence of the effect of degree modifiers in representing degrees of belief, and of the extent to which these beliefs themselves are strongly or weakly held as indicated by the certainty scores associated with each strength score.

Within these research questions in mind, and with a good sense of what the study by itself can contribute, the next stage is to describe the technical detail of the chosen statistical analysis methodology. I have also chosen to discuss the results as they present themselves and to build up a cumulative picture, as I found this more helpful and illustrative than keeping them separate.

4.2.1 Statistical Analysis Methodology and Interpretation of Results

One key characteristic of the study is the way it was structured, i.e. such that each of the 60 participants would complete the questionnaire in a completely consistent and uniform way. In each case they completed an identical questionnaire under the exact same test conditions, and consequently the data in its present format represents a direct 'like for like' comparison between each participant across the entire data set.

This is critically important for a number of reasons. If the study were such that different individuals were used to rate only one (instead of all) degree modifier/adjective combinations (as described above), then a simple linear regression alone would be appropriate. In this case, the design of the study was such that each individual was measured at multiple times under a number of different factors for the

entire degree modifier/adjective combination set. The 'strength' and 'uncertainty' associated with each combination varied for each individual and this was recorded each time. Thus, an appropriate analysis should take into account the repeated measures structure and the variation in strength and uncertainty scores. This is why PROC MIXED in SAS (a popular statistical analysis software suite) was used, i.e. **a linear mixed model**. PROC MIXED is a variation of a standard ***general linear model*** (GLM) that allows for both fixed and random effects. The MIXED procedure fits a variety of mixed linear models to data and enables you to use these fitted models to make statistical inferences about the data. A *mixed linear model* is a generalization of the standard linear model used in the GLM procedure, the generalization being that the data are permitted to exhibit correlation and non-constant variability. The mixed linear model, therefore, provides you with the flexibility of modeling not only the means of your data (as in the standard linear model) but their variances and covariances as well. The primary assumptions underlying the analyses performed by PROC MIXED are as follows:

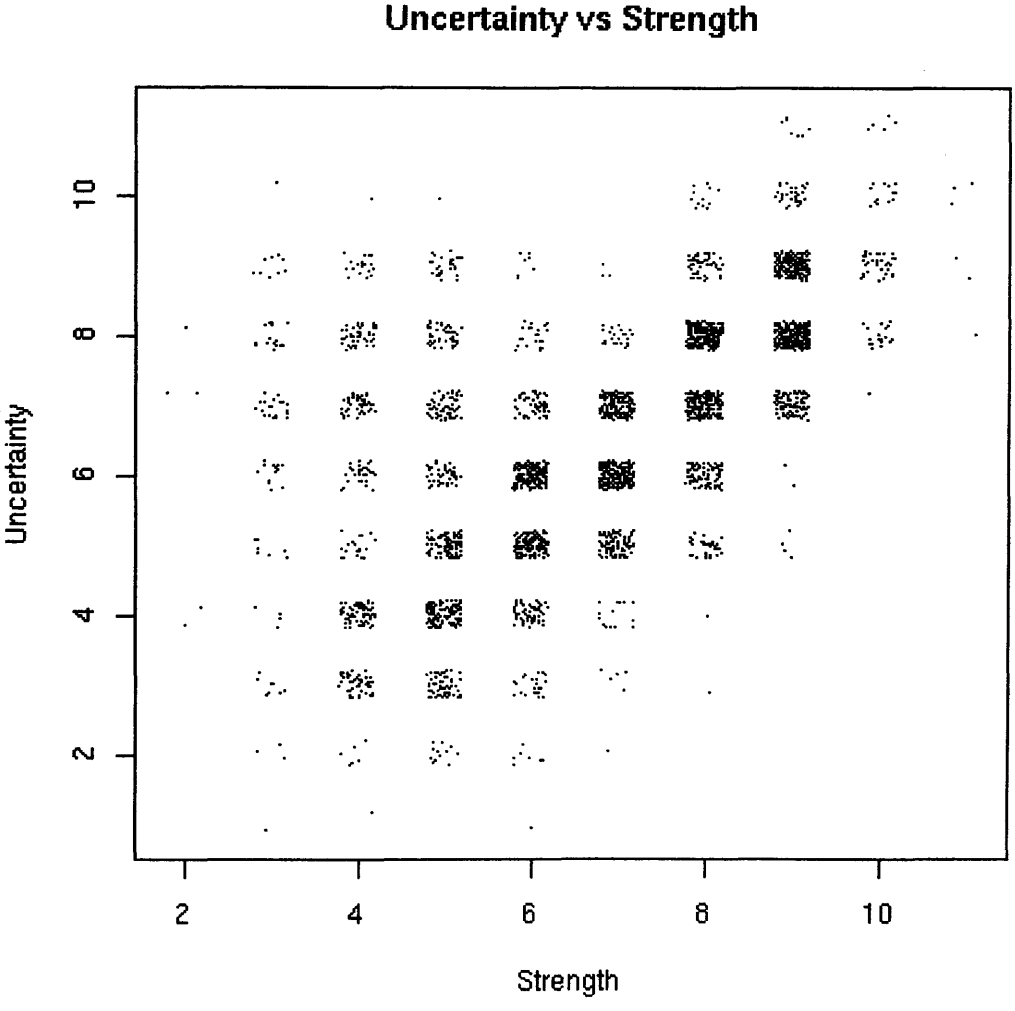
1. The data are normally distributed (Gaussian).
2. The means (expected values) of the data are linear in terms of a certain set of parameters.
3. The variances and covariances of the data are in terms of a different set of parameters, and they exhibit a structure matching one of those available in PROC MIXED.

Since direct interest centred on the values of each of the variables, they were considered as fixed effects for the fitted model. The model was also fitted considering strength as a random effect, to measure its impact on the other coefficients.

Considering the size and complexity of the data set, I felt it important to include as many visualisations of the data and outputs as possible. This is one area in

which both SPSS and SAS are lacking, and for this reason I also chose a statistical analysis software package called Data Desk (version 6.2), which is very effective in presenting data in graphical form. Using this package, I first plotted the entire set of strength and uncertainty scores for all 60 participants on a scatterplot, using the x and y axes to map strength and uncertainty scores respectively, as seen in the figure below.

Figure 4.2: Basic Strength/Uncertainty scatterplot

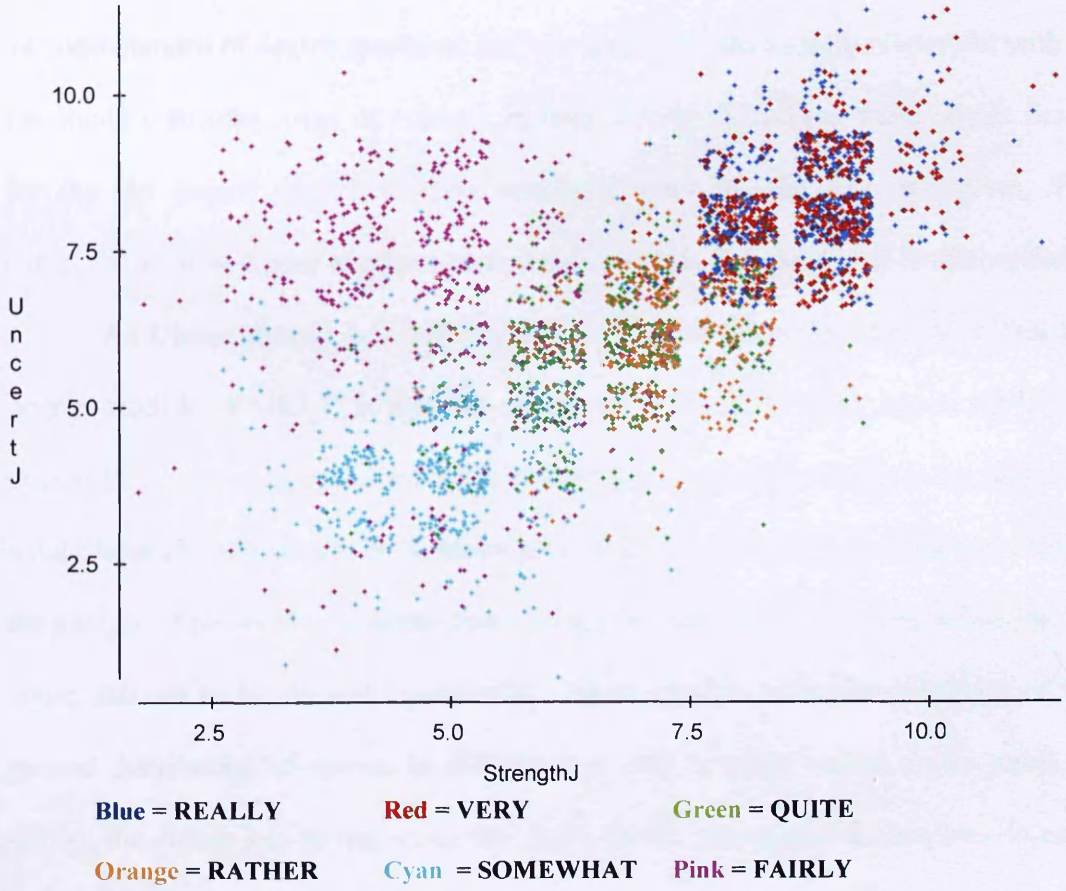


This scatterplot is the most rudimentary form of visual presentation of the full data set in that it does not illustrate which scores relate to the various combinations of degree modifiers and adjectives. However, it is interesting to observe the way the scores are distributed; in particular the diagonal cluster that is apparent in the

scatterplot, which immediately suggests that the distribution is not entirely random. The question then is what combinations of degree modifiers and adjectives give rise to this pattern, which is the next stage of analysis.

For the scatterplot below, the variables 'Strength' and 'Uncertainty' were ***jittered***. That is, a small amount of random noise was added to each of the recorded values. This was done to ensure that the scatterplot allowed each of the observations to be visible (since otherwise, individuals with equal observations would be plotted on top of each other). The scale of the axes below was also adjusted slightly to 'magnify' the scatterplot as much as possible. The colour coding is used to identify the scores per degree modifier without explicit reference to the adjectives used; this level of analysis will evolve later.

Figure 4.3: Jittered degree modifier scatterplot with colour coding



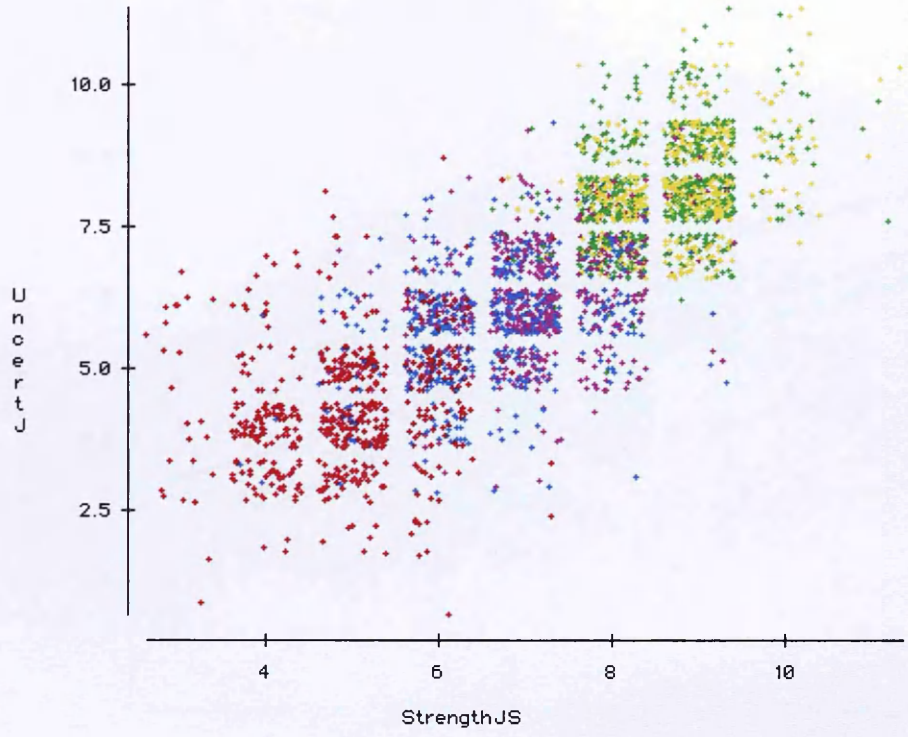
It is clear from this plot that the data for the degree modifier FAIRLY (plotted in pink above) lies far from, and has a different type of relationship with the other variables. This simple visual representation of the distribution of the scores from the study is very useful and gives us some immediate clues above what the data might ultimately tell us. Thus, the relationship between strength and uncertainty is similar between the different degree modifiers, apart from the sixth one (FAIRLY). The actual values of each measure are different for each degree modifier, but this will be examined later.

To progress the analysis further I calculated and plotted the mean scores for the strength and uncertainty scores for all participants. The shift from raw data (as in the scatterplot above) to mean scores is because the raw scores are more useful when considering correlations, whereas the mean scores are more useful when trying to understand the differences in scores between the variables, whether they are degree modifiers or adjectives. For the sake of clarity I have avoided trying to amalgamate the 54 combinations of degree modifiers and words (6 x 9) into a single scatterplot with an inevitably confusing array of colours. Instead, I have plotted the mean scores firstly for the six degree modifiers, then separately later for the nine adjectives. The combination of both was of course completed, which is discussed later in this section.

As I have already pointed out, it is clear from the scatterplot above that the degree modifier FAIRLY is atypical compared to the other five degree modifiers. Given this, I chose to exclude FAIRLY from the scatterplot below, as its inclusion would have skewed the analysis, although it will of course ultimately be included in the analysis. Specifically, it would have caused the slope of the regression line for the entire data set to be skewed considerably, which would not be representative of the general distribution of scores. In shifting from raw to mean scores, I also chose to change the colour key to maximise the clarity of the subsequent scatterplots. In each

individual scatterplot the colour key is provided although it remains unchanged between them.

Figure 4.4: Scatterplot of mean scores of degree modifiers excluding FAIRLY

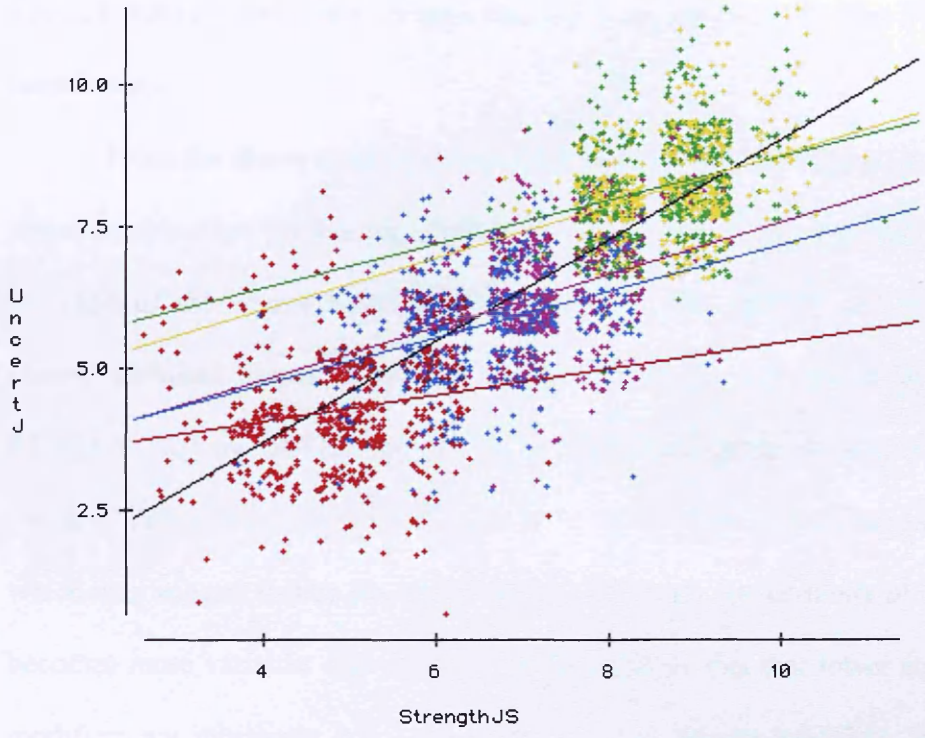


Green = VERY Yellow = REALLY Blue = QUITE
Purple = RATHER Red = SOMEWHAT

As expected, plotting the mean scores by degree modifier creates identifiable and distinct clusters with varying degrees of overlap. Both VERY and REALLY are almost identically distributed, RATHER and QUITE have similar distributions, and SOMEWHAT is reasonably distinct from the other degree modifiers. The most effective use of this output is achieved by adding coloured-coded (using the above colour key) regression lines to illustrate how the intercepts and slopes differ for each of the degree modifiers. Linear regression is a technique in which a straight line is fitted to a set of data points to measure the effect of a single independent variable. The

slope of the line is the measured impact of that variable. The slope of the line is its angular degree, and the intercept is where a regression line cuts the origin.

Figure 4.5: Scatterplot of mean scores of degree modifiers with regression lines



Green = VERY **Yellow = REALLY** **Blue = QUITE**

Purple = RATHER **Red = SOMEWHAT**

From the above scatterplot, the following features can be observed:

- All the coloured slopes are less than that of the overall regression (denoted by the black line)
- The intercepts for groups to the right are greater than those to the left.
- The coloured lines agree with the black line in the area supported by data, i.e. the data for each colour can only be related to the area of the black line for that degree modifier, and not beyond.

The next question is how the distribution of the regression lines relative to each other combined with the above observations can be interpreted. In preparing this interpretation, a few points need to be borne in mind. If the line around which the

points tend to cluster runs from lower left to upper right, the relationship between the two variables is positive (direct), but if the line around which the points tend to cluster runs from upper left to lower right, the relationship between the two variables is negative (inverse). Furthermore, the more the points tend to cluster around a straight line, the stronger the linear relationship between the two variables (the higher the correlation).

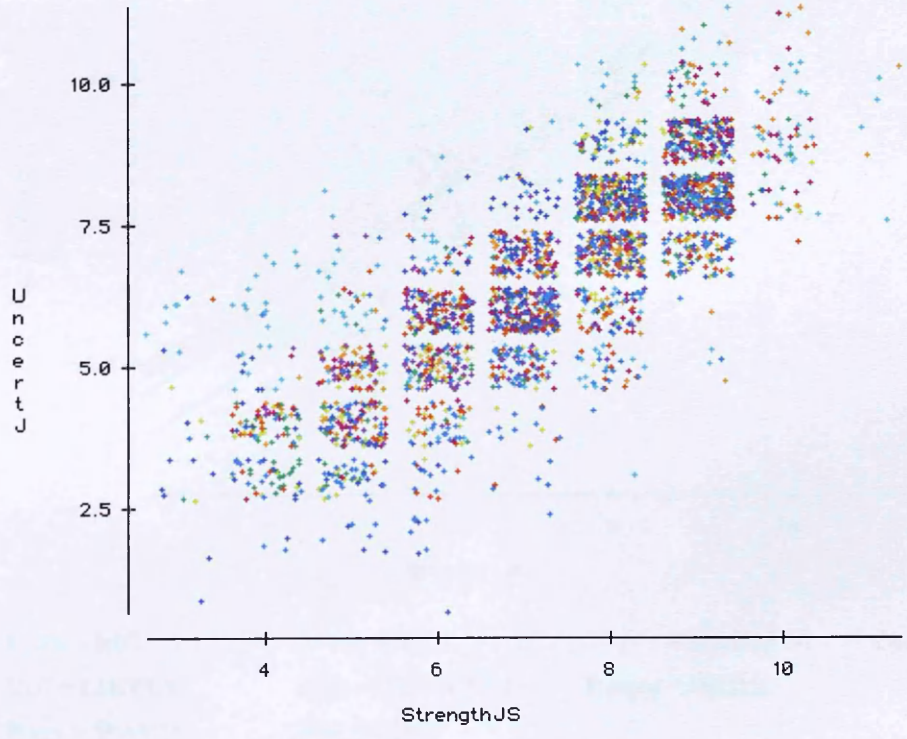
From the above scatterplot we can clearly see that all regression lines indicate direct relationships (to varying degrees) between the strength and uncertainty scores for each of the degree modifiers. VERY, REALLY, QUITE and RATHER have almost identical slopes, and very similar intercepts are shared by VERY and REALLY, and by QUITE and RATHER. The distribution of plots shows that the 'weaker' degree modifiers (i.e. those with lower strength scores) are more scattered, which may suggest that as perceived strength decreases, the certainty of the perception becomes more variable. One might hypothesise from this that lower strength degree modifiers are inherently less certain than stronger degree modifiers, but as yet the evidence is not sufficiently conclusive to make such an assertion.

To develop the analysis further, I decided to repeat the above process, this time using colour coding to illustrate how the scores were distributed among the nine adjectives. This is useful because it provides information as to whether the adjectives themselves moderate the strength of the degree modifier, e.g. does the strength of VERY differ when combined with the adjectives BIG or WARM. A consideration here from a purely linguistic point of view is that for each test sentence the degree modifier naturally preceded the adjective, and this naturally shifts the emphasis towards the degree modifier, thereby potentially reducing the effect of the adjective itself. Also, in spoken language, people are more likely to vary their intonation around

the degree modifier than the adjective if they want to achieve an emphasis effect, and one might ask whether this plays some part, however indirect, in the perceptions of the sixty participants, even though the test sentences were never actually spoken aloud.

The scatterplot below uses the same approach as before, i.e. it plots mean scores for strength and uncertainty, this time illustrating the distribution by adjective rather than degree modifier.

Figure 4.6: Jittered adjective scatterplot with colour coding

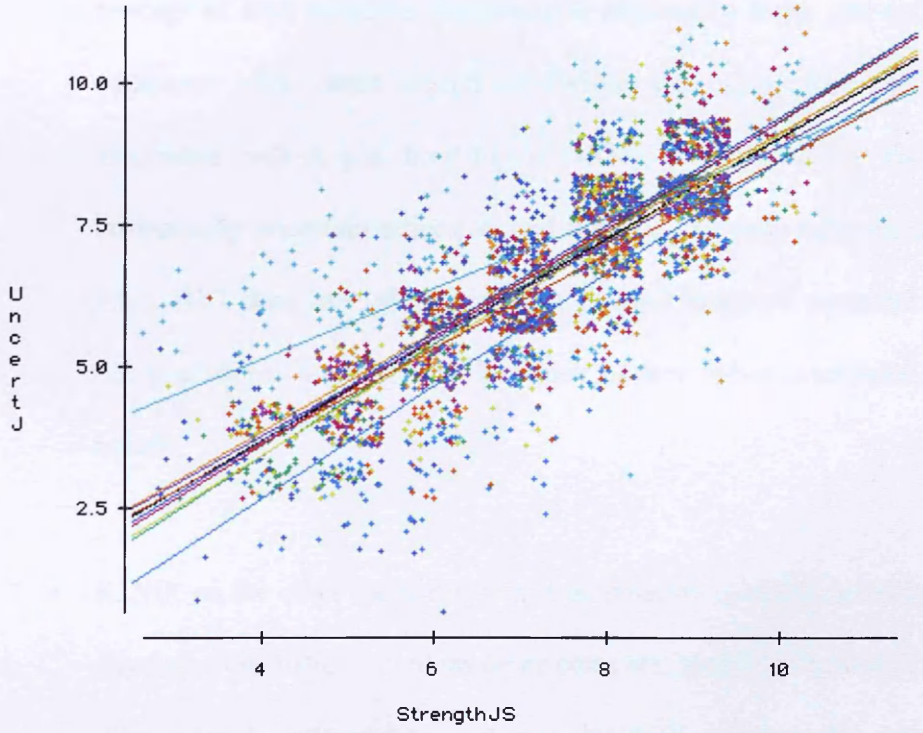


Cyan = BIG Green = NICE Yellow = HAPPY Orange = BAD
Red = LIKELY Pink = DIFFICULT Purple = WEAK
Navy = WARM Blue = KIND

The overall pattern here is very distinct. There is a clear diagonal cluster with a good degree of overlap between the plots for the nine adjectives, to the extent that the plots for the individual adjectives are difficult to see because of the level of overlap. Upon close examination, we can see that the plots for each adjective are

typically scattered along the full length of the diagonal, which contrasts with the scatterplot for the degree modifiers where each was confined to one particular area along the diagonal length. Adding regression lines (below) serves to further confirm the consistency between the different adjectives.

Figure 4.7: Scatterplot of mean scores of adjectives with regression lines



Cyan = BIG Green = NICE Yellow = HAPPY Orange = BAD
Red = LIKELY Pink = DIFFICULT Purple = WEAK
Navy = WARM Blue = KIND

This shows the relationship is approximately constant across different adjectives. The overall regression line is black and is buried in the centre of the plot. It might be noted that there is some evidence that BIG (cyan) and KIND (blue) have different slopes and intercepts to the rest of the group. BIG has higher scores along the diagonal than all other adjectives, whereas KIND has lower scores. From a linguistic point of view,

there are a number of reasons why BIG and KIND might be exceptional. There are two key observations that can be made about this:

- **BIG** refers to an attribute that is often physical and observable, e.g. a BIG dog. While this is not always the case, e.g. a BIG problem, this adjective does have an association with size or scale, either absolute or relative. In this regard the concept of BIG could be described as reasonably finite and solid, especially compared with other adjectives. While BIG does have some fuzziness associated with it (i.e. how big is BIG?), it could not be described as an intrinsically uncertain adjective, and the data certainly supports this assertion. Also, BIG does not offer a wide or diverse range of potential meanings or interpretations, a point that becomes clearer when contrasted with KIND below.

- **KIND**, on the other hand, refers to a personality trait that is neither visible nor physical. It is difficult to measure or compare, possibly because its definition is more open to interpretation or may be more contextually bound. So what exactly does KIND mean? Arguably, it could be replaced by a number of other adjectives (such as generous, warm, gentle, nice) depending on what exactly was intended. In this regard it is clear that, at least compared to BIG, the adjective KIND is relatively uncertain, and again the data supports this. Using the terms from section 1.4.3 above, KIND appears to contain three different types of uncertainty: **ambiguity** (what the word actually means), **vagueness** (lack of definition around each individual interpretation of the word) and **fuzziness** (lack of parameter definitions that distinguishes or differentiates it

from other similar adjectives). Furthermore, as identified in section 3.3.4 above, KIND relative to the other adjectives exhibits low raw frequency of occurrence within the BNC and is also exceptional in that a different part of speech (NN1) substantially outnumbered the occurrence of the adjectival form (AJO).

The other adjectives have very similar regression lines and as such there are no major differences between them from which any important conclusions can be drawn.

At this stage I have analysed the distribution of strength and uncertainty scores using both degree modifiers and adjectives to plot the scores. While there is some evidence that the adjectives themselves do moderate the effect of the degree modifier, this effect is not major. There are far more notable differences in the scores for degree modifiers, and FAIRLY in particular seems to have some interesting characteristics compared to the other degree modifiers. In order to more fully understand the very complex relationship between the degree modifier/adjective and strength/uncertainty relationships, a more quantitative analysis of the data is required using the combination of simple and mixed linear models described earlier in this section. To achieve this I have used **residual analysis** - residuals are differences between the observed values and the values predicted by the model. Analysis of residuals allows the estimation of the adequacy of a model for particular data, in this case the data set generated by the study.

The analysis of residuals plays an important role in validating the regression model. If the error term in the model satisfies the model assumptions, then the model is considered valid, and if the model fits well then it can also have a useful predictive value. The primary reason why a simple linear regression would be inappropriate in this circumstance is that the correlation in the subject specific residuals could breach

the model assumptions. In order to examine this, a linear model was fitted to the (original, unjittered) data, and residual analyses carried out. The output of the regression model (using SPSS 11.5) that included just 'Strength' is as follows:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.814	.662	.662	1.047

a Predictors: (Constant), Strength

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5784.924	1	5784.924	5279.516	.000
	Residual	2956.280	2698	1.096		
	Total	8741.204	2699			

a Predictors: (Constant), Strength

b Dependent Variable: Uncertainty

Coefficients

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	7.635E-03	.093		.082	.934
	Strength	.910	.013	.814	72.660	.000

a Dependent Variable: Uncertainty

The residuals were examined, and are consistent with the requirements for the model fitted. In addition, the residuals for each individual were examined in turn. There did not appear to be evidence of a correlation in these for each individual.

Figure 4.8: Studentised residual analysis

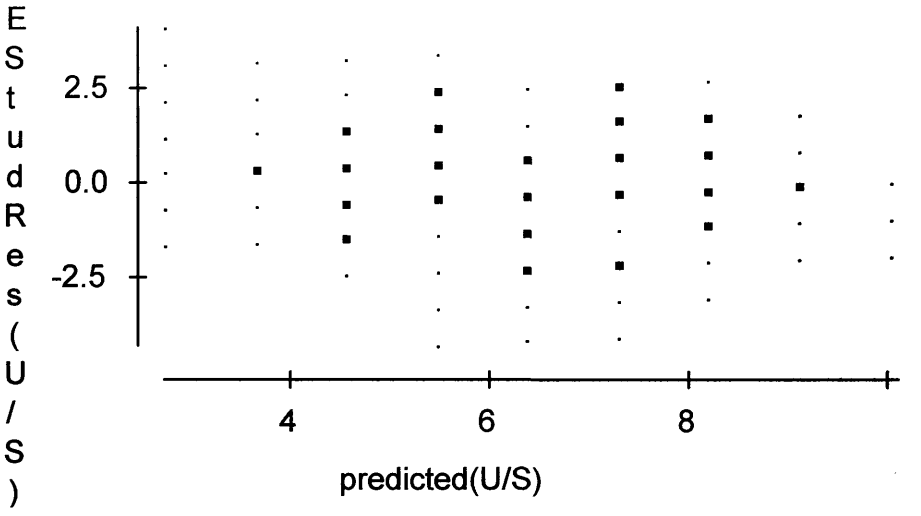
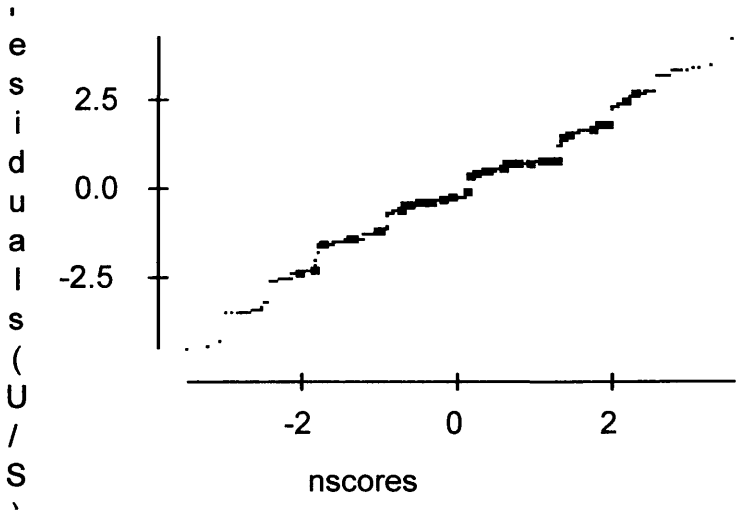


Figure 4.9: nScores versus Studentised residuals



The above graph shows *nscores* versus *studentized residuals* for participant 60. The stepped nature of curve is a feature of the discrete data. The studentized residual, also known at the standardized residual, is simply the raw residual divided by this standard error. An **error** is the amount by which an observation differs from its expected value. **Residuals,** as mentioned earlier, are differences between the observed values and the values predicted by the model, i.e. an observable estimate of the unobservable error.

For example, take a random sample of n women whose ages are measured. The sample average is used as an estimate of the population average.

- The difference between the age of each woman in the sample and the unobservable population average is an error, and
- The difference between the age of each woman in the sample and the observable sample average is a residual.

It is very important to understand the difference between errors and residuals in statistics. Consider the simple linear regression mode

$$Y_i = \alpha_0 + \alpha_1 x_i + \varepsilon_i,$$

where the **errors** ε_i, $i = 1, ..., n$, are independent and all have the same variance σ^2. The **residuals** are not the true, and unobservable, errors, but rather are *estimates*, based on the observable data, of the errors. When the method of least squares is used to estimate α_0 and α_1, then the residuals, unlike the errors, cannot be independent since they satisfy the two constraints

$$\sum_{i=1}^{n} \widehat{\varepsilon}_i = 0$$

and

$$\sum_{i=1}^{n} \widehat{\varepsilon}_i x_i = 0.$$

(Here ε_i is the ith error, and $\widehat{\varepsilon}_i$ is the ith residual)

Moreover, the residuals, unlike the errors, do not all have the same variance: the variance increases as the corresponding x-value gets farther from the average x-value. The fact that the variances of the residuals differ, even though the variances of the true errors are all equal to each other, is the principal reason for the need for Studentization.

The studentized residual = residual / $s_{residual}$, where $s_{residual}$ is the estimated standard error of the residual when the line is fit using all data values except the one for which the residual is being computed. These studentized deleted residuals therefore measure how many standard deviations each point is away from the line when the line is fit without that point. In moderately sized data sets (such as the one generated by this study), studentized residuals of 3.0 (+ or -) or greater in absolute value may well indicate outliers, which should be treated separately. We can see from the graph above that the scores fall within these parameters, and consequently a separate analysis of outliers is not necessary.

The pattern of residuals for models including adjectives and degree modifiers were similarly examined. The fitting of the model incorporating repeated measures for each subject for adjective and degree modifier was carried out using MIXED in SPSS version 11.5. The syntax and the output for the fitted model are presented separately below. However, the fitted values are worthy of note, and those values are included here for comment.

The two elements that need to be examined when considering the broader analysis of the results of the study are the **main effects** and the **interactions** (also known as interaction effects). It is important to understand what these mean and how they can be used to enhance our understanding of what the data is telling us. The **main effect** is how one variable affects the outcome. For example, the main effect of BIG is the 'average' extent to which using BIG will affect uncertainty. It may be thought of as how uncertainty will change, holding all else constant. Note, however, that interactions can be critical to how main effects are interpreted. The **interaction** is how the combination of two factors or covariates influences the outcome. For example, the main effect of the adjective could be high, but interaction with strength, say, could be

negative. Thus, to find out how a particular adjective influences uncertainty, holding all else constant, one has to add the main effect plus the interaction at whatever level of strength is being held constant. Note that, for example, the adjective/strength interaction is large whereas strength/degree modifier interaction is small. This means that if you change degree modifier you only need to consider the main effect of the degree modifier, not the interaction.

The intercept for BIG (ADJ 1) is high, which is consistent with the plot, and the intercept for NICE (ADJ 2) is low, again consistent with the plot. ADJ 9 (KIND) was taken as the reference. There is not much difference between the other adjectives. The degree modifier 6 (FAIRLY) was excluded for the reasons discussed earlier. The other degree modifier intercepts relate to the position of the degree modifier in relation to 'strength'. The early degree modifiers (e.g. VERY, REALLY) have high values of strength, and it is clear that there is a scalar relationship between degree modifiers based on their perceived strength. The interaction of slope with degree modifier and the high intercepts are compatible with the lines fitted. The main effect of strength is reduced, since the intercepts for adjective and degree modifier factors account for some of the scores on the uncertainty measure. It is worth noting in particular that the adjective/strength interactions tend to compensate for the non-zero intercepts – that is where the intercept is high, the slope is low. This is characteristic of the highly mixed scores (in terms of their distribution) and the consistencies in regression (in terms of their values) for the adjectives, which indicates the lesser effect they have relative to the effect of the degree modifiers. As has been observed, the relationship between measurements for each individual is not strong. That is, the use of a repeated measures design is not critical, and similar conclusions would be reached

by fitting a simpler (if less correct) model. Thus, the findings are not sensitive to modelling assumptions.

At this stage three different statistical processes have been employed in the analysis of the data. A ***mixed linear model*** was used which took account of the repeated measures aspect of the data. A ***regression model*** was then used which allowed some useful comparisons and visualisations to be drawn from the complex data set. Finally, a ***residual analysis*** was used to test the validity of the model and its fit with the data set. All contain a fair element of technical complexity, and there is always a danger that the desired understanding of the data will be lost in these complexities and details. Consequently, the next section will focus on summarising the findings of the various analyses and drawing more qualitative conclusions in light of the broader content of this thesis.

4.2.2 Comparing the Collocational and Experimental Analyses

From the above sections we can see that a reasonably rigorous methodology, both in terms of analysis and statistical integrity, was applied to the evaluation of the experimental data. In Chapter 4 this analysis so far has focused exclusively on the results of the experimental study and has not taken into consideration the issue of whether collocations between the chosen degree modifiers and adjectives have any influence or relevance on this data. This, as indicated in section 3.3.5, is an element that has been introduced as an additional part of the thesis, so does not represent a consideration that was entertained from the outset. As a consequence, there is not an integrated methodology to truly bring both elements together; this I would see as an important part of future research as such possible relationships would be an interesting area of exploration. I have focused therefore on a more descriptive than

methodological approach and have looked below at whether there appears to be any observable relationships between the collocations from Chapter 3 and the strength/uncertainty relationships identified in the above sections of Chapter 4. One of the issues in this analysis is how to look at the relationship between *collocations* instead of just the relationship between the individual frequencies of degree modifiers and adjectives relative to their perceived strength and certainty. This presents a difficulty because the analytical methodology and consequent visual presentations were not structured from the outset to achieve this.

I will firstly re-introduce figure 3.4 which illustrates in tabular form the collocations frequencies between the selected degree modifiers and adjectives:

DM	BIG	DIFFICULT	KIND	BAD	WEAK	HAPPY	WARM	LIKELY	NICE
VERY	472 (89.2)	2052 (434.4)	365 (69.9)	465 (115.8)	147 (76.5)	730 (212.3)	128 (46.4)	317 (61)	1419 (391.8)
REALLY	149 (43.2)	58 (16.4)	11 (0.4)	207 (80.7)	4 (2.1)	69 (29.7)	34 (18.7)	14 (1.4)	384 (164.7)
FAIRLY	20 (15.4)	8 (6)	0 (0)	5 (4.4)	13 (28.3)	13 (15.1)	4 (5.7)	1 (-0.3)	1 (0.3)
RATHER	9 (2.1)	112 (54.3)	0 (0)	15 (17.4)	33 (40.6)	3 (0.6)	5 (3.4)	1 (-1.6)	91 (58)
QUITE	93 (28.3)	209 (72.6)	8 (-0.1)	32 (11.6)	9 (7)	563 (277.8)	33 (19.8)	190 (63.6)	328 (151.9)
SOMEWHAT	0 (0)	14 (14.1)	0 (0)	0 (0)	2 (5)	0 (0)	1 (1.4)	0 (0)	0 (0)

And also the raw frequencies of individual degree modifiers and adjectives from figure 3.6:

Degree Modifier	Frequency
VERY	113,282
REALLY	46,467
FAIRLY	6,584
RATHER	20,531
QUITE	39,895
SOMEWHAT	4,495

Adjective	Frequency
BIG	24,433
DIFFICULT	21,621
KIND	1,041
BAD	14,493
WEAK	3,477
HAPPY	11,340
WARM	6,060
LIKELY	21,177
NICE	11,703

It is important to focus on the collocational table above from figure 3.4 and to understand the key messages from this before using these to compare against the findings of the experimental study data. For this reason I have used the data from table 3.4 to rank the top twelve collocations by frequency. I have chosen twelve instances simply because using the full set of combinations (54 in total) would be onerous. I have chosen the top twelve (as opposed to the lowest twelve) because, as I have mentioned in the section 4.3 below, the study would might have been improved by including degree modifiers at the lower end of the strength scale, such as BARELY. Also, the lowest twelve scores would mainly be zeros, which would not be useful.

Figure 4.10: Top 12 degree modifier/adjective collocations by frequency

Rank Order	Collocation	Frequency
1	VERY DIFFICULT	2,052
2	VERY NICE	1,419
3	VERY HAPPY	730
4	QUITE HAPPY	563
5	VERY BIG	472
6	REALLY NICE	384
7	VERY KIND	365
8	QUITE NICE	328
9	VERY LIKELY	317
10	QUITE DIFFICULT	209
11	REALLY BAD	207
12	QUITE LIKELY	190

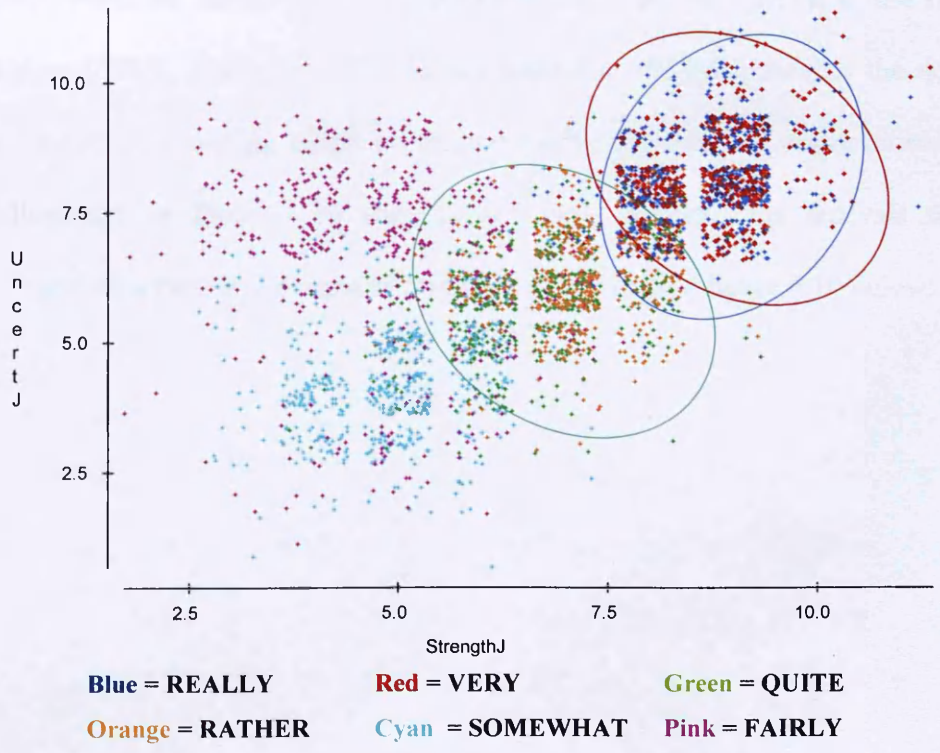
The results here are quite surprising in some ways. The top twelve collocations involve only three degree modifiers (VERY, QUITE, REALLY) – this is not that surprising in itself (given that they represent 50% of the total number of degree modifiers), but what *is* interesting is that they do not follow the pattern identified by the strength/uncertainty analysis in the experimental study. I will first present the rank ordering of the three degree modifiers identified above:

Figure 4.11: Top 3 degree modifiers by ranking and occurrence

Degree modifier	Ranking	Occurrences
VERY	1, 2, 3, 5, 7, 9	6 (50%)
QUITE	4, 8, 10, 12	4 (33%)
REALLY	6, 11	2 (17%)

We can now compare these collocational patterns with those of the degree modifiers from the experimental study as illustrated in figure 4.12 below:

Figure 4.12: Top 3 degree modifiers by collocation mapped to scatterplot



The above figure 4.12 is an adaptation of the original 4.3 figure, which illustrates the jittered distribution of scores for the six degree modifiers against both strength and uncertainty scales. In this case I have added circles to emphasise the clusters (excluding a few outliers) that characterise the distributions of VERY (red circle), REALLY (blue circle) and QUITE (green circle) on the scatterplot. VERY has relatively high strength and uncertainty scores, and also ranks highest of the degree modifiers as illustrated in figure 4.11 above. REALLY however, despite having a high individual frequency of occurrence in the BNC, scored considerably below QUITE in figure 4.11, which had a lower individual frequency of occurrence in the BNC.

We can immediately see that there is a considerable difference between the rankings of the top three degree modifiers and their behaviour on the strength and uncertainty scales. There does not initially therefore appear to be an argument that there is a direct correlation between collocational frequency (based on the rankings in table 4.11) and perceptions of the strength/uncertainty of these three modifiers; if there were, we would expect to see REALLY ahead of QUITE in the ranking, but below VERY. However, we have not looked at the behaviour of the adjectives in terms of their ranking based on the top twelve instances of collocational frequency (illustrated in figure 4.10 above), so I will perform this analysis now before commenting further. For ease of reference I have copied figure 4.10 below:

Rank Order	Collocation	Frequency
1	VERY DIFFICULT	2,052
2	VERY NICE	1,419
3	VERY HAPPY	730
4	QUITE HAPPY	563
5	VERY BIG	472
6	REALLY NICE	384
7	VERY KIND	365
8	QUITE NICE	328
9	VERY LIKELY	317
10	QUITE DIFFICULT	209
11	REALLY BAD	207
12	QUITE LIKELY	190

Figure 4.13: Listing of adjectives from collocational frequency table

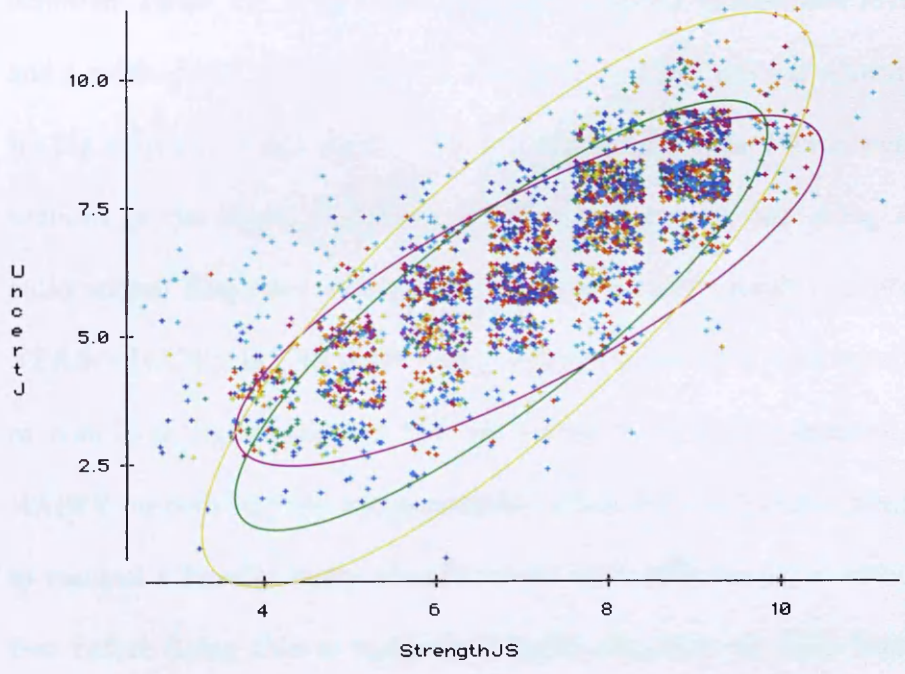
Adjective	Ranking	Occurrences
NICE	2, 6, 8	3 (25%)
DIFFICULT	1, 10	2 (17%)
HAPPY	3, 4	2 (17%)
LIKELY	9, 12	2 (17%)
BIG	5	1 (8%)
KIND	7	1 (8%)
BAD	11	1 (8%)

In this case I have described figure 4.13 above as a 'listing' of the adjectives, as they do not form a clear ranking either in terms of rank order or number of occurrences in the same way that the degree modifies did. This is partly due to the number of adjectives in the top twelve (7 in total from a possible 9), plus the fact that their rankings were far more scattered and appeared to occur in a more arbitrary manner. For example, it is debatable where DIFFICULT and HAPPY could be placed in rank as they all occur twice but have different rankings. LIKELY is however likely to feature both as its rankings are relatively low (9 and 12), despite having the same number of occurrences.

If we were looking at a larger or more complex data set then I would use one of many standard methodologies to present weighted rankings, or alternatively develop a more customised algorithm to process the data in more specific and optimal ways. However, the data from the collocational frequency table and from other areas of analysis such as those in chapter 3 is quite straightforward and does not really merit such endeavours, at least given the present structure of the experimental study. There are other reasons why I feel that an exclusively quantitative approach might be flawed, and I have identified these reasons in section 4.2.3 below.

I will now repeat the same process for top three adjectives as I conducted for the three degree modifiers (using the top seven would make the scatterplot completely unintelligible), i.e. to examine the ranking (or listing) of adjectives compared to their distribution on the strength/uncertainty scatterplot:

Figure 4.14: Top 3 adjectives by collocation mapped to scatterplot



Cyan = **BIG** Green = **NICE** Yellow = **HAPPY** Orange = **BAD**

Red = **LIKELY** Pink = **DIFFICULT** Purple = **WEAK**

Navy = **WARM** Blue = **KIND**

The distribution of adjectives is clearly very different that those of the degree modifiers. As we had seen from the original scatterplot of adjectives on the strength/uncertainty scales (figure 4.6), each adjective shows high levels of variability of scores and are highly scattered. There is also no discernable relationship between the distributions of adjectives in the collocational frequency table (figure 4.10) and the patterns observed in the scatterplot in figure 4.14. Although I have only mapped NICE, DIFFICULT and HAPPY, it is clear that the other four adjectives would be similarly distributed on the scatterplot.

There are a number of inherent difficulties in using collocational frequency to investigate any relationship or correlation between degree modifier/adjective collocation and their behaviour along the strength and uncertainty scales. Firstly, we are approaching this analysis with no clear hypothesis in mind, which means that there is no specific focus for the investigation and nothing in particular to validate or disprove. To do this would have required an extensive literature review beforehand and a more considered approach to which degree modifiers and adjectives to combine for the purposes of this thesis – this is a self-criticism that I have mentioned in other sections of the thesis. Furthermore, there is a danger that using a rather simple collocational frequency measure which gives a single result (e.g. the frequency of VERY + HAPPY is 730) is not highly informative in itself, and is unlikely to explain or contribute significantly to how we interpret the highly scattered distribution of HAPPY on both strength and uncertainty scales. I suspect that it would be necessary to conduct a broader study of collocations with each degree modifier and adjective first before being able to make meaningful comments on their likely influence on issues such as perceptions of strength and the certainty of these beliefs. This again is a

possible area of future research, and I believe is a necessary aspect of research on degree modifier/adjective combinations.

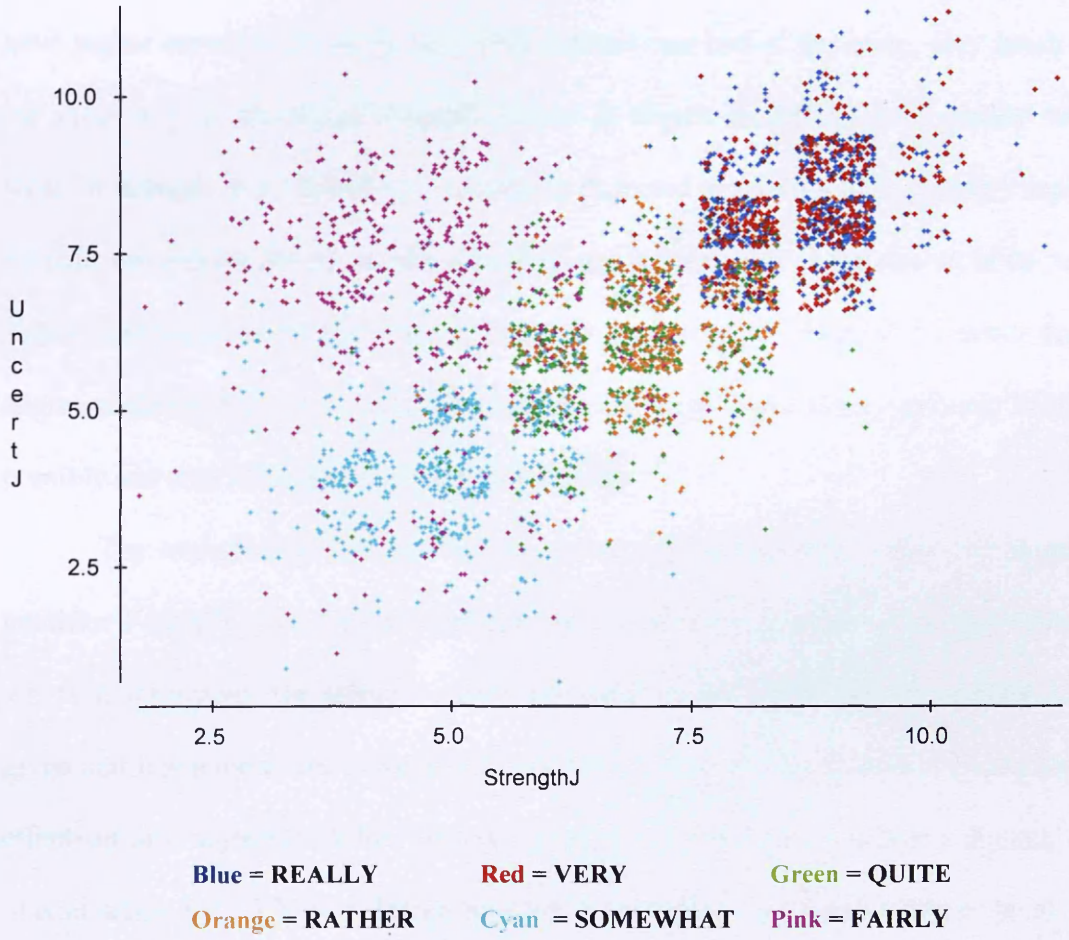
In the same way that FAIRLY generated some interesting results during the original experimental study in this chapter, QUITE is the only degree modifier that produced a really interesting result in this smaller area of analysis. It is important to bear in mind however that any influence would have been derived from the participants' prior knowledge or beliefs about each degree modifier and adjective, as there were no variations in the frequency of occurrence of either during the experimental study itself; each participant was asked a total of 54 questions representing 6 degree modifiers and 9 adjectives, so no individual combination occurred more frequently during the experiment than another. The question then is whether the collocations with particular adjectives caused or contributed to the behaviour of FAIRLY and QUITE, and at this stage there is no conclusive evidence that this is the case. There are other likely factors that should also be borne in mind, and I have included these in my conclusions in section 4.2.3 below.

4.2.3 Conclusions and Comments

This study generated quite an extensive and complex data set, not least from the point of view of statistical analysis. As mentioned earlier, there was no single approach or methodology that could analyse the data such that conclusive and complete outputs could be generated, and this was both the challenge and rationale in employing a combination of different methodologies. It is important then to bring all three chosen methods together at some level, even if it cannot be done computationally. Also, the degree modifier FAIRLY needs to be considered more fully, as it was excluded (for good reasons) from several of the analyses above. In

pursuing this discussion I have copied some of the scatterplots from the previous section for ease of reference.

It is clear from the analysis above that the study participants held reasonably consistent perceptions regarding the strength of the degree modifiers. This can clearly be seen in the distribution of score clusters in the jittered scatterplot below (from figure 4.3):



A number of observations can be made about this scatterplot. It would appear that the 'stronger' degree modifiers, i.e. those with higher strength scores, are more tightly clustered around the diagonal and are generally less scattered in their distribution. They also have the highest certainty scores relative to the other degree modifiers. Equally, the 'weaker' degree modifiers are noticeably more scattered, and with the

exception of FAIRLY, have lower certainty scores. The diagonal clustering in itself suggests that as strength decreases, so does the certainty of the perception. In some regards this is a little surprising. It could be argued that one might expect a more normal distribution of scores across the interaction between strength as uncertainty. What this means is that stronger scores will be highly certain, more moderate strength scores will be more uncertain, but that very low strength scores will be highly certain. It is this last element that is contentious, i.e. arguably the lowest strength scores should have higher certainty scores as they tend towards one end of the scale, very much in the same way as the higher strength scores. A degree modifier that is clearly very weak in strength, e.g. 'BARELY', should be expected to return a high certainty score. Perhaps one reason for the distribution of scores in this study is the choice of the test degree modifiers themselves. Had a distinctly weaker or extreme (at the lower end) degree modifier been included, this phenomenon might have been captured. This is possibly one area of exploration for future studies.

The exception to the way that the scores are distributed is clearly the degree modifier FAIRLY. The way it contrasts clearly, at least in terms of its uncertainty scores, is intriguing. The strength scores associated with FAIRLY are not unsurprising given that it is a moderate to weak degree modifier, which tends to have a 'lukewarm' effect on any adjective. While its uncertainty scores are quite widely scattered, in overall terms FAIRLY is a degree modifier that clearly has a much higher level of certainty associated with it, particularly when compared with SOMEWHAT, which has similar strength scores. This is puzzling as it goes against the notion of the linear relationship between strength and uncertainty suggested by linear regression and by the observable distribution of the scores above.

Paradis (1997: 147) points out that the strength of degree modifiers does not attract consensus. She refers to the fact that Leech and Startvik (1994: 113) contend that *quite*, *rather*, *fairly*, *pretty* all slightly intensify the meaning of a scalar adjective, whereas Collins (1990: 94) claims that they all reduce the strength of a qualitative adjective. These degree modifiers lack specificity in that they are "lexically bleached and semantically vague" (Paradis 1997: 147). It is clear from this analysis that the test participants answered in a highly consistent manner and that the only degree modifier that demonstrated any significant deviance from the rest of the group was FAIRLY. The exact reason for this is unclear, but the data itself was quite explicit about this fact.

Other than that, it can be observed that 'stronger' degree modifiers, i.e. those that intensify or emphasise the scalar strength of an adjective, attract high levels of certainty in those beliefs. Examples of these degree modifiers include VERY and REALLY. This can be seen in the close grouping in the scatterplots and the low degree of variance in the raw data.

'Weaker' degree modifiers, i.e. those that reduce the scalar strength of an adjective, attract lower levels of uncertainty, and with the exception of FAIRLY there appears to be a linear relationship between the reduction in strength and the reduction in certainty. As mentioned above, it would have helped to have included a pronounced telic modifier such as BARELY, as arguably this 'weak' degree modifier should have strong levels of certainty associated with it as it avoids being "lexically bleached and semantically vague (Paradis 1997: 147 from above paragraph).

Finally, the residual analysis established the integrity of the statistical model used for this research, in that it provided us with an estimation of the adequacy of a model for particular data, and the analysis clearly demonstrated adequacy in this

regard. This is possibly an approach therefore that can contribute to similar analyses in future for other researchers, as would a more detailed and rigorous examination of the possible influences of degree modifier/adjective collocations.

With regard to the consideration of collocations as a possible area of research, I have one major concern about a purely quantitative approach to integrating the data from the analysis of collocations with those of the experimental study, whether from the data in this thesis or from a completely different study. It is clear even from my limited exploration of collocations in chapter 3 that collocations can occur for many reasons and that their effects (from the standpoint of social or psychological salience, for example) could possibly be very varied (although this would need to be established in more concrete terms). Moreover, the selection of degree modifiers and adjectives would need to occur from the outset with their collocations in mind, i.e. there is little point in choosing combinations that are highly incongruous. This is one area where I have to criticise my own selection of degree modifiers – including SOMEWHAT caused some problems when it came to analysing collocations as the combination with adjectives were highly incongruous and consequently generated limited and uninformative results in terms of collocations frequency. Other degree modifiers (such as REALLY, discussed above) may have other properties that may influence how an analysis might be interpreted. My point therefore is that not all combinations can be treated as equivalent, yet an exclusively quantitative approach would do exactly that, as it would be difficult to build such considerations into the model assumptions. At the very least there would need to be a strong element of consideration about how an integrated experiment should be constructed, which combinations should be used, what statistical methodology should be used and in particular how the results should be interpreted.

4.3 Summary

In many regards the findings of the experimental study in this thesis raises more questions than answers. It establishes (with one exception) a linear relationship between perceptions of scalar strength and uncertainty, and goes some way to identifying the 'pecking order' of the chosen degree modifiers in terms of their relative strength. It does appear that the adjective can influence the perception of strength more than uncertainty, although the 'why' questions remains unanswered. I believe this would involve a more detailed study bringing many other factors such as intonation and more complex representational scales into consideration.

The inclusion of a study of collocations in chapter 3 was particularly useful and definitely contributed to the depth of the research. However, this was included relatively late in the research, which meant that the study of collocations (chapter 3) and the study of perceptions of strength and uncertainty (chapter 4) could not be more integrated. I am convinced that the overall study would have benefited from a more integrated approach using both elements, whereas in its current form this thesis keeps the two reasonably separate. This is a frustration that the benefit of hindsight does not sate, and is a dimension that I would have liked to address. I have to some extent begun this process by including section 3.3.5 in the final version of this thesis, which looks at the issues in integrating the analysis of collocations with the experimental study, and by adding a new subsection (4.2.2) to the thesis to look at the combination of collocational frequency with measures of strength and uncertainty on a comparative basis. This is one of the areas for future work that I have identified in the final chapter of this thesis.

Chapter 5

Overall Research Findings and Conclusions

5.1 Future Work and Directions on Degree Modifiers

The exploration of the topic of scalar representation and of the complexities of degree modifiers is a rich research area and offers a real opportunity to bring a multidisciplinary approach. Research on degree modifiers is far more than just an academic exercise. Several important practical applications are available, some of which are immediately relevant to my own professional occupation as an occupational psychologist.

My first comment is that there is a great deal of unfinished business remaining from this particular thesis, and this could represent a particularly interesting area for doctoral research. Based on my experience with this research, I believe that an extension of this work would entail the following elements:

- An initial test to assess people's judgement of the strength of an adjective (without the presence of a degree modifier)
- A follow-on re-test of the same adjectives, now combined a variety of specified degree modifiers. This would allow the researcher to measure the extent to which the degree modifier actually modified the strength of the adjective
- A robust formalism for explaining and measuring the process of belief revision under uncertain reasoning, including a computational element based on the data from the research experiment
- A more specific goal of using particular classes of degree modifiers (such as those described in section 3.2.4) to examine how these different classes interact with adjectives

- A more detailed overlay of the collocational aspects of degree modifiers and the role of collocations in shaping prototypical notions of scalar centrality
- The inclusion of the important area of intonational aspects of degree modification, which is not an element that is included in this thesis

These are just some of the elements that I personally would include in further research. This is a potentially important area of research and there are many possible applications within the fields of linguistics, psychology and artificial intelligence.

One specific area where this research can be applied is in the important area of occupational psychometric testing. In the UK and Ireland the main accrediting body for clinical, educational, forensic and occupational psychologists is the British Psychological Society (BPS). Occupational testing normally involves two areas of assessment:

- Ability tests, which measure a person's capabilities in areas such as critical numerical and verbal reasoning, deductive and inductive logic, etc. These are normally timed and administered under standardised test conditions, and the results are compared against an appropriate norm group.
- Personality profiling, which measures the natural preferences of the individual being assessed. This is not a 'test' in that the ability of the individual is not being measured, and they are not normally administered under test conditions. Theses assessments are also normally compared against an appropriate norm group.

Anyone who has Level A and B accreditation with the BPS will have been trained in the administration, scoring and analysis of both of these forms of assessment. Some assessments provide simple percentile scores or other similar quantitative outputs, and as such do not require a great deal of analysis or descriptive text. However, the second category in particular specifically uses degree modifiers in a highly prescribed manner, and there are strict protocols around their use.

I will use an example of the OPQ32i, a popular and widely used personality profiling tool. OPQ stands for Occupational Personality Questionnaire, the number 32 stands for the number of personality factors being assessed, and the 'i' at the end of the name means that the ipsative (forced choice) version of the assessment is being used. The assessment can be either administered online or in paper-based form. The output for the occupational psychologist to interpret is in the form of a visual representation of the score for each factor on a ten-point STEN (Standard Ten) scale.

Figure 5.1: Modified sample of OPQ32i psychometric analysis output

RELATIONSHIPS WITH PEOPLE 1 2 3 4 5 6 7 8 9 10				
5	rarely pressures others to change their views, dislikes selling, less comfortable using negotiation	Persuasive	enjoys selling, comfortable using negotiation, likes to change other people's view	INFLUENCE
4	happy to let others take charge, dislikes telling people what to do, unlikely to take the lead	Controlling	likes to be in charge, takes the lead, tells others what to do, takes control	
1	holds back from criticizing others, may not express own views, unprepared to put forward own opinions	Outspoken	freely expresses opinions, makes disagreement clear, prepared to criticize others	
6	accepts majority decisions, prepared to follow the consensus	Independent Minded	prefers to follow own approach, prepared to disregard majority decisions	
2	quiet and reserved in groups, dislikes being center of attention	Outgoing	lively and animated in groups, talkative, enjoys attention	SOCIABLY
7	comfortable spending time away from people, values time spent alone, seldom misses the company of others	Affiliative	enjoys others' company, likes to be around people, can miss the company of others	
5	feels more comfortable in less formal situations, can feel awkward when first meeting people	Socially Confident	feels comfortable when first meeting people, at ease in formal situations	
5	makes strengths and achievements known, talks about personal success	Modest	dislikes discussing achievements, keeps quiet about personal success	CARING
6	prepared to make decisions without consultation, prefers to make decisions alone	Democratic	consults widely, involves others in decision making, less likely to make decisions alone	
10	selective with sympathy and support, remains detached from others' personal problems	Caring	sympathetic and considerate towards others, helpful and supportive, gets involved in others' problems	

The table shows *part* of the output that would be generated by the assessment, although the formatting is slightly out of line due to the need to fit it within the page width; the full version would be much longer and would cover 32 different personality traits. As mentioned above, there are prescribed phrases that must be used depending on the STEN score returned by the assessment. The report below based on the scores in the example, and is a standard sample report issues by Saville and Holdsworth, the publishers of this particular assessment tool. The headers below relate to the areas identified in the red right hand column in the table above, and are based directly on

the scores recorded in the above example. I have marked the instances where degree modifiers are used.

Influence

Mr. Sample is fairly moderate when it comes to his influencing style. If called upon to take charge, negotiate or sell an idea, he emerges as similar to others. In fact, if anything he has a slight preference to avoid situations that call for him to take charge of others. Although he is extremely unwilling to take part in arguments and heated debates, Mr. Sample still prefers to be reasonably independent in his approach. He is as prepared as others to go his own way rather than follow the group consensus. While rarely one to voice his opinion, there are still some issues for him that he feels are not up for discussion or compromise.

Sociability

Mr. Sample is likely to be an extremely quiet person, tending not to contribute much to lively conversations. This doesn't mean, however, that he is particularly uncomfortable with others. When it comes to meeting strangers for the first time or when addressing a group, he tends to be as confident as most other people. He does not always require the company of others, if anything, he probably prefers being with other people a little more than spending time alone. His apparent ease in formal rather than informal situations suggests that he may feel less drawn to situations that are less well defined.

Empathy

Mr. Sample is extremely concerned about the welfare and possible problems of others, trying to be a very caring and sympathetic listener. This is linked to a moderate tendency to consult others when making decisions. Further, he is as likely to talk about his achievements as others. His very high level of concern for others' welfare and feelings

> is accompanied by a strong feeling that people should be trusted. This is likely to enable him to approach requests for help and support with a high degree of sympathy and concern. However, it does open the possibility of his being open to less deserving or less genuine appeals from those who may look to exploit his good nature.

There are in fact many more examples of degree modification and of scalar representation in these passages than I have actually indicated, but I hope that my point is nonetheless clear. Another aspect of this assessment to consider is that it ultimately is subjective, i.e. it is entirely based on self-report. The non-ipsative version in particular uses a Likert scale which is identical to that used in the study in this thesis, further evidence that this approach is valid for assessing subjective beliefs. The OPQ32i is formally recognised by the BPS as a valid and reliable assessment tool in areas such as selection and development.

The clear issue here is the use of degree modifiers (of all types) combined with a wide variety of adjectives to describe important information such as personality traits, upon which a decision to hire or promote an individual might be based, at least in part. Given current employment law, it is extremely important that such assessments are valid, reliable and consistent. These types of psychometric assessments can be part of extremely important decision processes for individuals and organisations, and thorough research into this topic is consequently important to ensure integrity; the integrity issue is not a question about the tools themselves, but rather how their results are presented through language. For this reason the use of degree modifiers within the wider sentential context also needs to be considered. Ultimately, if the description of the results is vague, inaccurate or ambiguous then the overall integrity of the tool may well be affected.

The OPQ32i is just one of many dozens of occupational tests that are used globally. They can relate to personality profile, leadership and communicative styles, and many other key areas or individual and organisational behaviours. Their use is widespread and often influences areas such as assessment for selection, development, succession planning, career direction and redeployment. It is a growing area of business, and the reach of these forms of assessment are now beginning to impact high growth potential markets such as China, south Asia and Asia/Pacific countries in addition to well established markets in Europe and north America. Any research that can contribute to this important area is likely to be of considerable value to those companies who develop, publish and distribute psychometric assessments, not to mention the end users themselves.

Apart from this commercial application, any research that contributes to the deeper understanding of degree modifiers, particularly through the use of multidisciplinary research, will always be of value to the core area of linguistics, which in the past have benefited substantially by including knowledge and methodology from many other areas such as cognitive science, psychology, logic and artificial intelligence. Cognitive linguistics can equally contribute widely to these and many other areas, and future research into the intriguing area of degree modifiers and scalar representation will continue to bring new value and learning.

5.2 Conclusion

As with many postgraduates who pursue advanced degrees by research, I wish that I had known the final focal point of my research from the outset – it would have made life so much easier and saved inordinate amounts of time. However, given the constraints of full-time employment and other substantial learning commitments, I am

satisfied that this thesis will contribute at least in some way to an area that I find personally very interesting. The findings of this research, as mentioned above, have applications in both the academic and commercial spheres, and I hope will also fuel the interest of other researchers in taking this research further. The range and depth required to truly address even a finite aspect of scalar representation is considerable, and I have outlined in the above section some of the criteria that I would apply in developing this topic further. For the moment, I will let my existing research speak for itself.

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APPENDIX 1: TEST SENTENCES FOR RESEARCH STUDY

Very

1. The wall is very big. *
2. That lady is very nice. *
3. That will make her very happy. *
4. His behaviour is very bad. *
5. That outcome is very likely. *
6. The exam is very difficult. *
7. Her argument is very weak. *
8. He is a very warm individual. *
9. She is a very kind person. *

Quite

1. The wall is quite big. *
2. That lady is quite nice. *
3. That will make her quite happy. *
4. His behaviour is quite bad. *
5. That outcome is quite likely. *
6. The exam is quite difficult. *
7. Her argument is quite weak. *
8. He is quite a warm individual. *
9. She is quite a kind person. *

Really

1. The wall is really big. *
2. That lady is really nice. *
3. That will make her really happy. *
4. His behaviour is really bad. *
5. That outcome is really likely. *
6. The exam is really difficult. *
7. Her argument is really weak. *
8. He is a really warm individual. *
9. She is a really kind person. *

Rather

1. The wall is rather big. *
2. That lady is rather nice. *
3. That will make her rather happy. *
4. His behaviour is rather bad. *
5. That outcome is rather likely.
6. The exam is rather difficult. *
7. Her argument is rather weak. *
8. He is a rather warm individual. *
9. She is a rather kind person. *

Somewhat

1. The wall is somewhat big. *
2. That lady is somewhat nice. *
3. That will make her somewhat happy. *
4. His behaviour is somewhat bad. *
5. That outcome is somewhat likely. *
6. The exam is somewhat difficult. *
7. Her argument is somewhat weak. *
8. He is a somewhat warm individual. *
9. She is a somewhat kind person. *

Fairly

1. The wall is fairly big. *
2. That lady is fairly nice. *
3. That will make her fairly happy. *
4. His behaviour is fairly bad. *
5. That outcome is fairly likely. *
6. The exam is fairly difficult. *
7. Her argument is fairly weak. *
8. He is a fairly warm individual. *
9. She is a fairly kind person. *

APPENDIX 2: SCALING TEST QUESTIONNAIRE

1. The wall is ***very big***

[] [] [] [] [] [] [] [] [] [] []

Least big **Big** **Most big**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

2. That lady is ***quite nice***

[] [] [] [] [] [] [] [] [] [] []

Least nice **Nice** **Most nice**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

3. That will make her ***really happy***

[] [] [] [] [] [] [] [] [] [] []

Least happy **Happy** **Most happy**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

4. His behaviour is ***rather bad***

[] [] [] [] [] [] [] [] [] [] []

Least bad **Bad** **Most bad**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

5. That outcome is ***somewhat likely***

[] [] [] [] [] [] [] [] [] [] []

Least likely **Likely** **Most likely**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

6. The maths exam is ***fairly difficult***

[] [] [] [] [] [] [] [] [] [] []

Least difficult **Difficult** **Most difficult**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

7. That lady is ***very nice***

[] [] [] [] [] [] [] [] [] [] []

Least nice **Nice** **Most nice**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

8. That will make her ***quite happy***

[] [] [] [] [] [] [] [] [] [] []

Least happy **Happy** **Most happy**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

9. His behaviour is ***really bad***

[] [] [] [] [] [] [] [] [] [] []

Least bad **Bad** **Most bad**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

10. That outcome is ***rather likely***

[] [] [] [] [] [] [] [] [] [] []

Least likely **Likely** **Most likely**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

11. The maths exam is ***somewhat difficult***

[] [] [] [] [] [] [] [] [] [] []

Least difficult **Difficult** **Most difficult**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

12. Her argument is ***fairly weak***

[] [] [] [] [] [] [] [] [] [] []

Least weak **Weak** **Most weak**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

13. That will make her ***very happy***

[] [] [] [] [] [] [] [] [] [] []

Least happy **Happy** **Most happy**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

14. His behaviour is ***quite bad***

[] [] [] [] [] [] [] [] [] [] []

Least bad **Bad** **Most bad**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

15. That outcome is ***really likely***

[] [] [] [] [] [] [] [] [] [] []

Least likely **Likely** **Most likely**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

16. The maths exam is ***rather difficult***

[] [] [] [] [] [] [] [] [] [] []

Least difficult **Difficult** **Most difficult**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

17. Her argument is ***somewhat weak***

[] [] [] [] [] [] [] [] [] [] []

Least weak **Weak** **Most weak**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

18. He is a ***fairly warm*** *individual*

[] [] [] [] [] [] [] [] [] [] []

Least warm **Warm** **Most warm**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

19. His behaviour is ***very bad***

[] [] [] [] [] [] [] [] [] [] []

Least bad **Bad** **Most bad**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

20. That outcome is ***quite likely***

[] [] [] [] [] [] [] [] [] [] []

Least likely **Likely** **Most likely**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

21. The maths exam is ***really difficult***

[] [] [] [] [] [] [] [] [] [] []

Least difficult **Difficult** **Most difficult**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

22. Her argument is ***rather weak***

[] [] [] [] [] [] [] [] [] [] []

Least weak **Weak** **Most weak**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

23. He is a ***somewhat warm*** individual

[] [] [] [] [] [] [] [] [] [] []

Least warm **Warm** **Most warm**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

24. She is a ***fairly kind*** person

[] [] [] [] [] [] [] [] [] [] []

Least kind **Kind** **Most kind**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

25. That outcome is ***very likely***

[] [] [] [] [] [] [] [] [] [] []

Least likely **Likely** **Most likely**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

26. The maths exam is ***quite difficult***

[] [] [] [] [] [] [] [] [] [] []

Least difficult **Difficult** **Most difficult**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

27. Her argument is ***really weak***

[] [] [] [] [] [] [] [] [] [] []

Least weak **Weak** **Most weak**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

28. He is a ***rather warm*** individual

[] [] [] [] [] [] [] [] [] [] []

Least warm **Warm** **Most warm**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

29. She is a ***somewhat kind*** person

[] [] [] [] [] [] [] [] [] [] []

Least kind **Kind** **Most kind**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

30. The wall is ***fairly big***

[] [] [] [] [] [] [] [] [] [] []

Least big **Big** **Most big**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

31. The maths exam is ***very difficult***

[] [] [] [] [] [] [] [] [] [] []

Least difficult **Difficult** **Most difficult**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

32. Her argument is ***quite weak***

[] [] [] [] [] [] [] [] [] [] []

Least weak **Weak** **Most weak**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

33. He is a ***really warm*** individual

[] [] [] [] [] [] [] [] [] [] []

Least warm **Warm** **Most warm**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

34. She is a ***rather kind*** person

[] [] [] [] [] [] [] [] [] [] []

Least kind **Kind** **Most kind**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

35. The wall is ***somewhat big***

[] [] [] [] [] [] [] [] [] [] []

Least big **Big** **Most big**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

36. That lady is ***fairly nice***

[] [] [] [] [] [] [] [] [] [] []

Least nice **Nice** **Most nice**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

37. Her argument is ***very weak***

[] [] [] [] [] [] [] [] [] [] []

Least weak **Weak** **Most weak**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

38. He is ***quite a warm*** individual

[] [] [] [] [] [] [] [] [] [] []

Least warm **Warm** **Most warm**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

39. She is a ***really kind*** person

[] [] [] [] [] [] [] [] [] [] []

Least kind **Kind** **Most kind**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

40. The wall is ***rather big***

[] [] [] [] [] [] [] [] [] [] []

Least big **Big** **Most big**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

41. That lady is ***somewhat nice***

[] [] [] [] [] [] [] [] [] [] []

Least nice **Nice** **Most nice**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

42. That will make her ***fairly happy***

[] [] [] [] [] [] [] [] [] [] []

Least happy **Happy** **Most happy**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

43. He is a ***very warm*** individual

[] [] [] [] [] [] [] [] [] [] []

Least warm **Warm** **Most warm**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

44. She is ***quite a kind*** person

[] [] [] [] [] [] [] [] [] [] []

Least kind **Kind** **Most kind**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

45. The wall is ***really big***

[] [] [] [] [] [] [] [] [] [] []

Least big **Big** **Most big**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

46. That lady is ***rather nice***

[] [] [] [] [] [] [] [] [] [] []

Least nice **Nice** **Most nice**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

47. That will make her ***somewhat happy***

[] [] [] [] [] [] [] [] [] [] []

Least happy **Happy** **Most happy**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

48. His behaviour is ***fairly bad***

[] [] [] [] [] [] [] [] [] [] []

Least bad **Bad** **Most bad**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

49. She is a ***very kind*** person

[] [] [] [] [] [] [] [] [] [] []

Least kind **Kind** **Most kind**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

50. The wall is ***quite big***

[] [] [] [] [] [] [] [] [] [] []

Least big **Big** **Most big**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

51. That lady is ***really nice***

[] [] [] [] [] [] [] [] [] [] []

Least nice **Nice** **Most nice**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

52. That will make her ***rather happy***

[] [] [] [] [] [] [] [] [] [] []

Least happy **Happy** **Most happy**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

53. His behaviour is ***somewhat bad***

[] [] [] [] [] [] [] [] [] [] []

Least bad **Bad** **Most bad**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

54. That outcome is ***fairly likely***

[] [] [] [] [] [] [] [] [] [] []

Least likely **Likely** **Most likely**

How certain or uncertain are you about the judgement you have just made?

[] [] [] [] [] [] [] [] [] [] []

Most uncertain **Most Certain**

APPENDIX 3: DATA TABLES FROM RESEARCH STUDY

BIG	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	9	10	9	9	7	5	7	7	5	7	3	4
V02	8	9	9	8	6	4	8	5	6	6	4	5
V03	8	9	8	9	8	6	8	5	5	8	3	5
V04	9	9	10	9	5	6	7	7	6	9	4	4
V05	9	9	9	8	6	5	6	6	7	7	5	3
V06	10	9	10	9	7	6	8	5	5	6	4	3
V07	9	9	9	10	6	7	9	8	6	6	3	4
V08	10	8	11	10	7	5	7	6	7	8	3	5
V09	9	10	9	8	8	3	6	7	5	5	4	3
V10	8	9	10	9	7	7	7	5	4	4	5	3
V11	8	10	9	9	7	6	7	6	4	6	3	4
V12	9	11	10	9	7	5	6	8	5	7	4	3
V13	8	8	10	10	6	4	8	5	3	6	5	4
V14	9	8	9	9	8	5	8	5	4	4	4	3
V15	8	9	7	8	9	5	7	7	5	3	3	2
V16	9	10	10	9	7	5	8	5	6	5	4	4
V17	9	9	9	9	6	6	9	5	4	6	4	4
V18	9	8	8	10	5	6	8	6	3	6	4	3
V19	9	9	9	9	6	5	7	5	4	5	4	4
V20	8	9	10	9	6	7	8	6	5	6	3	5
V21	10	10	9	8	7	6	8	6	4	7	5	4
V22	11	8	9	9	6	8	8	5	3	6	4	5
V23	9	9	9	9	7	9	7	5	5	5	3	6
V24	8	9	10	10	8	6	8	6	5	4	3	4
V25	9	9	8	8	7	5	9	7	4	6	4	3
V26	9	9	9	9	6	4	7	5	6	7	5	7
V27	9	8	9	9	6	6	6	5	4	5	5	4
V28	8	10	10	9	7	5	8	6	5	4	5	3
V29	9	11	10	9	6	5	7	5	6	6	4	5
V30	8	10	9	10	6	4	6	7	7	7	3	3
V31	10	9	9	9	7	6	5	5	4	5	4	3
V32	8	8	10	8	7	7	7	6	5	5	5	5
V33	9	9	8	9	7	6	8	6	4	6	4	5
V34	9	9	9	9	6	7	8	5	4	6	3	4
V35	9	9	9	8	5	7	7	5	3	5	3	3
V36	10	9	9	9	6	7	6	6	5	7	3	3
V37	9	9	10	9	5	6	8	5	4	6	4	5
V38	10	9	9	9	6	7	7	6	5	5	3	4
V39	9	10	9	8	7	8	7	5	4	4	3	5
V40	8	9	10	10	8	6	6	6	4	7	4	3
V41	9	9	9	9	7	5	7	7	5	6	5	5
V42	8	10	9	11	6	6	8	8	5	5	4	6
V43	8	9	9	9	6	7	7	6	4	6	3	4
V44	8	10	8	8	7	6	8	5	4	5	2	3
V45	9	8	9	10	6	7	8	6	3	7	4	6
V46	8	9	9	8	8	6	7	7	5	8	5	4
V47	10	10	10	9	5	6	6	5	4	6	4	6
V48	11	9	9	10	7	8	8	7	4	5	4	4

V49	9	8	9	9	7	6	7	7	4	4	5	3
V50	8	8	9	8	6	5	7	5	5	6	4	5
V51	8	8	10	9	7	6	8	7	4	7	4	6
V52	9	8	9	9	6	7	7	6	3	6	3	4
V53	8	9	9	9	5	6	8	6	4	5	4	3
V54	8	9	10	9	8	6	6	5	4	7	4	5
V55	8	8	9	8	5	6	7	6	3	6	5	3
V56	9	10	8	9	7	7	6	7	4	5	4	5
V57	9	9	9	10	6	6	5	7	5	7	4	3
V58	8	10	10	10	7	7	6	6	5	5	4	5
V59	8	9	9	9	6	8	7	7	4	7	5	3
V60	8	10	9	10	5	6	6	7	5	6	3	6

NICE	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	8	8	8	8	8	6	8	8	3	3	4	4
V02	8	8	9	9	7	6	8	7	4	3	4	4
V03	9	9	8	8	7	6	9	7	5	4	5	4
V04	8	8	9	7	7	7	8	7	5	4	3	3
V05	9	8	8	7	7	6	8	7	3	4	4	3
V06	10	8	9	8	6	6	7	7	4	3	4	4
V07	9	9	9	8	7	7	8	8	5	4	4	3
V08	9	8	9	7	7	6	8	8	4	4	4	3
V09	9	8	8	8	5	6	8	8	5	4	3	3
V10	8	8	8	8	7	5	9	8	5	4	4	3
V11	8	8	10	9	6	6	8	7	4	3	4	5
V12	9	9	9	9	6	6	8	7	4	3	3	3
V13	9	8	9	8	7	7	8	6	4	4	4	3
V14	10	8	9	8	7	6	7	7	4	3	4	4
V15	8	8	9	7	7	6	8	7	4	3	4	4
V16	9	8	9	8	6	6	9	8	5	5	3	3
V17	8	9	9	8	6	5	9	7	5	4	4	3
V18	9	8	8	8	7	5	8	8	4	3	4	4
V19	8	8	9	8	6	7	9	8	5	3	3	4
V20	8	8	8	8	7	7	9	8	5	4	4	4
V21	9	8	9	7	8	7	9	7	4	4	5	3
V22	9	9	9	8	7	6	8	7	4	3	3	3
V23	9	7	9	8	7	6	8	7	4	3	4	3
V24	8	8	9	8	7	5	9	8	4	4	3	3
V25	9	8	8	7	6	6	8	8	4	4	3	4
V26	9	9	9	8	6	5	8	7	5	3	3	4
V27	8	8	8	8	7	6	8	8	4	3	5	3
V28	8	7	9	7	7	6	8	7	4	4	3	4
V29	8	9	8	8	6	5	8	8	4	3	3	3
V30	8	7	9	7	6	4	9	8	5	4	4	3
V31	9	8	8	7	7	6	8	8	4	3	3	3
V32	9	8	9	7	5	6	9	8	4	4	3	3
V33	9	8	8	8	6	5	9	9	4	4	4	3
V34	9	8	9	8	6	4	8	7	5	3	4	3
V35	8	8	9	9	5	6	8	9	4	4	4	3
V36	9	8	9	7	6	5	8	8	4	3	4	4

V37	9	8	8	7	6	5	9	8	4	4	4	3
V38	8	8	9	7	7	5	8	8	5	4	3	3
V39	9	8	9	8	6	6	9	9	5	3	3	4
V40	8	8	8	7	6	5	8	8	4	4	4	4
V41	9	7	9	8	7	6	9	8	5	3	5	3
V42	8	8	9	7	6	5	9	8	4	3	5	3
V43	8	8	9	8	6	5	8	7	4	3	3	3
V44	8	7	9	8	6	6	8	8	4	4	2	1
V45	9	8	9	7	6	5	8	8	5	4	2	3
V46	9	8	8	8	6	5	8	7	4	4	3	3
V47	9	8	9	8	6	5	9	8	4	3	4	3
V48	9	7	9	8	6	5	9	8	5	3	5	3
V49	9	9	10	8	5	5	9	9	4	4	4	4
V50	9	8	9	8	7	6	8	8	5	4	4	3
V51	9	9	10	9	7	5	8	8	4	4	5	3
V52	9	9	9	8	6	5	9	8	4	4	4	4
V53	9	8	8	8	6	5	8	7	5	3	4	4
V54	8	7	8	7	6	5	8	8	4	4	4	3
V55	8	7	10	8	5	5	8	7	5	3	4	3
V56	9	8	9	9	6	5	8	8	4	3	3	3
V57	9	7	9	8	6	5	9	8	4	4	3	3
V58	8	8	10	8	6	5	9	8	5	4	3	4
V59	8	8	8	8	6	5	9	9	4	3	4	4
V60	8	7	8	8	6	5	8	8	4	4	3	2

HAPPY	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	9	8	9	9	6	6	6	5	4	4	5	5
V02	9	9	8	8	7	7	6	6	5	4	4	5
V03	8	8	9	7	6	6	7	6	4	3	5	5
V04	8	7	8	8	7	6	6	4	4	3	6	5
V05	8	8	8	8	6	5	5	5	4	4	5	4
V06	8	8	8	7	7	6	7	5	4	4	4	4
V07	8	8	8	8	6	5	6	6	4	3	4	4
V08	8	7	8	8	6	6	7	6	5	3	5	4
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V14	8	8	8	7	6	5	8	6	3	5	4	3
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V16	8	7	8	8	7	5	8	5	5	4	5	5
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V18	8	8	9	8	6	5	7	4	5	5	5	5
V19	9	8	9	7	6	4	7	5	5	4	5	4
V20	8	7	8	7	7	5	7	5	5	5	5	5
V21	9	7	8	7	6	5	7	6	4	3	5	4
V22	8	7	8	7	7	7	7	4	5	3	4	4
V23	8	7	8	8	6	6	8	7	5	4	5	4
V24	9	7	9	9	6	6	7	7	5	3	5	4
V25	7	7	8	8	7	5	8	6	6	4	5	5

V26	8	8	8	7	6	3	7	5	6	5	6	5
V27	9	8	8	8	6	5	8	7	5	3	6	5
V28	8	8	8	7	6	6	7	6	6	4	5	4
V29	9	8	8	8	6	6	6	6	6	5	5	5
V30	8	7	8	8	6	5	5	4	4	4	6	4
V31	8	8	7	7	5	5	7	5	4	4	4	4
V32	8	7	8	7	6	5	6	6	6	4	5	3
V33	8	8	9	8	7	5	6	6	5	5	5	4
V34	8	8	9	7	6	5	7	6	5	4	4	4
V35	9	8	8	8	6	6	7	7	5	4	3	3
V36	8	8	8	8	7	6	7	6	6	4	5	4
V37	8	7	8	8	6	6	7	6	5	4	5	4
V38	8	7	8	8	5	4	8	6	3	4	4	5
V39	8	8	9	7	5	5	7	7	5	4	5	5
V40	9	7	8	7	6	6	8	7	5	3	6	4
V41	8	7	8	7	6	6	8	6	6	4	5	4
V42	9	7	8	8	5	5	7	6	4	4	4	4
V43	8	7	8	7	6	5	8	6	4	4	5	4
V44	8	8	9	9	6	5	6	6	5	4	5	5
V45	9	9	8	7	5	5	7	7	5	5	4	4
V46	8	8	9	7	6	6	7	6	5	3	5	4
V47	8	7	8	8	7	6	7	5	5	4	5	5
V48	8	7	8	8	5	4	8	6	5	3	5	5
V49	8	8	8	7	6	4	7	6	4	4	4	5
V50	8	8	9	7	6	5	8	7	5	4	5	5
V51	9	9	8	8	5	5	7	6	5	3	5	4
V52	8	7	8	7	6	4	6	6	5	5	4	3
V53	8	8	9	9	5	4	7	6	5	4	3	3
V54	8	8	8	8	7	5	8	6	5	4	5	5
V55	7	7	9	7	6	5	7	6	3	3	5	4
V56	8	7	8	9	6	6	8	6	4	4	4	4
V57	8	7	8	8	6	6	7	6	6	4	6	5
V58	8	7	8	7	6	5	8	6	5	5	5	5
V59	9	8	8	7	7	4	8	7	5	4	4	4
V60	9	7	9	8	5	5	6	6	5	3	6	4

BAD	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	9	9	10	9	7	7	6	6	5	4	6	5
V02	9	8	9	8	8	6	7	7	5	5	6	5
V03	9	8	9	8	6	5	7	7	5	4	5	5
V04	8	8	9	9	8	7	7	6	4	4	5	5
V05	9	8	9	8	8	8	7	6	5	4	6	6
V06	9	9	8	8	7	7	7	6	5	5	5	5
V07	8	8	9	9	8	7	8	6	5	4	5	5
V08	8	8	9	8	8	8	6	6	4	4	6	6
V09	8	8	9	8	7	7	6	7	5	5	6	5
V10	9	7	9	8	7	6	7	7	4	4	6	4
V11	8	7	8	8	7	7	8	7	6	5	6	4
V12	9	8	9	9	8	7	7	7	6	5	5	5
V13	8	8	9	9	8	8	8	7	6	6	5	4
V14	9	8	8	9	7	7	8	7	6	4	6	6

V15	8	8	9	8	8	7	8	7	5	4	7	5
V16	9	8	9	9	6	6	7	7	6	5	5	5
V17	8	7	10	8	8	8	7	7	6	5	6	6
V18	9	8	8	8	7	7	6	6	6	5	6	5
V19	8	8	8	8	7	6	7	7	5	5	6	6
V20	8	8	9	8	8	6	7	6	6	5	6	5
V21	8	7	9	9	8	8	8	7	4	4	5	5
V22	8	8	10	10	9	5	7	6	5	4	6	5
V23	8	8	9	7	7	7	7	7	5	6	6	6
V24	8	7	9	8	8	7	8	7	6	5	6	6
V25	8	8	9	9	7	7	8	7	6	5	6	5
V26	9	8	9	8	7	7	7	7	5	5	5	5
V27	9	9	9	8	8	8	8	8	4	4	6	6
V28	10	8	10	8	8	7	8	7	4	4	6	5
V29	9	9	9	9	7	7	7	6	5	5	6	5
V30	8	8	9	9	8	7	8	7	6	5	6	6
V31	9	8	8	7	8	8	8	7	5	4	6	6
V32	8	8	9	9	8	6	7	7	5	5	6	5
V33	9	9	9	9	9	6	7	6	6	5	5	5
V34	9	8	9	8	7	7	8	6	5	5	6	4
V35	9	9	9	9	8	7	7	6	5	5	5	5
V36	9	8	9	7	8	8	8	7	5	4	5	5
V37	8	8	9	9	8	7	7	7	5	4	6	5
V38	8	8	9	8	9	7	7	6	4	4	6	5
V39	9	8	9	9	8	7	8	7	4	5	6	6
V40	9	7	10	8	7	7	7	7	5	4	6	6
V41	8	8	9	7	8	6	7	7	5	5	5	5
V42	8	8	9	8	8	7	7	6	5	4	5	4
V43	8	8	8	8	7	7	7	5	5	4	5	5
V44	9	8	9	8	9	7	8	7	6	5	6	5
V45	9	8	8	8	7	6	8	8	6	5	6	6
V46	9	8	8	8	7	7	8	5	4	4	5	5
V47	8	7	9	8	6	6	7	8	5	5	6	6
V48	8	8	9	9	6	6	8	7	5	5	6	5
V49	9	8	9	8	7	7	7	7	5	4	6	5
V50	9	8	9	8	7	6	7	7	6	6	5	6
V51	9	8	9	8	8	6	7	7	5	5	6	6
V52	8	8	8	8	8	7	8	7	6	5	6	5
V53	9	7	9	8	6	7	8	8	5	5	5	5
V54	8	8	9	8	8	7	8	7	6	5	6	5
V55	8	7	9	8	7	7	7	6	5	5	6	4
V56	8	8	9	9	8	7	8	7	6	4	6	5
V57	9	8	10	10	8	6	7	7	5	5	5	5
V58	9	8	9	8	7	7	7	6	6	5	6	6
V59	8	7	9	9	7	6	7	7	5	5	7	5
V60	8	8	9	9	9	7	7	6	5	5	6	5

LIKELY	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	10	8	8	8	8	7	7	7	6	3	7	5
V02	9	8	9	7	7	7	6	6	5	4	6	6
V03	9	7	8	8	7	6	7	6	4	4	6	6

V04	9	8	9	7	6	6	6	6	6	4	7	7
V05	9	9	9	7	8	5	5	5	6	3	7	6
V06	9	8	8	6	6	6	8	5	4	4	6	6
V07	8	7	8	7	8	6	6	4	5	3	6	6
V08	9	8	9	9	7	6	7	3	5	4	7	5
V09	9	8	8	8	7	7	6	6	6	6	6	6
V10	9	8	10	8	8	8	7	6	6	4	7	6
V11	8	8	7	7	9	7	6	6	4	4	6	6
V12	9	8	8	7	6	6	7	6	5	4	7	5
V13	9	7	8	8	6	7	7	6	5	5	6	4
V14	10	9	8	8	8	5	7	7	4	3	6	5
V15	9	7	9	9	6	6	5	5	5	3	5	5
V16	9	8	9	8	7	6	7	5	5	4	7	7
V17	9	8	8	7	6	6	8	6	3	6	7	5
V18	9	7	9	9	7	6	7	7	4	3	7	6
V19	9	8	9	8	6	6	8	5	6	4	6	5
V20	9	7	9	9	6	7	7	5	4	4	7	6
V21	9	8	9	7	8	7	7	4	6	5	8	7
V22	9	8	9	9	7	6	7	6	6	6	6	6
V23	9	7	8	8	8	7	7	6	4	4	7	6
V24	8	8	8	8	8	6	6	6	5	4	7	5
V25	9	9	9	8	6	6	7	6	5	5	7	7
V26	9	7	8	8	7	6	6	6	5	4	8	5
V27	8	8	8	8	8	6	7	6	6	4	7	6
V28	8	7	8	7	8	7	7	7	6	5	7	6
V29	9	8	9	7	8	6	7	7	6	6	6	6
V30	8	7	9	8	7	6	8	8	4	4	7	6
V31	9	9	8	8	6	6	8	5	5	4	7	7
V32	8	8	9	8	7	6	6	6	6	6	7	6
V33	9	8	9	8	7	7	6	5	6	4	6	6
V34	8	7	8	8	8	6	5	5	4	4	6	5
V35	9	8	8	8	7	6	6	6	6	3	6	5
V36	8	8	8	8	8	6	7	6	4	3	7	5
V37	9	9	9	8	7	7	6	6	5	4	6	6
V38	8	8	9	9	7	6	8	5	6	6	6	6
V39	8	7	10	7	7	6	7	6	6	4	8	6
V40	8	7	8	8	5	6	7	5	6	3	7	7
V41	9	8	8	8	8	6	5	6	6	4	6	5
V42	9	8	8	8	8	6	7	5	6	6	6	4
V43	8	7	9	8	6	6	5	7	5	5	7	4
V44	8	7	9	9	7	5	7	5	5	5	7	6
V45	9	8	9	8	8	5	7	4	4	3	5	5
V46	8	8	9	9	6	6	7	6	6	4	8	6
V47	7	7	9	8	8	6	7	5	6	5	7	7
V48	9	8	9	8	8	8	6	5	5	4	8	7
V49	8	8	9	7	7	6	7	7	4	4	7	6
V50	9	8	7	7	6	6	7	5	5	4	6	5
V51	8	8	8	8	5	5	7	6	4	4	6	5
V52	8	7	9	7	7	6	6	6	6	4	7	5
V53	8	8	9	8	7	6	6	5	6	4	7	7
V54	9	8	10	9	7	6	7	5	6	3	6	6
V55	9	9	9	9	7	5	7	6	5	4	6	5

V56	8	7	9	8	6	5	7	6	4	4	6	4
V57	9	9	8	7	7	7	6	6	5	4	7	6
V58	9	8	9	9	6	7	8	5	5	4	7	7
V59	9	8	9	7	8	6	6	6	6	4	7	6
V60	10	9	8	8	7	5	7	5	6	6	6	6

DIFFICULT	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	9	8	9	9	7	6	6	6	5	4	4	5
V02	9	9	8	9	7	6	7	6	5	5	5	5
V03	9	9	9	9	7	7	7	7	5	5	5	5
V04	10	8	9	8	8	6	7	7	4	4	5	6
V05	9	9	8	8	7	6	7	6	6	4	6	5
V06	9	8	8	8	7	7	6	6	5	5	6	5
V07	9	9	9	9	7	6	7	7	5	4	4	5
V08	9	9	9	8	8	7	7	6	4	4	5	5
V09	10	9	9	9	8	7	7	6	4	4	5	4
V10	9	9	8	8	8	7	7	7	5	4	4	4
V11	9	8	9	9	7	6	8	6	5	5	4	4
V12	9	9	10	9	7	6	7	7	5	5	5	4
V13	9	9	9	8	7	5	8	7	6	5	6	4
V14	9	9	9	9	8	7	6	6	5	4	5	5
V15	9	8	9	8	7	6	6	5	4	3	5	4
V16	8	8	9	9	7	6	6	6	4	5	6	5
V17	9	9	8	8	6	6	7	7	5	5	5	4
V18	9	8	9	8	7	6	8	7	5	3	4	3
V19	9	9	9	9	6	6	7	6	5	4	5	4
V20	9	8	10	10	6	7	6	6	5	5	5	4
V21	9	9	9	8	8	7	6	7	5	5	8	7
V22	8	8	9	8	7	6	8	6	6	4	5	5
V23	9	9	9	9	8	7	7	7	5	5	4	4
V24	9	8	9	9	8	6	7	6	6	5	5	4
V25	9	8	9	9	6	6	7	7	6	6	5	4
V26	9	8	9	9	7	6	8	6	6	6	5	5
V27	9	8	10	8	8	6	6	6	5	5	4	4
V28	8	8	9	9	8	7	7	6	5	4	6	5
V29	8	8	8	8	8	6	6	5	4	4	4	4
V30	9	7	9	9	7	6	6	6	5	4	5	5
V31	9	8	9	8	6	6	7	6	5	5	5	4
V32	9	8	9	9	7	6	7	6	6	5	6	5
V33	9	9	9	9	7	7	7	7	5	4	6	4
V34	9	7	10	8	8	6	7	6	5	5	4	4
V35	9	9	9	9	7	6	7	6	5	5	5	4
V36	9	9	9	8	8	6	8	7	4	4	5	5
V37	9	7	9	9	7	7	7	7	5	5	6	5
V38	10	9	9	8	7	6	8	7	6	5	4	4
V39	8	8	8	8	7	6	7	7	5	5	5	4
V40	9	9	9	8	5	6	7	7	6	5	5	5
V41	9	8	9	9	8	6	8	6	6	6	6	4
V42	9	8	9	8	8	6	8	7	6	5	5	4
V43	9	8	9	9	6	6	7	6	6	5	3	5
V44	9	8	10	8	7	5	6	6	5	4	5	5

V45	9	7	8	8	8	5	6	7	4	4	6	5
V46	9	8	8	8	6	6	7	6	6	5	5	4
V47	9	9	8	8	8	6	7	7	6	6	4	4
V48	9	9	8	8	8	8	7	5	5	5	5	5
V49	9	8	9	8	7	6	7	6	4	4	6	5
V50	9	9	8	8	6	6	6	6	5	4	5	4
V51	9	8	9	8	5	5	6	6	5	4	6	5
V52	9	8	9	9	7	6	7	7	5	5	4	5
V53	9	9	8	8	7	6	6	6	5	4	5	5
V54	9	9	9	8	7	6	7	6	6	5	4	4
V55	10	9	8	8	7	5	6	6	5	5	3	6
V56	9	9	8	8	6	5	7	5	5	4	5	4
V57	9	8	9	7	7	7	7	6	6	6	4	5
V58	9	9	9	8	6	7	7	7	6	4	6	6
V59	9	9	9	8	8	6	7	6	6	6	5	5
V60	9	7	9	9	7	5	7	6	6	5	4	4

WEAK	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	9	9	8	8	7	7	7	6	4	4	5	4
V02	8	9	8	8	7	7	6	6	5	4	5	4
V03	9	8	9	8	6	6	7	6	6	5	5	4
V04	8	7	9	7	7	6	7	6	5	4	4	4
V05	9	8	8	8	8	7	7	7	5	5	4	4
V06	8	8	9	8	6	6	7	6	5	4	5	7
V07	9	8	9	8	6	5	8	6	5	5	4	4
V08	9	9	9	7	6	6	7	7	5	4	6	7
V09	8	7	8	8	7	6	6	6	5	5	6	5
V10	9	8	9	8	6	6	7	6	5	5	5	4
V11	9	9	9	8	7	6	6	6	6	5	5	5
V12	8	7	8	8	6	5	7	6	5	4	4	4
V13	8	8	9	7	6	6	7	6	6	6	4	4
V14	9	8	9	7	7	6	7	6	6	6	5	4
V15	8	6	8	8	7	5	7	6	5	5	4	4
V16	8	7	8	8	6	5	6	5	5	4	3	4
V17	9	7	9	7	7	5	7	6	7	5	4	6
V18	9	8	8	8	6	5	6	6	5	5	4	4
V19	9	7	7	8	7	6	6	5	5	5	5	5
V20	9	9	8	9	7	7	7	6	6	5	4	5
V21	8	8	7	8	8	6	7	7	6	5	4	5
V22	9	8	8	8	7	7	8	7	5	5	4	4
V23	9	8	9	8	8	7	8	7	5	4	5	4
V24	8	8	8	8	8	7	7	6	5	5	4	3
V25	8	8	8	8	7	6	7	6	6	5	5	5
V26	9	8	8	9	7	6	8	6	5	5	5	6
V27	9	9	8	7	7	6	7	6	6	5	6	4
V28	9	8	9	9	6	6	7	7	6	6	5	5
V29	10	8	9	8	7	6	6	6	5	4	5	4
V30	9	8	9	8	7	7	7	6	5	4	5	5
V31	9	9	8	8	7	6	7	7	5	5	5	4
V32	9	9	8	8	7	7	7	5	6	5	6	5
V33	8	8	9	8	6	6	6	6	5	4	6	4

V34	9	8	8	8	6	5	7	7	6	5	5	4
V35	8	8	9	8	7	5	6	6	5	4	5	5
V36	9	7	8	8	6	5	7	6	6	4	4	5
V37	8	8	8	7	7	6	7	6	6	5	5	6
V38	8	8	8	8	6	6	8	6	5	4	4	5
V39	9	8	9	9	6	5	6	6	4	4	5	5
V40	9	8	9	9	7	5	7	5	4	4	5	7
V41	9	9	8	7	6	5	7	6	6	4	3	5
V42	9	9	9	9	7	5	8	7	5	7	5	6
V43	8	7	9	8	7	6	7	6	5	4	5	4
V44	9	7	8	7	7	7	7	7	5	5	5	4
V45	9	9	8	8	7	5	7	5	4	5	4	5
V46	8	9	9	9	6	5	7	7	6	6	4	4
V47	9	7	9	8	7	5	7	6	6	5	5	4
V48	8	7	9	9	6	7	7	6	6	5	5	4
V49	8	8	8	8	7	7	6	6	5	4	6	3
V50	9	8	8	7	7	6	7	6	5	5	5	5
V51	8	7	8	7	7	5	7	7	5	7	5	4
V52	8	8	9	8	6	6	7	6	7	5	4	4
V53	9	8	9	8	7	5	7	6	5	5	5	4
V54	9	8	8	8	6	5	7	8	5	4	4	6
V55	8	7	9	9	7	5	7	7	6	6	4	4
V56	9	7	9	8	6	5	8	5	5	5	5	6
V57	9	8	8	7	7	5	6	6	6	5	5	5
V58	9	7	8	8	7	5	7	6	6	5	6	4
V59	8	8	9	7	5	5	6	6	5	4	5	6
V60	8	7	8	7	6	5	7	7	6	7	5	4

WARM	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	8	8	9	9	6	6	7	7	3	6	5	5
V02	9	9	8	9	7	6	8	8	5	5	4	5
V03	8	7	8	8	6	5	7	8	4	5	4	4
V04	7	8	8	8	7	7	7	8	6	4	3	3
V05	8	8	9	9	7	8	7	6	4	4	4	5
V06	8	7	8	8	6	6	7	7	5	6	5	5
V07	8	8	9	9	6	6	8	7	3	4	4	3
V08	9	8	10	8	7	6	7	6	4	7	4	6
V09	7	8	8	9	6	6	6	8	4	4	5	5
V10	8	8	9	9	6	5	7	8	3	5	5	5
V11	9	8	8	9	7	7	6	7	4	6	4	6
V12	8	8	9	8	7	6	7	7	4	5	5	4
V13	9	8	9	9	6	7	8	7	4	5	3	4
V14	9	9	9	9	7	6	7	7	6	4	3	6
V15	8	8	9	8	7	6	7	7	5	3	4	5
V16	8	7	9	10	6	6	7	6	3	4	4	5
V17	8	8	9	9	7	6	6	6	4	5	4	3
V18	8	9	9	8	5	4	8	6	6	6	4	6
V19	9	8	9	9	7	8	7	7	5	3	4	4
V20	9	8	9	9	7	6	6	7	3	4	5	6
V21	9	9	9	7	6	7	6	6	6	4	5	5
V22	7	8	9	8	8	6	8	8	5	6	4	5

V23	8	9	8	8	6	7	8	7	4	6	4	5
V24	9	8	8	7	6	6	7	7	5	6	3	4
V25	9	8	8	8	7	7	8	8	4	5	4	4
V26	9	9	9	9	6	6	8	7	5	3	4	4
V27	8	9	9	7	7	6	7	8	4	6	5	4
V28	8	8	9	8	7	6	7	9	6	4	5	3
V29	8	7	9	9	7	6	7	8	4	5	5	5
V30	8	8	9	7	7	7	8	8	6	4	5	5
V31	7	8	8	8	7	6	7	7	5	6	5	4
V32	8	8	9	8	8	6	7	6	4	5	6	5
V33	9	8	8	8	6	7	7	6	5	5	6	4
V34	8	7	8	7	6	6	8	7	4	5	5	4
V35	8	7	8	8	6	6	7	6	3	4	5	5
V36	7	7	7	8	6	7	7	8	5	5	5	6
V37	8	8	8	8	7	7	7	7	6	6	3	4
V38	7	7	9	8	7	7	7	6	5	5	4	3
V39	8	8	9	7	6	6	6	8	5	3	5	7
V40	9	9	9	8	7	6	8	6	3	3	4	3
V41	7	8	8	7	7	5	7	6	5	6	5	4
V42	9	8	9	8	7	7	8	7	5	4	3	5
V43	8	8	9	9	6	6	7	7	5	6	4	6
V44	8	7	8	8	7	6	7	6	3	4	4	5
V45	8	8	8	9	7	6	6	6	6	4	5	7
V46	8	7	9	9	7	6	7	6	3	6	4	5
V47	9	8	9	8	7	8	7	7	5	4	4	3
V48	8	9	8	8	6	6	8	6	5	6	3	5
V49	9	8	9	8	7	6	7	6	4	3	4	4
V50	9	9	8	9	7	7	7	8	5	6	5	3
V51	8	8	9	7	6	8	8	7	4	4	4	5
V52	9	8	8	8	6	6	7	7	6	4	5	5
V53	9	8	8	7	7	6	7	7	5	7	3	5
V54	7	8	8	8	7	5	8	8	5	3	3	4
V55	8	8	9	8	7	7	7	6	3	7	4	5
V56	9	8	8	8	7	7	7	8	4	4	3	5
V57	8	9	8	8	6	6	8	6	4	4	4	5
V58	9	8	9	8	7	6	7	7	4	6	4	4
V59	9	9	8	7	6	6	7	6	5	5	4	5
V60	9	7	8	9	6	8	7	6	5	6	5	6

KIND	Very	U	Really	U	Quite	U	Rather	U	Somewhat	U	Fairly	U
V01	8	5	8	8	6	4	6	3	5	3	3	2
V02	7	7	9	8	4	3	6	5	7	4	4	3
V03	8	8	9	7	6	3	6	4	4	4	4	5
V04	7	6	8	9	7	4	7	4	5	5	5	3
V05	7	7	9	8	4	4	7	5	4	3	6	3
V06	8	7	8	7	5	3	7	6	7	4	4	1
V07	9	8	9	7	6	4	7	6	6	3	3	4
V08	8	6	8	7	6	3	7	5	6	3	4	3
V09	8	9	9	8	4	3	6	6	5	2	5	3
V10	8	7	9	7	5	4	7	3	5	3	6	3
V11	8	7	8	8	5	4	8	6	6	4	4	4

V12	9	6	8	8	4	6	6	5	5	4	5	5
V13	8	7	9	8	6	4	8	4	4	3	5	3
V14	8	7	9	8	6	6	6	5	5	3	4	3
V15	9	8	8	7	6	6	8	5	4	3	4	4
V16	9	7	9	8	6	4	7	6	5	3	6	3
V17	9	8	9	8	7	3	7	5	5	3	4	4
V18	8	8	8	9	6	4	6	7	6	5	6	4
V19	8	7	9	8	7	3	8	5	5	5	5	2
V20	9	8	9	7	6	5	8	6	5	4	5	5
V21	8	9	9	8	7	4	7	6	4	6	6	4
V22	9	9	9	9	6	6	8	5	5	3	6	3
V23	8	7	9	8	7	4	7	5	6	3	5	3
V24	8	7	9	7	6	5	8	6	5	3	5	2
V25	9	7	8	9	7	6	8	6	5	2	5	4
V26	9	7	9	7	7	4	8	6	4	5	3	2
V27	9	8	9	8	5	6	7	5	6	3	5	3
V28	8	8	8	8	7	5	7	6	5	5	2	4
V29	8	9	9	8	5	4	7	5	4	4	5	3
V30	9	9	8	7	5	4	7	6	6	5	5	2
V31	8	7	8	8	6	5	6	5	5	5	4	4
V32	9	8	8	8	6	4	7	6	5	4	2	4
V33	9	7	8	8	7	5	7	7	5	2	6	3
V34	9	9	9	8	6	4	8	6	5	3	5	5
V35	9	7	9	8	7	6	7	7	6	4	5	3
V36	8	7	9	7	7	7	7	5	6	5	5	4
V37	8	7	8	8	5	4	9	5	5	4	4	3
V38	9	7	8	7	8	6	7	5	5	3	4	2
V39	9	8	9	8	5	7	7	5	5	4	6	5
V40	9	7	8	8	7	4	7	6	5	3	5	3
V41	8	8	8	9	5	6	8	6	4	4	5	2
V42	8	8	9	9	6	4	7	5	6	3	5	4
V43	9	7	9	7	7	4	7	5	4	2	5	4
V44	8	8	9	8	6	4	7	5	4	4	4	3
V45	9	8	8	8	7	5	8	7	4	3	5	3
V46	8	8	9	8	8	6	7	5	5	4	6	3
V47	8	8	9	7	7	5	8	6	4	3	5	4
V48	8	7	8	8	8	5	7	6	3	4	5	3
V49	9	7	9	9	6	4	7	5	5	3	5	3
V50	9	8	9	9	7	6	7	5	5	3	5	4
V51	8	8	9	8	7	5	7	5	5	3	4	2
V52	8	7	9	8	8	5	7	6	4	5	4	4
V53	9	7	9	7	6	6	8	7	5	5	5	3
V54	8	7	9	8	6	4	8	6	5	4	6	4
V55	8	7	9	8	8	6	8	6	6	4	4	3
V56	8	7	8	9	6	4	7	6	5	3	6	4
V57	9	7	9	9	8	6	6	5	4	3	6	3
V58	9	9	9	7	8	5	8	5	6	5	5	3
V59	9	8	9	7	6	5	7	5	5	3	4	3
V60	8	8	9	9	7	4	8	5	5	4	5	2

APPENDIX 4: SYNTAX AND OUTPUT OF SPSS ANALYSIS

Mixed Model Analysis

Model Dimension

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	WORD	9		8		
	PREFIX	6		5		
Random Effects	STRENGTH	1	Identity	1		
	WORD * STRENGTH	9	Identity	1		
	PREFIX * STRENGTH	6	Identity	1		
Repeated Effects	WORD * PREFIX	54	Variance Components	54	SUBJECT	60
Total		86		71		

Information Criteria	
-2 Log Likelihood	8218.591
Akaike's Information Criterion (AIC)	8360.591
Hurvich and Tsai's Criterion (AICC)	8363.818
Bozdogan's Criterion (CAIC)	8863.507
Schwarz's Bayesian Criterion (BIC)	8792.507

Fixed Effects

Type III Tests of Fixed Effects

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	2041.922	1146.792	.000
WORD	8	335.497	18.580	.000
PREFIX	5	950.065	80.275	.000

Estimates of Fixed Effects							
Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	6.2375	.3342	500.799	18.665	.000	5.5809	6.8940
[WORD=1]	1.9682	.3156	311.166	6.237	.000	1.3474	2.5891
[WORD=2]	1.2777	.2763	261.332	4.624	.000	.7336	1.8218
[WORD=3]	2.0404	.2962	285.002	6.889	.000	1.4575	2.6234
[WORD=4]	2.3189	.2896	267.050	8.007	.000	1.7487	2.8891
[WORD=5]	1.9351	.3174	289.417	6.096	.000	1.3103	2.5598
[WORD=6]	2.2462	.2825	288.941	7.951	.000	1.6902	2.8023
[WORD=7]	3.0869	.3000	309.088	10.291	.000	2.4967	3.6772
[WORD=8]	2.6879	.3130	319.202	8.587	.000	2.0720	3.3038
[WORD=9]	0	0	.	.	.	.	.
[PREFIX=1]	-3.3337	.4814	596.530	-6.925	.000	-4.2791	-2.3883
[PREFIX=2]	-2.6847	.4736	689.415	-5.668	.000	-3.6147	-1.7548
[PREFIX=3]	-4.7816	.3483	871.083	-13.729	.000	-5.4651	-4.0980
[PREFIX=4]	-5.1221	.3903	768.363	-13.125	.000	-5.8882	-4.3560
[PREFIX=5]	-5.7374	.3086	718.511	-18.589	.000	-6.3434	-5.1314
[PREFIX=6]	0	0	.	.	.	.	.

Covariance Parameters

Estimates of Covariance Parameters			
Parameter		Estimate	Std. Error
Repeated Measures	VC diagonal 1	.8525	.1630
	VC diagonal 2	.4668	8.656E-02
	VC diagonal 3	1.6102	.2991
	VC diagonal 4	1.8006	.3619
	VC diagonal 5	3.3708	.7416
	VC diagonal 6	1.1951	.2536
	VC diagonal 7	.8785	.1815
	VC diagonal 8	.5915	.1665
	VC diagonal 9	.4373	8.113E-02
	VC diagonal 10	.9756	.2918
	VC diagonal 11	.3371	6.587E-02
	VC diagonal 12	1.5478	.3125
	VC diagonal 13	.7869	.1542

VC diagonal 14	.4386	8.138E-02
VC diagonal 15	.5706	.1081
VC diagonal 16	.5051	9.306E-02
VC diagonal 17	.4890	8.977E-02
VC diagonal 18	2.1098	.4276
VC diagonal 19	.4486	.1166
VC diagonal 20	1.0360	.2143
VC diagonal 21	.6010	.1193
VC diagonal 22	.3723	6.852E-02
VC diagonal 23	.2472	4.554E-02
VC diagonal 24	1.3217	.2609
VC diagonal 25	.3281	6.063E-02
VC diagonal 26	.4667	8.570E-02
VC diagonal 27	.6310	.1266
VC diagonal 28	.8970	.1669
VC diagonal 29	.7659	.1407
VC diagonal 30	1.1044	.2296
VC diagonal 31	.6542	.1288
VC diagonal 32	.2803	5.155E-02
VC diagonal 33	.3988	7.524E-02
VC diagonal 34	.3382	6.357E-02
VC diagonal 35	.3688	6.825E-02
VC diagonal 36	.9943	.1908
VC diagonal 37	.4923	9.031E-02
VC diagonal 38	.3709	6.789E-02
VC diagonal 39	.5375	.1009
VC diagonal 40	.3561	6.532E-02
VC diagonal 41	.5680	.1060
VC diagonal 42	1.0255	.1930
VC diagonal 43	.3746	7.130E-02
VC diagonal 44	.5086	9.322E-02
VC diagonal 45	.6473	.1216
VC diagonal 46	.8682	.1682
VC diagonal 47	2.2196	.4593
VC diagonal 48	1.0539	.1956
VC diagonal 49	.6620	.1213
VC diagonal 50	.6448	.1271
VC diagonal 51	1.1365	.2094
VC diagonal 52	.7283	.1351
VC diagonal 53	1.0073	.1945
VC diagonal 54	7.9544	1.6375

STRENGTH	ID diagonal	5.961E-02	.1027
WORD * STRENGTH	ID diagonal	9.039E-03	5.071E-03
PREFIX * STRENGTH	ID diagonal	6.849E-02	4.498E-02

Mixed Model Analysis

Model Dimension

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	WORD	9		8		
	PREFIX	6		5		
	STRENGTH	1		1		
	WORD * STRENGTH	9		8		
	PREFIX * STRENGTH	6		5		
Repeated Effects	WORD * PREFIX	54	Variance Components	54	SUBJECT	60
Total		86		82		

Information Criteria	
-2 Log Likelihood	8109.541
Akaike's Information Criterion (AIC)	8273.541
Hurvich and Tsai's Criterion (AICC)	8277.853
Bozdogan's Criterion (CAIC)	8854.374
Schwarz's Bayesian Criterion (BIC)	8772.374

Fixed Effects

Type III Tests of Fixed Effects

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	2094.355	1129.346	.000
WORD	8	399.512	20.047	.000
PREFIX	5	1086.214	80.777	.000
STRENGTH	1	2419.476	203.330	.000
WORD * STRENGTH	8	543.664	14.780	.000
PREFIX * STRENGTH	5	735.407	35.455	.000

Estimates of Fixed Effects							
Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	6.1324	.3471	563.024	17.667	.000	5.4506	6.8142
[WORD=1]	2.0888	.3318	427.430	6.296	.000	1.4367	2.7409
[WORD=2]	1.3999	.2904	289.842	4.820	.000	.8283	1.9716
[WORD=3]	2.2578	.3118	350.814	7.242	.000	1.6446	2.8710
[WORD=4]	2.5226	.3041	308.953	8.294	.000	1.9241	3.1210
[WORD=5]	2.1557	.3341	381.208	6.452	.000	1.4988	2.8126
[WORD=6]	2.4361	.2966	332.833	8.214	.000	1.8527	3.0195
[WORD=7]	3.3588	.3154	400.453	10.650	.000	2.7388	3.9788
[WORD=8]	2.9190	.3300	440.003	8.845	.000	2.2704	3.5676
[WORD=9]	0	0	.	.	.	.	.
[PREFIX=1]	-3.4642	.4880	653.133	-7.099	.000	-4.4224	-2.5060
[PREFIX=2]	-2.7547	.4812	754.409	-5.724	.000	-3.6995	-1.8100
[PREFIX=3]	-4.8749	.3529	957.044	-13.812	.000	-5.5675	-4.1822
[PREFIX=4]	-5.2883	.3948	858.183	-13.395	.000	-6.0632	-4.5134
[PREFIX=5]	-5.8255	.3132	772.361	-18.598	.000	-6.4404	-5.2106
[PREFIX=6]	0	0	.	.	.	.	.
STRENGTH	-8.8870E-02	5.761E-02	598.742	-1.543	.123	-.2020	2.427E-02
[WORD=1] * STRENGTH	-.1129	4.327E-02	481.677	-2.608	.009	-.1979	-2.7832E-02
[WORD=2] * STRENGTH	-8.0997E-02	3.978E-02	374.768	-2.036	.042	-.1592	-2.7762E-03
[WORD=3] * STRENGTH	-.2382	4.296E-02	437.250	-5.545	.000	-.3227	-.1538
[WORD=4] * STRENGTH	-.2020	4.131E-02	388.083	-4.891	.000	-.2833	-.1208
[WORD=5] * STRENGTH	-.2232	4.411E-02	442.640	-5.060	.000	-.3099	-.1365
[WORD=6] * STRENGTH	-.1895	3.981E-02	393.040	-4.759	.000	-.2677	-.1112
[WORD=7] * STRENGTH	-.3549	4.261E-02	465.981	-8.328	.000	-.4386	-.2711
[WORD=8] * STRENGTH	-.2638	4.408E-02	499.815	-5.986	.000	-.3504	-.1772

[WORD=9] * STRENGTH	0	0	.	.	.	.	.
[PREFIX=1] * STRENGTH	.6653	6.783E-02	774.439	9.808	.000	.5321	.7985
[PREFIX=2] * STRENGTH	.5787	6.688E-02	828.415	8.652	.000	.4474	.7099
[PREFIX=3] * STRENGTH	.6458	6.032E-02	761.299	10.706	.000	.5274	.7642
[PREFIX=4] * STRENGTH	.7368	6.434E-02	790.853	11.452	.000	.6105	.8631
[PREFIX=5] * STRENGTH	.6389	6.160E-02	730.563	10.371	.000	.5179	.7598
[PREFIX=6] * STRENGTH	0	0	.	.	.	.	.

Covariance Parameters

Estimates of Covariance Parameters

Parameter		Estimate	Std. Error
Repeated Measures	VC diagonal 1	.8527	.1628
	VC diagonal 2	.4614	8.515E-02
	VC diagonal 3	1.6104	.2991
	VC diagonal 4	1.8134	.3639
	VC diagonal 5	3.4554	.7662
	VC diagonal 6	1.1769	.2477
	VC diagonal 7	.8527	.1745
	VC diagonal 8	.6301	.1836
	VC diagonal 9	.4374	8.135E-02
	VC diagonal 10	.8924	.2724
	VC diagonal 11	.3333	6.448E-02
	VC diagonal 12	1.5544	.3149
	VC diagonal 13	.7922	.1559
	VC diagonal 14	.4343	8.038E-02
	VC diagonal 15	.5694	.1079
	VC diagonal 16	.5027	9.256E-02
	VC diagonal 17	.4880	8.968E-02
	VC diagonal 18	2.1098	.4282
	VC diagonal 19	.4375	.1150
	VC diagonal 20	1.0413	.2176
	VC diagonal 21	.6002	.1193
	VC diagonal 22	.3701	6.803E-02
	VC diagonal 23	.2455	4.514E-02
	VC diagonal 24	1.2945	.2540
	VC diagonal 25	.3250	5.992E-02

VC diagonal 26	.4641	8.515E-02
VC diagonal 27	.6231	.1250
VC diagonal 28	.9009	.1677
VC diagonal 29	.7621	.1398
VC diagonal 30	1.0819	.2219
VC diagonal 31	.6509	.1284
VC diagonal 32	.2780	5.104E-02
VC diagonal 33	.3969	7.489E-02
VC diagonal 34	.3379	6.353E-02
VC diagonal 35	.3669	6.787E-02
VC diagonal 36	1.0057	.1931
VC diagonal 37	.4884	8.941E-02
VC diagonal 38	.3696	6.768E-02
VC diagonal 39	.5395	.1014
VC diagonal 40	.3545	6.499E-02
VC diagonal 41	.5624	.1045
VC diagonal 42	1.0239	.1918
VC diagonal 43	.3689	6.984E-02
VC diagonal 44	.5047	9.234E-02
VC diagonal 45	.6430	.1206
VC diagonal 46	.8622	.1669
VC diagonal 47	2.2500	.4694
VC diagonal 48	1.0578	.1958
VC diagonal 49	.6629	.1215
VC diagonal 50	.6271	.1219
VC diagonal 51	1.1442	.2111
VC diagonal 52	.7374	.1370
VC diagonal 53	1.0409	.2050
VC diagonal 54	7.5655	1.5753

Type III Tests of Fixed Effects(a)

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	1797.110	641.069	.000
Adjective	8	284.495	21.832	.000
Degree Modifier	4	1084.402	9.970	.000
STRENGTH	1	2160.249	325.162	.000
Adj * STRENGTH	8	336.951	14.069	.000
Degree Modifier * STRENGTH	4	906.369	1.755	.136

a Dependent Variable: Uncertainty

Estimates of Fixed Effects (b)

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	1.0461	.3290	304.508	3.179	.002	.3986	1.6935
[ADJ=1]	3.4447	.3693	280.386	9.328	.000	2.7177	4.1717
[ADJ=2]	.4652	.3006	246.517	1.548	.123	-.1267	1.0572
[ADJ=3]	1.3498	.3216	301.510	4.197	.000	.7168	1.9827
[ADJ=4]	2.1076	.3110	265.853	6.776	.000	1.4952	2.7200
[ADJ=5]	1.9934	.3420	331.152	5.829	.000	1.3206	2.6662
[ADJ=6]	1.7251	.3103	295.457	5.559	.000	1.1144	2.3358
[ADJ=7]	2.6219	.3405	358.490	7.701	.000	1.9524	3.2915
[ADJ=8]	2.1160	.3826	325.669	5.531	.000	1.3634	2.8686
[ADJ=9]	0(a)	0	.	.	.	.	.
[DM=1]	2.0000	.4793	664.399	4.173	.000	1.0590	2.9411
[DM=2]	2.5781	.4784	739.103	5.389	.000	1.6389	3.5173
[DM=3]	.7190	.3342	882.741	2.151	.032	6.311E-02	1.3750
[DM=4]	.2635	.3830	799.202	.688	.492	-.4883	1.0152
[DM=5]	0(a)	0	.	.	.	.	.
STRENGTH	.4475	5.428E-02	506.560	8.245	.000	.3409	.5542
[ADJ=1] * STRENGTH	-.2569	4.706E-02	349.460	-5.459	.000	-.3494	-.1643
[ADJ=2] * STRENGTH	4.121E-02	4.108E-02	327.608	1.003	.316	-3.9597E-02	.1220
[ADJ=3] * STRENGTH	-.1254	4.415E-02	381.939	-2.840	.005	-.2122	-3.8577E-02
[ADJ=4] * STRENGTH	-.1493	4.204E-02	340.884	-3.551	.000	-.2320	-6.6609E-02
[ADJ=5] * STRENGTH	-.1989	4.497E-02	392.826	-4.424	.000	-.2874	-.1105
[ADJ=6] * STRENGTH	-.1044	4.136E-02	353.787	-2.523	.012	-.1857	-2.3004E-02
[ADJ=7] * STRENGTH	-.2646	4.558E-02	416.892	-5.805	.000	-.3542	-.1750
[ADJ=8] * STRENGTH	-.1664	5.016E-02	371.241	-3.318	.001	-.2651	-6.7818E-02
[ADJ=9] * STRENGTH	0(a)	0	.	.	.	.	.
[DM=1] * STRENGTH	8.053E-02	6.567E-02	894.644	1.226	.220	-4.8352E-02	.2094
[DM=2] * STRENGTH	1.027E-02	6.531E-02	935.078	.157	.875	-.1179	.1384
[DM=3] * STRENGTH	4.811E-02	5.687E-02	897.253	.846	.398	-6.3500E-02	.1597
[DM=4] * STRENGTH	.1450	6.166E-02	873.276	2.351	.019	2.395E-02	.2660
[DM=5] * STRENGTH	0(a)	0	.	.	.	.	.

a This parameter is set to zero because it is redundant.

b Dependent Variable: Uncertainty.

DM = Degree Modifier

ADJ = Adjective

Degree modifier 1	Very
Degree modifier 2	Really
Degree modifier 3	Quite
Degree modifier 4	Rather
Degree modifier 5	Somewhat
Degree modifier 6	Fairly

Adj 1	Big
Adj 2	Nice
Adj 3	Happy
Adj 4	Bad
Adj 5	Likely
Adj 6	Difficult
Adj 7	Weak
Adj 8	Warm
Adj 9	Kind